

AWARD NUMBER: W81XWH-16-2-0004

TITLE: Military Suicide Research Consortium: Extensions to New Opportunities and Challenges

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REPORT DATE: April 2018

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
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REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
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1. REPORT DATE April 2018		2. REPORT TYPE Annual		3. DATES COVERED 31 Mar 2017 - 30 Mar 2018	
4. TITLE AND SUBTITLE Military Suicide Research Consortium: Extension to New Opportunities and Challenges				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER W81XWH-16-2-0004	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Peter M. Gutierrez, PhD email: Peter.Gutierrez@va.gov				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Denver Research Institute 830 N. Potomac Circle, Suite 125 Aurora, Colorado 80111				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Year 2 included funding several projects from the second round of proposals. The MSRC supports a total of 13 funded projects, including 4 long-term follow-up studies of MSRC 1.0 projects; 4 secondary data analyses of the MSRC Common Data Elements; 4 intervention studies; and 1 assessment study. The MSRC continues to provide training opportunities to future leaders in the field of military suicide research including through a joint MSRC-Army STARRS postdoctoral fellowship. The Denver staff continues to collaborate with the Florida State University site and seek guidance from its senior advisors and the Military External Advisory Board.					
15. SUBJECT TERMS Funding research projects; pre-doctoral and post-doctoral training; leveraging funds; collaboration with MSRC Cores; quarterly and annual reports; progress meetings					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Unclassified	18. NUMBER OF PAGES 436	19a. NAME OF RESPONSIBLE PERSON USAMRMC
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code)

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INTRODUCTION:

The Military Suicide Research Consortium's (MSRC) continued goal is suicide prevention in the military, through research, including on primary, secondary, and tertiary interventions, as well as through information management/scientific communications (disseminating knowledge on military suicide). Specifically, suicidal personnel compromise force readiness, place a strain on the healthcare resources of the military, impact unit morale, and take a large emotional toll on the involved friends, family, and commanders. The stigma associated with being suicidal, which limits the extent to which at-risk individuals are willing to seek help, continues to be present and can be heightened by media focus. MSRC intends to progress in the development of its tools and funding new studies, it is now an established go-to resource for decision-makers to obtain accurate and efficient answers regarding suicidal behavior, with the continued emphasis on the military perspective. MSRC plans to facilitate information management/scientific communications for the Department of Defense (DoD) and to maximize research efforts at understanding and improving suicide risk screening and assessment, interventions, and population-level prevention programs. MSRC and its associates plan to increase their level of involvement and dissemination of information. MSRC continues to receive acknowledgement for its work and its contributions. MSRC has a main goal: expanding knowledge, understanding, and capacity to prevent, treat, and enhance the quality of life of persons in military communities who are affected by suicide-related problems.

KEYWORDS:

Military, suicide, research, dissemination, prevention, intervention, assessment, training

ACCOMPLISHMENTS:

What are the major goals of the project?

- (1) Maintain situational readiness, research infrastructure, intellectual capacity, and institutional memory to ensure that the resources exist to meet future military suicide research needs as they change and develop.
- (2) Continuing to produce new scientific knowledge about suicidal behavior in the military.
- (3) Use high quality research methods and analyses to extend significant findings from studies completed in the first five years of MSRC.
- (4) Conduct after-action analyses of null findings from initial MSRC studies to determine whether interventions significantly affected other outcomes (e.g., mechanism variables covered by the Common Data Elements [CDE]).
- (5) Capitalize on the CDE (variables collected by all currently funded studies) to encourage rigorous secondary analyses, exploring rival mediators and mechanisms, and moving toward making the data available to the broader research community.
- (6) Build on the first five years of research conducted by the MSRC, by continuing to disseminate Consortium knowledge, information, and findings through a variety of methods appropriate for decision makers, practitioners, and others who are accountable for ensuring the mental health of military personnel.
- (7) Train future leaders in military suicide research.

What was accomplished under these goals?

Consortium Specific Aim 1: Maintain situational readiness, research infrastructure, intellectual capacity, and institutional memory to ensure that the resources exist to meet future military suicide research needs as they change and develop.

Major Task 1: Implement plan for revised infrastructure

Subtask 2: Consortium Start-up

- The MSRC continues to respond to queries from decision makers and others with speed and efficiency.
- Core B research staff in Denver continue to monitor listservs for military suicide research. Cores A and B continue to respond to media inquiries, data requests, membership requests, general information requests, and funding requests made through the MSRC website portal.
- The MSRC Standard Operating Procedures (SOP) for Principal Investigators were finalized and distributed to funded investigators.

Subtask 3: Attend meetings (annual MSRC, MSRC IPR, MEAB, and DoD IPR) and submit reports (annual and quarterly)

- The MOMRP IPR meeting was held on April 17-18, 2017 at Ft. Detrick with representatives from MOMRP, DSPO and DCoE in attendance.
- The MSRC annual meeting was held on September 18, 2017 in Frederick, MD. Representatives from Core A, Core C, Core D, MOMRP, Senior Advisors, and the joint MSRS/STARS post-docs were in attendance.
- A MEAB Meeting was held on September 19, 2017 to review selected proposals from the second RFP. Drs. Joiner and Gutierrez were in attendance and presented the secondary data analyses and long-term follow-up proposals. Six investigators were provided the opportunity to present their proposals in person. The MEAB recommended funding two clinical trials, two secondary data analyses of the MSRC CDEs, and 4 long-term follow-up studies of MSRC 1.0 projects. The MEAB also recommended 4 proposals be revised and submitted for a re-vote. Those included one clinical trial and three machine learning CDEs.
- Dr. Gutierrez attended the DSPO quarterly SPARC meeting and briefed them on the status of 1.0 study deliverables.
- Dr. Gutierrez represented the MSRC at the Air Force Suicide Prevention Solutions Working Group meeting at Joint Base Andrews.
- Dr. Joiner presented at the VA/DOD Suicide Conference in Denver.
- Drs. Gutierrez and Joiner attended the Military Health Systems Research Symposium (MHSRS) meeting.
- Drs. Gutierrez and Joiner attended a meeting of the Leadership Tool Working Group convened by the Deputy Under-Secretary of the Army on February 20, 2018 in Washington, DC.
- Quarterly reports for Year 2 were submitted to MOMRP on schedule.

Subtask 4: Prepare MEAB and scientific review functions

- Drs. Joiner and Gutierrez attended the MOMRP Suicide IPR Meeting in Ft. Detrick on May 17-18, 2017.

- Core A provided proposals, independent scientific peer reviews, and proposal presentations to the MEAB prior to the September 19, 2017 meeting.
- A MEAB Meeting is scheduled for 22 May 2018. Drs. Joiner and Gutierrez will update the MEAB on the status of currently funded studies, Core D, and post-doctoral activities. There will also be a presentation of one proposal: Long-term Follow-up of the Military Continuity Project; Kate Comtois, PhD.
- The MOMRP Suicide IPR Meeting is scheduled for 23-24 May 2018. Drs. Joiner and Gutierrez will present on the status of the MSRC and currently funded studies.
- A MEAB meeting is tentatively scheduled for November 14, 2018 to review proposals from the third RFP.

The following milestones were achieved in Year 2:

- Infrastructure Updated
- Meetings Attended
- Reports Submitted

Consortium Specific Aim 2: Continuing to produce new scientific knowledge about suicidal behavior in the military.

Major Task 2: Refine & Develop research priorities

Subtask 1: Plan research projects

- Drs. Gutierrez and Joiner continue to participate in monthly Study to Assess Risk & Resilience in Servicemembers – Longitudinal Study (STARRS-LS) PI conference calls.
- Dr. Gutierrez is working with the VA Suicide Prevention Office on their review and refinement of the VA's Suicide Research Portfolio.
- Dr. Joiner spoke with Dave Sisus, the director of the TBI Consortium regarding the possibility of joint partnerships on tracking VA suicide risk/attempts and monitoring.
- Dr. Joiner presented MSRC to the FBI in Northern Virginia on November 13, 2017 and the topic was "Research Update on the MSRC and the Interpersonal Theory of Suicide".
- Dr. Joiner did community suicide prevention events, using variations of the above topic, at Detroit on November 9 and at Flagstaff, AZ on November 17, 2017.
- Dr. Joiner did several UVA lectures: Psychology, Psychiatry, Student Health, Emergency Medicine, and the Institute of Law & Psychiatry. These were held November 14-15, 2017.
- Dr. Gutierrez was invited to participate in a panel with the National Governor's Association Meeting held in Denver on March 27, 2018 to discuss MSRC studies and suicide prevention.

Subtask 2: Identify research teams

- The following studies were approved by the MEAB and are currently funded:
 - o Dr. Mike Anestis: Project Safe Guard
 - o Dr. Jessica Ribeiro: Examining the nature of suicide risk over time using machine learning
 - o Dr. Brad Schmidt: Long Term Follow-up for MSRC DARTS Clinical Trial
 - o Dr. Joe Franklin: Using Machine Learning to Distinguish among Active Duty, Veteran, and Civilian Suicidality
 - o Dr. Jessica Ribeiro: Optimized suicide risk detection and management in military primary care

- o Dr. Brad Schmidt: Building Stronger Allies: Development and Evaluation of a Web Application Targeting Interpersonal Risk Factors for Suicide in Active Duty Service Members
- o Dr. Sarra Nazem: Efficacy of a Computerized Cognitive Behavioral Treatment for Insomnia: Increasing Access to Insomnia Treatment to Decrease Suicide Risk
- o Dr. Alexis May: Couples Crisis Response Planning to Reduce Post-Discharge Suicide Risk
- o Dr. Courtney Bagge: Profiles of Behavioral Warning Signs for Suicide Attempts in the Prediction of Future Suicidality
- o Dr. Lora Johnson: Three Year Follow-up of Study on Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans
- o Dr. Andrew Littlefield: Enhancing Identification of Suicide Risk among Military Service Members and Veterans: A Machine Learning Approach to Suicidality
- o Dr. April Smith: Interoceptive Deficits and Suicidality
- o Dr. David Vogel: Establishing Measurement Equivalence of MRSC Database Assessments

Subtask 3: Consult with funded MSRC applicants to develop D&I plans for their research proposals that are feasible and relevant to military settings and populations

- Core D provided consultation to funded applicants on development of dissemination products such as toolkits, policy recommendations, or training plans.

Subtask 4: Determine gaps in implementation science research and methods relevant to military populations

- Core D provided consultation to Core A on integrating dissemination and implementation into research priorities.
- Core D continues to hold weekly meetings to organize Core D tasks, review the MSRC study research findings, prepare for the Readiness Working Group reviews, and has provided consultation to PIs in preparation for their scheduled reviews. Kelly Soberay from MSRC Core A joined Core D team to ensure information coordination.
- Seven 1.0 MSRC-funded studies were reviewed by the Readiness Working Group this Year. The reports for these studies contain recommendations for D&I research areas the MSRC could consider funding (see Appendix A.10).
- Core D is creating a structure and process for reviewing the MSRC research outcomes, and has developed a new Quality of Evidence Rating Scale for these types of reviews. Two of the three currently scheduled study reviews will follow this new format, which will be revised as necessary based on the review experience. All processes are being developed in collaboration with the Working Group.
- The Core D Annual Meeting was held to strategize goals and tasks for the coming year including:
 - o Developing EBP implementation strategies and conducting associated pilot evaluations
 - o Developing tool kits and conducting associated pilot evaluations
 - o Developing and deploying consultants to assist MSRC PIs, Core D, and our military partners on implementation science, economic analysis, etc.
 - o Developing a webcast series
 - o Developing projects for post-doctoral fellow

Subtask 5: Call for proposals for second round of new studies

- The second targeted RFP included clinical trials as well as other areas of research to include screening and risk assessment, prevention, postvention, and basic research. A total of 11 projects were funded, including 4 long-term follow-up studies, 4 secondary data analyses of the CDEs, 2 intervention studies, and 1 assessment study.
- Core A, in conjunction with MOMRP, developed a targeted RFPs for additional funded projects.
 - Dr. Kate Comtois has submitted a proposal to conduct a long-term follow-up to the MSRC 1.0 funded Military Continuity Project.
 - Dr. J. Logan with the Centers for Disease Control (CDC) also expressed interest in using the MSRC CDEs to examine the relationship between prescription drug abuse and suicidal ideation/behavior and the interaction of this relationship with having PTSD, TBI, hopelessness, and depression. Dr. Logan informed the MSRC that going through the MSRC LOI and proposal process on his organization's end is not feasible at this time. Therefore, he requested examining his hypotheses with the CDE data in-kind through the MSRC Data Request portal that is available for use without funding.
- Core A has consulted with MOMRP regarding the next RFP to be released on April 6, 2018. The topic areas include:
 - Help-seeking behavior (e.g., interventions, messaging campaigns, resource portals which encourage and facilitate service members accessing care without prompting from command/clinicians)
 - Community and peer-based interventions, specifically identifying at-risk individuals and what to do when an individual is in crisis (e.g., programs aimed at teaching service members to recognize and respond to risk in others)
 - Suicide bereavement (e.g., programs which seek to decrease the negative impacts of suicide losses within a unit on unit members)
 - Messaging about interventions to increase effectiveness in dissemination and implementation (e.g., dissemination and implementation interventions to effectively roll-out existing military-specific suicide prevention interventions)
 - Translation of research into practice (e.g., studies that evaluate how we can facilitate the effective and consistent adoption of evidence-based therapies; evaluation of military medical records to assess to what degree the treatment offered was evidence-based)
 - Postvention addressing or, perhaps primarily focusing on, suicide attempts, not suicide (e.g., develop and evaluate best methods to promote continued unit function at high level, avoid stigmatization of survivors (peers, friends, family), avoid "glorification", etc.)

The following milestones were achieved in Year 2:

- Research Priorities Updated (ongoing)
- Research Studies Funded (ongoing)

Major Task 3: Fund and Oversee Clinical Trials and Research Studies

Subtask 1: Facilitate Success

- Core C continues to manage upload and maintenance of the common data elements.
- Core A has updated the guidelines to monitor progress of funded projects to facilitate success.
- Funded investigators have submitted quarterly reports on time.

- Core A held two kick-off conference calls for newly funded investigators. During the call, the PI SOP including regulatory requirements, invoicing, quarterly and final reports, data uploading, and D&I resources were reviewed.
- Core A will hold an in-person (IPR) meeting for funded investigators in Frederick, MD on 25 May 2018.

The following milestones were achieved in Year 2:

- Maintain defined schedule of data uploads and meetings.

Consortium Specific Aim 3: Use high quality research methods and analyses to extend significant findings from studies completed in the first five years of MSRC.

Major Task 4: Perform analyses on findings from years 1-5

Subtask 1: Perform analyses on years 1-5 findings to extend first five years of MSRC research activities

- Long-term follow-up studies of four of the MSRC 1.0 were funded with the second RFP. A fifth long-term follow-up study will be reviewed at the MEAB Meeting on May 24, 2018.

Consortium Specific Aim 4: Conduct after-action analyses of null findings from initial MSRC studies to determine whether interventions significantly affected other outcomes (e.g., mechanism variables covered by the Common Data Elements [CDE]).

Major Task 5: Perform after-action analyses

Subtask 1: Conduct after-action analyses on any null findings from years 1-5

- 1.0 PIs were asked to select findings and CDE variables that were not included in their primary study analyses and test them for potential moderator effects. Several of the PIs conducted the requested analyses and did not find anything which added to their primary results. Other PIs were unable to conduct the requested analyses due to insufficient resources now that their study protocols have been closed. We concluded that commitment of additional MSRC resources to this task is not necessary and therefore deem it complete.

The following milestones were achieved in Year 2:

- Analyses completed

Consortium Specific Aim 5: Capitalize on the CDE (variables collected by all currently funded studies) to encourage rigorous secondary analyses.

Major Task 6: Capitalize on CDE Secondary Analyses

Subtask 1: Call for proposals for secondary data analyses of Common Data Elements

- Four secondary data analysis projects were approved for funding following the September 19, 2017 MEAB meeting:
 - o Dr. Joe Franklin: Using Machine Learning to Distinguish among Active Duty, Veteran, and Civilian Suicidality
 - o Dr. Andrew Littlefield: Enhancing Identification of Suicide Risk among Military Service Members and Veterans: A Machine Learning Approach to Suicidality
 - o Dr. April Smith: Interoceptive Deficits and Suicidality

- o Dr. David Vogel: Establishing Measurement Equivalence of MRSC Database Assessments

The following milestones were achieved in Year 2:

- Secondary analyses funded
- Research Priorities updated

Consortium Specific Aim 6: Disseminate Consortium knowledge, information, and findings.

Major Task 7: Development of D&I Plans

Subtask 1: Review years 1-5 MSRC studies' design and implementation of findings

- The MSRC Readiness Working Group completed reviews of seven MSRC 1.0 interventions. A template for the Working Group's final report for each 1.0 study was created and includes the following:
 - Summary of Intervention
 - Executive Summary of Working Group Feedback
 - The MSRC 1.0 Intervention Summary Template
 - Next Steps for Dissemination of the Intervention for Military Personnel
 - Suggestions for Research Needed to Support Dissemination and Implementation for Military Personnel
 - Contacts to Explore Funding for Further Research
 - Summary of Working Group Meeting Feedback
- All steps in these review processes and all documents were developed collaboratively with and approved by the Working Group.
- The MSRC Readiness Working Group continues to meet monthly. A new meeting format has been developed and a Quality of Evidence Rating Scale was designed specifically for research outcome reviews. Feedback reviewed thus far from members regarding the new structure has been positive. For further verification, a process review is scheduled with the working group next quarter. The final reports for two reviews conducted in the 4th quarter are under review and will be included with the next quarterly report.
- Began discussion with VA leadership about a Veteran-focused D&I Working Group.

Subtask 2: Evaluate MSRC study interventions for readiness for D&I

- Core D is working with MSRC 2.0 investigators to develop integrated D&I plans for their studies. Preliminary conversations were held with two research staff, and Core D provided them with a list of considerations for discussion with the PI. Follow-up conversations will be scheduled.

Subtask 3: Core D will establish and maintain ongoing relationships and partnerships with agencies and organizations that can support D&I in military and veteran settings and with military communities.

- DCoE changed its representation on the MSRC Readiness Working Group Committee, providing new connections for Core D.
- Dr. Comtois attended the Cohen Veteran Network D&I Conference in Washington, DC as well as the Aeschi 9: Suicide Across the Lifespan: Relational Models of Treatment 2017 conference in Vail, CO. The former meeting led to further connections with the Center for Deployment Psychology and STRONG STAR as well as the Cohen Veteran

Network team. The latter conference included meeting with new DCoE colleagues, Andrew Blatt and Jennifer Tucker.

- With the goal of further understanding evidence-based policy and policy research regarding military suicide prevention, Core D held a teleconference with representatives from the Partnered Evidence-Based Policy Resource Center (PEPReC) to discuss possible collaboration and gain their expertise on methodologies for measuring policy as well as best practices for policy development and implementation based on research knowledge. PEPReC is a new VA HSR&D/QUERI resource designed to provide timely, rigorous data analysis to support the development of high-priority policy, planning, and management initiatives and quantitative program evaluations with strong potential to improve the quality and efficiency of VA healthcare.
- At the MSRC Annual meeting, MOMRP provided new guidance for the dissemination of the results of MSRC 1.0 intervention and experimental studies, and Core D continues to collaborate with MOMRP and MSRC directors on a coordinated strategy.
- In association with the 4th Annual Society for Implementation Research Collaboration (SIRC) Conference held September 7-9, 2017, Dr. Comtois organized the symposium, “Dissemination and Implementation of Evidence Based Practices in Military Settings: Three Approaches from Policy and Intermediary Perspectives”. This was the first ever military-focused symposium at SIRC and had representation from DCoE, DSPO, the VA, and MSRC.
- During the SIRC pre-conference workshop day Dr. Comtois organized and facilitated a DoD/VA focused Implementation Development Workshop (IDW). The IDW provides researchers, policy makers, trainers, consultants, and other intermediaries a structured environment in which to share expertise on developing projects as well as foster discussion on cutting-edge issues in implementation.
- A lunch meeting of the SIRC/D&I Core Policy Interest Group was held to encourage new membership. Four new members were engaged.
- In February 2018, Dr. Comtois attended a one-day conference organized by DSPO for the Strategic Decision Team (SDT) Dissemination & Implementation Working Group, a subgroup of the Research and Evaluation mission of the Joint VA/DoD collaboration around suicide prevention. The venue provided opportunities to reference the expertise and resources of MSRC and for identifying connections within military and veteran organizations.
- Core D continues to make progress honing the Scope of Work for a Dissemination Science Institute (previously referred to as the Dissemination Knowledge Institute) and designing this 1.5-day program focused on dissemination of Evidence-Based Practices (EBPs) within the military. Specific goals of the Institute include: An introductory tutorial about dissemination science, cutting edge, successful dissemination examples within and outside a military context, and discussing how to apply this knowledge to research findings. The intended audience is DoD stakeholders, MSRC members, and PIs. A consultation meeting was held with Society for Implementation Research Collaboration (SIRC) member Dr. Ross Brownson, an expert in the development of innovative methods and approaches in dissemination and implementation research, as well as dissemination of existing evidence-based interventions. Dr. Brownson provided insight for the program structure as well as suggestions for invited speakers with whom Core D will be connecting.

The following milestone was achieved in Year 2:

- Establish D&I relationships

Major Task 8: Organized Dissemination

Subtask 1: Identify and establish connection with implementation science organizations which can support D&I with military populations

- Core D presented the symposium “Developing and Evaluating a System for Consensus Decision-Making for Prioritizing Evidence-Based Practices for Dissemination and Implementation in Very Large Systems: A Collaboration with the Department of Defense for Suicide Prevention,” which included presentations from DCoE, DSPO and Core D. to the Society for Implementation Research Collaboration (SIRC) bi-annual conference in September 2017.
- Core D is also organized a pre-SIRC conference, military and Veteran focused Implementation Development Workshop (IDW). The IDW provides researchers, policy makers, trainers, consultants, and other intermediaries a structured environment in which to share expertise on developing projects as well as foster discussion on cutting-edge issues in implementation.
- Core D also held the first joint SIRC/Core D Policy Task force meeting with representatives from DSPO, HQMC, MOMRP, and federal and regional civilian members of the SIRC who are involved and/or invested in a policy role in D&I. Future meetings are schedule on a monthly basis.
- Core D increased connections between D&I oriented military representatives of MSRC, Center for Deployment Psychology, Defense Suicide Prevention Office, and Defense Centers of Excellence with implementation scientists at the SIRC conference. In addition to the activities listed above, this included a dinner of military representatives with the MSRC director and Core D team.
- The Core D Program Manager and Post-Doctoral Fellow attended the Academy of Health’s 10th Annual Conference on the Science of Dissemination and Implementation in Health December 3-4, 2017 in Arlington, VA, which aims to bridge the gap between research, practice, and policy in health and health care. Activities included networking with researchers and organizational representatives regarding ideas and opportunities for supporting D&I with military populations and attending sessions.
- Core D continues to make progress collaborating with the Society for Implementation Research Collaboration (SIRC) in the planning of a 1.5-day Knowledge Institute focused on Dissemination of EBPs within the military. The workshop will be held in the Washington DC area, most likely in December of 2018 to coincide with the next Academy of Health D&I Conference.
- Core D has facilitated DoD colleagues’ participation in the Society for Implementation Research Collaboration Practitioner Interest Groups – for Policy (policy makers and funders), Intermediaries (trainers, consultants), and Providers (clinic leadership). These groups meet monthly by teleconference to advance cutting edge implementation and implementation research in their respective areas.
- Core D is a core representative at the Defense Suicide Prevention Office Dissemination and Implementation work group as part of the Research and Evaluation focus of the Joint VA/DoD Coordination MOA on suicide prevention.
- Core D is coordinating an opportunity to disseminate Consortium knowledge, information, and findings by hosting an MSRC exhibit table at the American Association of Suicidology Conference (AAS) April 18-21, 2018 in Washington, DC. PIs were invited to exhibit their MSRC funded research, interventions and study results (via

brochures, papers, websites, phone apps, etc.), and to participate in scheduled “meet and greet” sessions. Ten PIs plan to exhibit and 7 of them are also being scheduled for the in-person networking opportunity. In coordination with Cores A and B, information about the exhibit and schedule will be publicized via social media (Twitter, the conference app, MSRC website, etc.).

Consortium Specific Aim 7: Train future leaders in military suicide research.

Major Task 9: Continue pre-doctoral and postdoctoral training experiences at FSU and Rocky Mountain MIRECC

Subtask 1: Establish career development network

- FSU MSRC, under the leadership and guidance of Dr. Joiner continues to provide training and research opportunities to its graduate students.
- Matt Podlogar accepted a postdoctoral fellowship position with the Rocky Mountain MIRECC working with Dr. Gutierrez.
- Jenny Buchman accepted an internship at the Denver VA.

Subtask 2: Establish joint pre-doctoral and postdoctoral training experiences through the MSRC

- The MSRC Preconference Training Day, in conjunction with the American Association of Suicidology (AAS) Annual Conference was held on April 26, 2017. The full-day training included 34 students and eleven faculty.
- The Silverman Student Paper Award winner presented at the 2017 AAS Annual Conference was a previous student/attendee of the MSRC Training Day. Claire Houtsma, B.S. is a student of Dr. Mike Anestis at University of Southern Mississippi. In comments to Dr. Gutierrez she indicated that her attendance at the 2016 Training Day directly contributed to the submitted paper.
- MSRC provided its sixth year of dissertation awards to doctoral students whose dissertation director is a current member of MSRC. The awards of up to \$2,000/each are intended to provide support for completion of a doctoral dissertation topic of relevance to the MSRC. Four dissertation awards were funded this year:
 - Melanie Hom, Florida State University: Identifying Correlates and Predictors of Help-Seeking and Treatment Engagement among Undergraduates at Elevated Suicide Risk with and without a Military Service History
 - Ian Stanley, Florida State University: Identifying Effective Approaches to Counseling on Firearm Safety: A Randomized Experimental Design Among Firearm-Familiar Individuals at Risk for Suicide
 - Keyne Law, University of Southern Mississippi: Mechanisms Driving Suicidal Ideation to Action: The Impact of Rumination and Physiological Arousal on Momentary Fluctuations in Pain Tolerance and Persistence
 - Katrina Speed, Mississippi State University: A Pilot Study: Imagery Rehearsal Therapy with Clinician vs Smart Phone Application Intervention for Treating Nightmares, PTSD, and Suicide Risk Within the Military Community
- Drs. Samantha Bernecker and Kelly Zuromski started their joint MSRC/STARRS postdoctoral fellowships in August. They are focusing on evaluating the impact and cost effectiveness of available intervention and prevention programs in epidemiologically targeted high risk military population segments.
- An in-person meeting with the current MSRC/STARRS post-docs and Drs. Joiner, Gutierrez, Nock, and Kessler was held in October 2017. Drs. Zuromski and Bernecker

provided an overview of projects they will be working on and planned manuscripts. They were reminded to consider the implications of their work on the priorities and deliverables discussed at the MSRC Annual Meeting.

- Twelve applications were reviewed for the Year 2 joint MSRC/STARRS post-docs. Drs. Carol Chu and Chelsey Wilks were chosen and will begin training in August 2018.
- The MSRC will host the 2018 MSRC Training Day in conjunction with the AAS conference on April 18, 2018. There were 44 applications and 31 were accepted. The current and recently accepted post-docs were also invited, resulting in 36 attendees.

Subtask 3: Establish military/veteran oriented D&I postdoctoral training experiences within Core D

- On December 16, 2017 Dr. Bruce Crow began his Dissemination and Implementation of Suicide Prevention Strategies in Military Settings Post-Doctoral Fellowship with Core D. Dr. Crow is fully onboarded and has completed the mandatory trainings for the Fellowship.
- In addition to having attended the 10th Annual D&I Conference, Dr. Crow submitted a proposal that was accepted for their Technical Assistance Workshop, a training that provides guidance and feedback to investigators currently developing proposals to conduct dissemination or implementation research in health.
- Core D established an academic readings list and initial broad curriculum for Dr. Crow to orient himself to his new subject area, and Dr. Crow has established a tracking spreadsheet for this “library.” Dr. Comtois and Core D consultants have and will continue to provide guidance in an ongoing, structured manner to further develop the curriculum and learning opportunities.
- Dr. Crow actively participates in the Comtois Lab by attending standing meetings, providing consultation to Lab research staff on military relevance and contextual accuracy, and contributing to written reports, review summaries and grant proposals.
- Dr. Crow actively participates on the MSRC 1.0 D&I Readiness Working Group reviews, the TACTICS project Implementation work group, and the DSPO/VA Strategic Decision Team.
- During the 4th Quarter Dr. Crow consulted with the Army Public Health Center about Army suicide epi data, with PHCoE-West about potential collaboration, and provided consultation to Harvard-located MSRC fellows about military data systems.

The following milestones were achieved in Year 2:

- Career development and training experiences established.
- D&I postdoctoral experiences established

What opportunities for training and professional development has the project provided?

Please refer to Consortium Specific Aim 7: Train future leaders in military suicide research (above).

How were the results disseminated to communities of interest?

Nothing to Report.

What do you plan to do during the next reporting period to accomplish the goals and objectives?

- The third RFP will be released on April 6, 2018. We anticipate funding 6-8 proposals. Core A will work with AAS to make sure the scientific reviews are completed in a timely fashion. Core A will provide reviews to MEAB members prior to the November 14, 2018 MEAB meeting.
- Core A will submit quarterly reports on time.
- Core A staff will work with the currently funded PIs to obtain IRB and HRPO approvals.
- The 5th Annual MSRC Research Training Day in conjunction with the American Association of Suicidology Annual Conference is scheduled for April 18, 2018.
- The MSRC IPR meeting for funded investigators is scheduled for May 25, 2018. This will be an opportunity for PIs to present on the status of their project. It will also be an opportunity to troubleshoot problems and brainstorm ideas among the PIs and MSRC staff.
- MSRC funded studies will inform the development of tools for military leaders to identify and manage suicidal service members.
- Drs. Gutierrez and Joiner will continue to establish and maintain ongoing relationships and partnerships with STARRS-LS, DSPO, DCoE, and military and veteran communities and organizations.
- Provide ongoing training opportunities for MSRC staff, MSRC trainees, and MSRC investigators.
- The MSRC Annual Meeting, which will be held in Frederick, MD is tentatively scheduled for November 15, 2018.

During the next reporting period Core D will:

- Represent the MSRC and funded researchers at an exhibit table at the American Association of Suicidology (AAS) Conference in Washington, D.C. April 18-21, 2018.
- Network at AAS. Each Core D member has specific contacts and networking goals.
- Hold the 2nd Annual D&I Core meeting on April 19, 2018.
- Moderate and participate on the panel, “Developing and Evaluating a System for Consensus Decision-Making for Prioritizing Evidence-Based Practices for Dissemination and Implementation in Very Large Systems: A Collaboration with the Department of Defense for Suicide Prevention” with representatives from DSPO and CDP at the AAS conference on April 20, 2018.
- Further collaborate with SIRC on Dissemination Institute and Practitioner Workgroups.
- Continue organizing the membership for a Veteran-focused Working Group to parallel the active duty military group.
- Continue considering publication of the MSRC Readiness Working Group process.
- Complete two study reviews and one process review during the MSRC D&I Readiness Working Group monthly meetings.

IMPACT:

What was the impact on the development of the principal discipline(s) of the project?

The Consortium has funded thirteen projects to date. Subawards have been approved for all projects and several have IRB and HRPO approval. Four projects are currently recruiting, and the four CDE projects have begun preliminary analyses.

What was the impact on other disciplines?

Nothing to report.

What was the impact on technology transfer?

Nothing to report.

What was the impact on society beyond science and technology?

Nothing to report.

CHANGES/PROBLEMS:

Changes in approach and reasons for change

Nothing to report.

Actual or anticipated problems or delays and actions or plans to resolve them

Nothing to report.

Changes that had a significant impact on expenditures

We received a contract modification exercising the first option period and increasing funding for each site by \$4,250,000. The MSRC administrative group met and updated the SOW and budget as requested by MOMRP. These funds extend the range from clinical trials only to clinical trials plus other types of studies. For these new funds, MSRC opened the process for submission of proposals after the prior MEAB meeting in December.

On March 8, 2017 both sites were notified that an additional \$660,404 in option period funds were available to each site. The additional funds were added to the research program budget at each site. The revised budget, budget justification, and SOW have been sent to the MOMRP grants officer.

Significant changes in use or care of human subjects.

Nothing to report.

Significant changes in use or care of vertebrate animals.

N/A

Significant changes in use of biohazards and/or select agents

N/A

PRODUCTS:

Publications, conference papers, and presentations

Publications

Hom, M. A., Chu, C., Schneider, M. E., Lim, I. C., Hirsch, J. K., Gutierrez, P. M., & Joiner, T. E. (2017). Thwarted belongingness as an explanatory link between insomnia and suicidal ideation: Findings from three samples of military service members and veterans. *Journal of Affective Disorders*, 209, 114-123. doi: 10.1016/j.jad.2016.11.032

Hom, M. A., Stanley, I. H., Gutierrez, P. M., & Joiner, T. E. (2017). Exploring the association between exposure to suicide and suicide risk among military service members and veterans. *Journal of Affective Disorders*. 1;207:327-335. doi: 10.1016/j.jad.2016.09.043. doi:10.1016/j.jad.2016.09.043

Ringer, F.B. Soberay, K. A., Rogers, M. L., Hagan, C. R., Chu, C., Schneider, M., Podlogar, M. C. Witte, T., Holm-Denoma, J., Plant, Gutierrez, P. M., & Joiner, T. E. (2017). Initial Validation of Brief Measures of Suicide Risk Factors: Common Data Elements Used by the Military Suicide Research Consortium. *Psychological Assessment*. <http://dx.doi.org/10.1037/pas0000519>

Chu, C., Hom, M. A., Stanley, I. H., Gai, A., Nock, M. K., Gutierrez, P. M., & Joiner, T. E. (2018). Non-suicidal self-injury and suicidal thoughts and behaviors: A study of the explanatory roles of the interpersonal theory variables among military service members and veterans. *Journal of Consulting and Clinical Psychology*, 86(1), 56-68. <http://dx.doi.org/10.1037/ccp0000262>

Nock, M. K., Millner, A. J., Joiner, T. E., Gutierrez, P. M., Han, G., Hwang, I., King, A., Naifeh, J.A., Sampson, N., Zaslavsky, A., Stein, M., Ursano, R., Kessler, R. C. (2018). Risk factors for the transition from suicide ideation to suicide attempt: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Journal of Abnormal Psychology*, 127(2), 139-149. <http://dx.doi.org/10.1037/abn0000317>

Bernecker, S. L., Rosellini, A. J., Nock, M. K., Chiu, W. T., Gutierrez, P. M., Hwang, I., Joiner, T. E., Naifeh, J. A., Sampson, N. A., Zaslavsky, A. M., Stein, M. B., Ursano, R. J., & Kessler, R. C. (2018). Improving risk prediction accuracy for new soldiers in the U.S. Army by adding self-report survey data to administrative data. *BMC Psychiatry*, 18, 87. <http://doi.org/10.1186/s12888-018-1656-4>

Presentations

Gutierrez, P. M., & Joiner, T. (2017, April). The Military Suicide Research Consortium (MSRC): Overview, accomplishments and recommendations for implementation in other nations. Presented at the NATO HFM-275 Symposium on Military Suicide Prevention, Riga, Latvia.

Soberay, K. A., Hanson, J. E., & Gutierrez, P. M. (2017, July). Military suicide research presence and impact in policy documents captured by altmetrics. Presented at the VA/DOD Suicide Prevention conference, Denver, CO.

Soberay, K. A., Plant, E. A., Hanson, J. E., & Gutierrez, P. M. (2017, July). Traumatic brain injury, severe insomnia, and suicidal behaviors in active duty military. Presented at the VA/DOD Suicide Prevention conference, Denver, CO.

Joiner, T. & Gutierrez, P. M. (2017, August). The Military Suicide Research Consortium common data elements: Measurement invariance across enlisted service members, younger veterans, and older veterans. Military Health System Research Symposium, Kissimmee, FL

Comtois, K. & Brown, G. (2017, September). A Public Health Approach: Translation and Implementation of Non-Clinical Practices for Suicide Prevention in the Military. Presented at the 4th Annual Society for Implementation Research Collaboration (SIRC) Conference, Seattle, WA.

Gutierrez, P. M. & Joiner, T. (2017, November). The Military Suicide Research Consortium common data elements: Psychometric support, clinical, and research utility. International Academy of Suicide Research meeting, Las Vegas, NV.

Joiner, T. & Gutierrez, P. M. (2017, November). The Military Suicide Research Consortium Common Data Elements: An examination of measurement invariance across enlisted service members, younger veterans, and older veterans. International Academy of Suicide Research meeting, Las Vegas, NV.

Gutierrez, P. M., Hanson, J., & Joiner, T. (2018, April). Suicide assessment for military service members: And maybe everyone else? Presented at the 51st Annual Conference of the American Association of Suicidology, Washington, DC.

Other Products

- MSRC D&I Core Access Database
- Military Suicide Research Consortium Core D Dissemination and Implementation (D&I) Recommendation Categories
- Common Data Elements 2.0
- MSRC Demographics Form
- MSRC Intervention Summary Template
- Online Working Group Feedback Surveys
- MSRC Manual for New Research Consortia (provided to MOMRP)

Website

<https://msrc.fsu.edu>

In collaboration with Core B, Core D created pages on the MSRC website for those who are new to the science of implementation along with a D&I resources library available to MSRC members that contains tools for MSRC researchers.

About D&I

<https://msrc.fsu.edu/about-msrc/dissemination-and-implementation>

D&I Resources

<https://msrc.fsu.edu/about-msrc/d-and-i-library>

Technologies or techniques

Nothing to report.

Inventions, patent applications, and or licenses

Nothing to report.

Other Products

Nothing to report.

Leveraging

- In association with the Center for Deployment Psychology and National Center for PTSD D&I Center at Palo Alto, Dr. Comtois applied for and received a contract (#W81XWH-17-C-0236), "Targeted strategies to accelerate EBP implementation in military settings" for which Core D staff will assist in the development of a needs assessment measure, implementation strategies package, and measure of which strategies were used in each setting. The goal will be to determine which are the most effective strategies for implementation of an intervention to reduce PTSD.
- Dr. Joiner was named a Fellow of the American Association for the Advancement of Science.
- Dr. Anestis was the 2018 Schneidman Award recipient for the American Association of Suicidology.

PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS:

What individuals have worked on the project?

Denver VA Medical Center, Denver Research Institute

Peter Gutierrez, PhD

Principal Investigator

75% effort

Contribution to Project: Dr. Gutierrez is responsible for the oversight and management of project staff based at Denver. He works closely with Dr. Joiner on overall Consortium executive management (Core A co-direction) and provides oversight of all Consortium Cores (B, C, D) in collaboration with Dr. Joiner.

Lisa Brenner, PhD
Co-Investigator
3% effort

Contribution to Project: Dr. Brenner has expertise in Traumatic Brain Injury and Suicide. She collaborates with Dr. Gutierrez on MSRC training program issues and research projects.

Kelly Soberay, MA
Project Coordinator
50% effort

Contribution to Project: Ms. Soberay is the Project Coordinator for the Denver site and serves to facilitate the daily management of administrative tasks to include financial management, technical reporting, and management of reports from the research projects.

Karen Gronau, BS
Project Coordinator/IRB Coordinator
100% effort

Contribution to Project: Ms. Gronau is the Project Coordinator/IRB Coordinator for the Denver site and serves to facilitate the daily management of administrative tasks to include financial management, technical reporting, and management of reports from the research projects. She also manages local regulatory issues and assists funded PIs with regulatory approvals.

Jetta Hanson, MA
Research Coordinator
100% effort

Contribution to Project: Ms. Hanson supports the Principal Investigator in day to day operations and managing research studies at the Denver site. She also monitors military and civilian research relevant to the MSRC and fields research requests.

Core D – Dissemination and Implementation (D&I) Core – University of Washington

Kate Comtois, PhD
Director
30% effort

Contribution to Project: Dr. Comtois directs the D&I Core and is responsible for the team's completion of tasks in the Statement of Work (SOW).

Andria Pierson, MEd
Project Manager
92.5% effort

Contribution to Project: Ms. Pierson coordinates operation for the D&I Core including management of time line, budget, and scheduling, and training events.

Amanda Kerbrat, MS
Research Scientist
20% Effort

Contribution to Project: Ms. Kerbrat develops protocols and standard operating procedures to facilitate MSRC investigator's use of evidence-based implementation research strategies.

Justin Um, BA
Assistant to the Director
70% effort

Contribution to Project: Mr. Um assists the D&I director with day to day operations of the D&I Core, and supports Dr. Comtois, Ms. Kerbrat and Ms. Pierson in completing all Core tasks on time and on budget

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?

No changes.

What other organizations were involved as partners?

Florida State University

SPECIAL REPORTING REQUIREMENTS:

Quad charts are attached in Appendix A15.

APPENDICIES:

A1. Peter Gutierrez, PhD CV	Appendix Pages: 23-51
A2. Efficacy of a Computerized Cognitive Behavioral Treatment for Insomnia: Increasing Access to Insomnia Treatment to Decrease Suicide Risk; Sarra Nazem, PhD	Appendix Pages: 52-53
A3. Interoceptive deficits and suicidality; April Smith, PhD	Appendix Pages: 54-55
A4. Three Year Follow-up of Study on Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans; Lora Johnson, PhD	Appendix Pages: 56
A5. Establishing Measurement Equivalence of MSRC Database Assessments Across Demographic Groups; David Vogel, PhD	Appendix Pages: 57
A6. Profiles of Behavioral Warning Signs for Suicide Attempts in the Prediction of Future Suicidality; Courtney Bagge, PhD	Appendix Pages: 58
A7. Couples Crisis Response Planning to Reduce Post-Discharge Suicide Risk; Alexis May, PhD	Appendix Pages: 59
A8. Enhancing Identification of Suicide Risk among Military Service Members and Veterans: A Machine Learning Approach to Suicidality; Andrew Littlefield, PhD	Appendix Pages: 60
A9. MSRC Core D Readiness Report: Window to Hope; Lisa Brenner, PhD	Appendix Pages: 61-190
A10. MSRC Core D Readiness Report: Randomized controlled trial of CRP as compared to treatment as usual; Craig Bryan, PsyD	Appendix Pages: 191-292
A11. MSRC Core D Readiness Report: Virtual Hope Box; Nigel Bush, PhD	Appendix Pages: 293-298
A12. MSRC Core D Readiness Report: New Approaches to the Measurement of Suicide-Related Cognition; Matthew Nock, PhD & Joseph Franklin, PhD	Appendix Pages: 299-336
A13. MSRC Core D Readiness Report: Development and Evaluation of a Brief, Suicide Prevention Intervention Targeting Anxiety and Mood Vulnerabilities; Brad Schmidt, PhD	Appendix Pages: 337-342
A14. Publications	Appendix Pages: 343-428
A15. MSRC Quad Charts	Appendix Pages: 429-436

A1**VITA**

DATE: 4-23-18

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1055 Clermont Street
Denver, Colorado 80220

PHONE: 303-378-5562

E-MAIL: peter.gutierrez@va.gov

EDUCATION:

<u>Degree</u>	<u>Date</u>	<u>Institution</u>	<u>Location</u>
PhD, Clinical Psychology	1997	University of Michigan	Ann Arbor, MI
M.A., Clinical Psychology	1994	University of Michigan	Ann Arbor, MI
B.A., Psychology <i>Summa Cum Laude</i>	1991	Winona State University	Winona, MN

AREAS OF SPECIALIZATION AND RESEARCH INTERESTS:

Suicide risk factors, assessment, and interventions. Scale development and psychometric evaluation.

PROFESSIONAL EXPERIENCE:

2008-	Clinical/ Research Psychologist, Department of Veterans Affairs, Rocky Mountain Mental Illness Research and Education Clinical Center.
6/9/08-	Licensed Clinical Psychologist, Colorado #3203.
7/1/14-	Professor, University of Colorado School of Medicine, Department of Psychiatry.
2009-2014	Associate Professor, University of Colorado School of Medicine, Department of Psychiatry.
2008-2009	Visiting Associate Professor, University of Colorado Denver School of Medicine, Department of Psychiatry.
2007-2008	Research Psychologist, Denver VA Medical Center, Mental Illness Research and Education Clinical Center.

- 2006-2008 Adjoint Associate Professor, University of Colorado Denver School of Medicine, Department of Psychiatry.
- 2006-2007 Research Consultant, Denver VA Medical Center, Mental Illness Research and Education Clinical Center.
- 2002-2007 Associate Professor, Northern Illinois University, Department of Psychology.
- 2002-2006 Assistant Chair, Northern Illinois University, Department of Psychology.
- 1996-2002 Assistant Professor, Northern Illinois University, Department of Psychology.

PUBLICATIONS (106): <http://www.ncbi.nlm.nih.gov/sites/myncbi/1NSkUvt-678QZ/bibliography/48519024/public/?sort=date&direction=ascending>

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- Bernecker, S. L., Rosellini, A. J., Nock, M. K., Chiu, W. T., Gutierrez, P. M., Hwang, I., Joiner, T. E., Naifeh, J. A., Sampson, N. A., Zaslavsky, A. M., Stein, M. B., Ursano, R. J., & Kessler, R. C. (in press). Improving risk prediction accuracy for new soldiers in the U.S. Army by adding self-report survey data to administrative data. *BMC Psychiatry*.
- Stanley, I. H., Hom, M. A., Chu, C., Dougherty, S. P., Gallyer, A. J., Spencer-Thomas, S., Shelef, L., Fruchter, E., Comtois, K. A., Gutierrez, P. M., Sachs-Ericsson, N. J., & Joiner, T. E. (in press). Perceptions of belongingness and social support attenuate PTSD symptom severity among firefighters: A multi-study investigation. *Psychological Services*. DOI: 10.1037/ser0000240
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- Nock, M. K., Millner, A. J., Joiner, T. E., Gutierrez, P. M., Han, G., Hwang, I....& Kessler, R. C. (in press). Risk Factors for the Transition from Suicide Ideation to Suicide Attempt: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Journal of Abnormal Psychology*.
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- Jobes, D. A., Comtois, K. A., Gutierrez, P. M., Brenner, L.A., Huh, D., Chalker, S. A....& Crow, B. (2017). A Randomized Controlled Trial of the Collaborative Assessment and

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BOOK/CHAPTERS (8):

Jobes, D. A., Comtois, K. A., Brenner, L. A., Gutierrez, P. M., & O'Connor, S. S. (2016). Lessons learned from clinical trials of the Collaborative Assessment and Management of Suicidality (CAMS). In R. O'Connor, S. Platt, & J. Gordon (Eds.), *International handbook of suicide prevention: Research, policy, and practice*, 2nd Edition (pp. 431-449). West Sussex, UK: Wiley-Blackwell.

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PAPER PRESENTATIONS (83):

Gutierrez, P. M., Hanson, J., & Joiner, T. (2018, April). Suicide assessment for military service members: And maybe everyone else? Presented at the 51st Annual Conference of the American Association of Suicidology, Washington, DC.

- Poindexter, E., King, C. A., & Gutierrez, P. M. (2018, April). Psychotherapy strategies to target perceived burden on others and suicide risk. Presented at the 51st Annual Conference of the American Association of Suicidology, Washington, DC.
- Comtois, K. A., Carter, G., Gutierrez, P. M., & Jobes, D. A. (2018, April). Suicide risk assessment: Should we do it? Why should we do it? What should we do? Presented at the 51st Annual Conference of the American Association of Suicidology, Washington, DC.
- Gutierrez, P. M. & Joiner, T. (2017, November). The Military Suicide Research Consortium common data elements: Psychometric support, clinical, and research utility. Presented at the International Academy of Suicide Research meeting, Las Vegas, NV.
- Joiner, T. & Gutierrez, P. M. (2017, November). The Military Suicide Research Consortium Common Data Elements: An examination of measurement invariance across enlisted service members, younger veterans, and older veterans. Presented at the International Academy of Suicide Research meeting, Las Vegas, NV.
- Joiner, T. & Gutierrez, P. M. (2017, August). The Military Suicide Research Consortium common data elements: Measurement invariance across enlisted service members, younger veterans, and older veterans. Presented at the Military Health System Research Symposium, Kissimmee, FL.
- Berman, L., McIntosh, J., Campbell, F., King, C., Jobes, D., Eastgard, S., Mazza, J., Gutierrez, P., Schmitz, B., & Miller D. (2017, April). AAS past presidents panel: Perspectives on the field and AAS at 50 years. Presented at the 50th Annual Conference of the American Association of Suicidology, Phoenix, AZ.
- Fiske, A., Gutierrez, P., Nadorff, M., Muehlenkamp, J., & Anestis, M. (2017, April). An illustration of how student mentorship has progressed: Important research questions over the 50 years of Suicidology. Presented at the 50th Annual Conference of the American Association of Suicidology, Phoenix, AZ.
- Drapeau, C. W., Muehlenkamp, J. J., Quinn-Lee, L., Cross, W., Quinnett, P. G., & Gutierrez, P. M. (2017, April). Innovating gatekeeper trainings: Incorporating per educators, postvention and cultural competencies, active learning strategies, and novel evaluative methods. Presented at the 50th Annual Conference of the American Association of Suicidology, Phoenix, AZ.
- Chen, J. I., Gutierrez, P. M., Bahraini, N. (2017, April). Facilitators and barriers to use of standardized suicide risk assessment tools among veteran-serving clinicians. Presented at the 50th Annual Conference of the American Association of Suicidology, Phoenix, AZ.
- Corona, C. D., Gutierrez, P. M., Wagner, B. M., & Jobes, D. A. (2017, April). Assessing the reliability of the CAMS rating scale using a generalizability study. Presented at the 50th Annual Conference of the American Association of Suicidology, Phoenix, AZ.
- Gutierrez, P. M., & Joiner, T. (2017, April). The Military Suicide Research Consortium (MSRC): Overview, accomplishments and recommendations for implementation in other

- nations. Presented at the NATO HFM-275 Symposium on Military Suicide Prevention, Riga, Latvia.
- Gutierrez, P. M., & Shelef, L. (2017, March). Predictive validity of suicide-specific measures. Presented at the 2017 Shores Conference on Military Medicine, Rockville, MD.
- Gutierrez, P. M., & Joiner, T. (2016, August). The Military Suicide Research Consortium Common Data Elements: Psychometric Support, Clinical, and Research Utility. Presented at the Military Health System Research Symposium, Kissimmee, FL.
- Gutierrez, P. M. (2016, April). The Interpersonal Needs Questionnaire and Acquired Capability for Suicide Scale: Valid and Reliable Measures for use with Veterans. In M. VanSickle (Chair), *Measures*. Presented at the 49th Annual Conference of the American Association of Suicidology, Chicago, IL.
- O'Connor, S. S., Jobes, D. A., Gutierrez, P. M., Johnson, L. L., Jennings, K. A., & Carney, E. (2016, April). Applying Mediational and Qualitative Methods to Advance our Understanding of Suicidal ideation in Distinct Clinical Populations. Presented at the 49th Annual American Association of Suicidology conference, Chicago, IL.
- Gutierrez, P. M., Pease, J., Matarazzo, B., Monteith, L., & Hernandez, T. How well do the Interpersonal Needs Questionnaire and the Acquired Capability for Suicide Scales work for military veterans? Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY, October 14, 2015.
- Villatte, J. L., O'Connor, S., Leitner, R., Kerbrat, A. H., Johnson, L. A., & Gutierrez, P. M. Differences in Risk Factors and Characteristics of Suicide Attempts between Active Duty Military Personnel and Veterans. Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY, October 12, 2015.
- Gutierrez, P. M., & Joiner, T. The Military Suicide Research Consortium: Clinical trials reducing suicide risk and increasing resilience. Presented at the Military Health Systems Research Symposium, Fort Lauderdale, FL, August 19, 2015.
- Gutierrez, P. M. Advances in understanding suicide in the US military. Presented at the International Association for Suicide Prevention conference, Montreal, QC, Canada, June 18, 2015.
- Cornette, M., Wintersteen, M., Gutierrez, P. M., Reidenberg, D., & McKeon, R. Youth warning signs for suicide: Results of a national expert consensus panel. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 17, 2015.
- Crowley, K. J., Tucker, R., Davidson, C., & Gutierrez, P. M. Connecting over what "drives" suicide: Defining suicide-specific drivers and their utility for clinical risk. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 17, 2015.

- Anestis, M., Bradley, B., Cornette, M., Denneson, L., & Gutierrez, P. M. On the front lines of military suicidology. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 17, 2015.
- Crowley, K. J., Ballard, E., Tucker, R., Davidson, C., May, A. E., Klonsky, E. D., & Gutierrez, P. M. Improving imminent risk assessment: Conceptual and empirical considerations. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 16, 2015.
- Gutierrez, P. M., & Shelef, L. (2015, March). Predictive Validity of Suicide-specific Measures. Shoresh military medicine conference, Ramat Gan, Israel.
- Gutierrez, P. M., & Joiner, T. (2015, March). Military Suicide Research Consortium Treatment Studies. Shoresh military medicine conference, Ramat Gan, Israel.
- Gutierrez, P. M. Veteran suicide risk assessment. Grand Rounds presentation at the University of Mississippi Medical Center, Department of Psychiatry and Human Behavior, Jackson, MS, September 5, 2014.
- Gutierrez, P. M. Veteran suicide risk assessment. Presented at the American Psychological Association convention, Washington, DC, August 8, 2014.
- Gutierrez, P. M. Is alcohol use really a direct risk factor for suicide? Presented at the Show Me You Care About Suicide Prevention Conference, Jefferson City, MO, July 15, 2014.
- Gutierrez, P. M. Providing for our youngest Veterans: Similarities and Differences in College Student and Veteran Suicide Prevention Efforts. Presented at the Preventing Suicide Among Youth and Young Adults conference, Springfield, IL, April 25, 2014.
- Chesin, M. S., Hughes, J., Andover, P., & Gutierrez, P. M. Developing and testing three novel adjunctive psychosocial interventions to prevent suicide and non-suicidal self-injury: An overview of the interventions, lessons learned, and preliminary outcomes. Presented at the American Association of Suicidology conference, Los Angeles, CA, April 10, 2014.
- O'Connor, S. S., Villatte, J., & Gutierrez, P. M. Differences in characteristics of suicide attempts between active duty military personnel and veterans. Presented at the American Association of Suicidology conference, Los Angeles, CA, April 11, 2014.
- Gutierrez, P.M. Toward a gold standard for suicide risk assessment for military personnel. Presented at the International Association for Suicide Prevention Congress, Oslo, Norway, September 27, 2013.
- Gutierrez, P. M., Joiner, T., Blatt, A., & Castro, C. United States military suicide prevention research: Navigating challenges and capitalizing on opportunities. Presented at the International Academy of Suicide Research World Congress on Suicide, Montreal, Quebec, Canada, June 12, 2013.
- Goodman, M., Gutierrez, P. M., Bossarte, R., Rasmussen, A. M., Brenner, L., & Stanley, B. Research updates and new directions for suicide prevention in the Veterans

- Administration. Discussant for symposium presented at the American Psychiatric Association annual meeting, San Francisco, CA, May, 19, 2013.
- Gutierrez, P. M. Alcohol and suicide: A deadly cocktail or misinterpretation of data? Plenary address presented at the American Association of Suicidology conference, Austin, TX, April 26, 2013.
- Gutierrez, P. M., Joiner, T., & Castro, C. Preventing suicide in the United States military: Research challenges and opportunities. Presented at the 14th European Symposium of Suicide & Suicidal Behavior, Tel Aviv-Jaffa, Israel, September 5, 2012.
- Gutierrez, P. M., Castro, C., Fitek, D. J., Holloway, M., & Jobes, D. A. Status of DoD funded suicide research. Presented at the Annual DoD/VA Suicide Prevention Conference, Washington, DC, June 20, 2012.
- Matarazzo, B., Gutierrez, P. M., & Silverman, M. M. The Self-Directed Violence Classification System: What it is and why it matters. Presented at the Annual DoD/VA Suicide Prevention Conference, Washington, DC, June 20, 2012.
- Gutierrez, P. M., Fitek, D. J., Joiner, T., Holloway, M., Jobes, D., & Rudd, M. D. Status of Department of Defense funded suicide research. Featured Panel presentation at the American Association of Suicidology conference, Baltimore, MD, April 20, 2012.
- Gutierrez, P. M. Navigating IRBs as a suicide researcher. Presented at the American Association of Suicidology conference, Baltimore, MD, April 19, 2012.
- Kemp, J., Thompson, C., Brown, G. K., Brenner, L. A., & Gutierrez, P. M. VA continuum of care for suicidal Veterans. Panel presentation at the American Association of Suicidology conference, Portland, OR, April 16, 2011.
- Gutierrez, P. M., & Lineberry, T. United States Army Medical Research and Materiel Command United States military suicide research: Activities and opportunities. Panel presentation at the American Association of Suicidology conference, Portland, OR, April 14, 2011.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Hedegaard, H., & Huggins, J. The Colorado Violent Death Reporting System (COVDRS): Exploring factors associated with suicide in VA and non-VA services utilizing Veterans. Presented at the American Association of Suicidology conference, Portland, OR, April 14, 2011.
- Marshall, J., Gutierrez, P. M., Lineberry, T., & Jobes, D. United States Army Medical Research and Material Command United States military suicide research activities: Activities and opportunities. Panel presentation at the DOD/VA Annual Suicide Prevention Conference, Boston, MA, March 15, 2011.
- Gutierrez, P. M., Bahraini, N., Basham, C. M., Brenner, L. A., Hedegaard, H., Denneson, L. M., & Dobscha, S. K. Lessons learned about veteran suicide from the Colorado and Oregon Violent Death Reporting Systems. Presented at the American Association of Suicidology conference, Orlando, FL, April 22, 2010.

- Gutierrez, P. M. Blister packaging medication to increase treatment adherence and clinical response: Impact on suicide related morbidity and mortality. Presented at the 2010 DoD/VA Suicide Prevention Conference, Washington, DC, feb 12, 2010.
- Gutierrez, P. M. Theater of War. Plenary Panel member at the 2010 DoD/VA Suicide Prevention Conference, Washington, DC, January 12, 2010.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Hedegaard, H., Chase, M., & Shupe, A. The Colorado violent death reporting system: Exploring factors associated with suicide in VA and non-VA services utilizing veterans. Presented at the Centers for Disease Control and Prevention's NVDRS Reverse Site Visit, Denver, CO, May 14, 2009.
- Leach, R. L., Breshears, R. E., Brenner, L. A., Homaifar, B. Y., Gutierrez, P. M., Gorgens, K. M., & Harwood, J. E. F. The utility of the Personality Assessment Inventory for predicting violence in veterans with traumatic brain injury. Presented at the Rehabilitation Psychology Conference, Jacksonville, FL, February 27, 2009.
- Gutierrez, P. M. Collaborative assessment and management of suicide (CAMS): A feasibility study. DoD/VA Annual Suicide Prevention Conference, San Antonio, TX, January 13, 2009.
- Gutierrez, P. M., Brenner, L. A., Homaifar, B. Y., & Olson-Madden, J. H. VA VISN 19 MIRECC research and clinical efforts at suicide prevention. Symposium presented at the American Psychological Association convention, Boston, MA, August 15, 2008.
- Brausch, A. M., & Gutierrez, P. M. Body image and disordered eating in adolescent suicidality. Presented at the American Association of Suicidology conference, Boston, MA, April 17, 2008.
- Gutierrez, P. M. Redefining diversity: The chronically suicidal veteran as one example. Presidential address at the American Association of Suicidology conference, Boston, MA, April 17, 2008.
- Breshears, R. E., Brenner, L. A., & Gutierrez P. M. Predictive validity of the Personality Assessment Inventory in veterans with traumatic brain injury. Presented at the Rehabilitation Psychology Conference, Tucson, AZ, March 13, 2008.
- King, C. A., Gutierrez, P. M., & Jobes, D. A. Looking back – looking ahead: American suicidology at mid-life. Plenary panel presentation at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.
- Mazza, J. J., Reynolds, W. M., & Gutierrez, P. M. Screening for youth suicidal behavior revisited. Panel presentation at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.
- Schumacher, M., Quinnett, P., & Gutierrez, P. M. QPRT suicide risk assessment and management course utility. Panel presentation at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.

- Gutierrez, P. M. Change is good: What the past 40 years tell us about the future. Presidential address at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.
- Gutierrez, P. M. Suicide in the young adult population. Presented at the Department of Veterans Affairs Employee Education System's Evidence-Based Interventions for Suicidal Persons conference, Denver, CO, February 8, 2007.
- Rudd, M. D., Berman, L., Silverman, M. M., Gutierrez, P. M., & Schumacher, M. Warning signs for suicide: Theory, research, and clinical applications. Panel presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Freedenthal, S. L., & Gutierrez, P. M. Adolescents' disclosures of suicidality: Who knows? Presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Gutierrez, P. M. Shneidman Award Presentation – An integrated approach to assessing risk and protective factors for adolescent suicide. Presented at the American Association of Suicidology conference, Broomfield, CO, April 15, 2005.
- Schumacher, M., & Gutierrez, P. M. Bipolar spectrum traits and suicide risk. Presented at the American Association of Suicidology conference, Broomfield, CO, April 15, 2005.
- Gutierrez, P. M., & Osman, A. Prediction of adolescent suicide reattempts. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 22, 2004.
- Gutierrez, P. M., & Konick, L. C. Evaluation of school-based suicide prevention programs. Presented at the Suicide Prevention: Advancing the Illinois Strategic Plan conference, Springfield, IL, September 23, 2004.
- Williams, J. E., Osman, A., Barrios, F., Kopper, B. A., & Gutierrez, P. M. Reliability and validity of the Inventory for Suicide Ideation – 30. Presented at the American Psychological Society conference, Chicago, IL, May 28, 2004.
- Hovey, J. D., Freedenthal, S., Gutierrez, P. M., & Fernquist, R. Career development strategies in suicide research #1: Working with a mentor. Panel presented at the American Association of Suicidology conference, Miami, FL, April 15, 2004.
- Conwell, Y., Silverman, M., Gutierrez, P. M., Konick, L. C., & Muehlenkamp, J. J. Career development strategies in suicide research #3: Publishing your findings. Workshop presented at the American Association of Suicidology conference, Miami, FL, April 16, 2004.
- Konick, L. C., & Gutierrez, P. M. Suicide risk in college students: A test of a model. Presented at the 2004 American Association of Suicidology conference, Miami, FL, April 16, 2004.

- Brausch, A. M., & Gutierrez, P. M. Does this magazine make me look fat? Media's impact on body image, depression, and eating. Presented at the Midwestern Psychological Association Conference, Chicago, IL, May 1, 2004.
- Muehlenkamp, J. J., Swanson, J., & Gutierrez, P. M. Differences between self-injury and suicide on measures of depression and suicidal ideation. Presented at the Midwestern Psychological Association annual meeting, Chicago, IL, May 9, 2003.
- Kaplan, M., Schultz, D., Gutierrez, P. M., Sanddal, N., & Fernquist, N. Suicide research: Working with a mentor. Panel presentation at the American Association of Suicidology annual conference, Santa Fe, NM, April 24, 2003.
- Konick, L. C., & Gutierrez, P. M. Is spirituality a moderator of risk for suicide? Presented at the American Association of Suicidology annual conference, Santa Fe, NM, April 25, 2003.
- Watkins, R. L., & Gutierrez, P. M. Exposure to peer suicide in college students. Presented at the American Association of Suicidology annual conference, Santa Fe, NM, April 25, 2003.
- Gutierrez, P. M., Osman, A., Watkins, R. L., Konick, L. C., Muehlenkamp, J. J., & Brausch, A. M. Development and validation of the Suicide Resilience Inventory - 25 (SRI-25) in clinical and nonclinical samples. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 19, 2002.
- Konick, L. C., Brausch, A. M., Gutierrez, P. M., & Pawlowski, C. CBT in depressed kids: What factors moderate treatment effectiveness? Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 19, 2002.
- Hovey, J. D., Gutierrez, P. M., & Jha, A. Measuring cultural risk factors in suicide research. Panel presented at the American Association of Suicidology annual conference, Atlanta, GA, April 19, 2001.
- Gutierrez, P. M., Osman, A., Barrios, F. X., & Kopper, B. A. The Self-Harm Behavior Questionnaire. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 21, 2001.
- Gutierrez, P. M., Collura, D., & Watkins, R. A case for regular suicide risk screening in high schools. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 14, 2000.
- Osman, A., Gutierrez, P. M., Kopper, B. A., Barrios, F. X., Breitenstein, J. L., & Silich, N. Validity and utility of the Adolescent Psychopathology Scale (APS) with adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 13, 2000.
- Kopper, B. A., Gutierrez, P. M., Osman, A., & Barrios, F. X. Helping kids stay alive: The Reasons for Living Inventory - Adolescents. Presented at Western Psychological Association Annual Convention, Portland, OR, April 14, 2000.

Gutierrez, P. M., Rodriguez, P. J., & Foat, N. K. A model of late adolescent suicidality. Presented at the American Association of Suicidology annual conference, Houston, TX, April 15, 1999.

Gutierrez, P. M., Osman, A., Kopper, B. A., & Barrios, F. X. Quality of risk assessment with common measures. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 18, 1998.

POSTER PRESENTATIONS (62):

Soberay, K. A., Hanson, J. E., & Gutierrez, P. M. (2017, July). Military suicide research presence and impact in policy documents captured by altmetrics. Presented at the VA/DOD Suicide Prevention conference, Denver, CO.

Soberay, K. A., Plant, E. A., Hanson, J. E., & Gutierrez, P. M. (2017, July). Traumatic brain injury, severe insomnia, and suicidal behaviors in active duty military. Presented at the VA/DOD Suicide Prevention conference, Denver, CO.

Lavigne, J. E., Walsh, P., Zhou, M., & Gutierrez, P. (2017, July). Cost-utility of blister packaging versus dispensing as usual all medications for veterans with post-traumatic stress disorder, major affective disorder, bipolar affective disorder, and/or schizophrenia: Results from a pragmatic randomized trial. Presented at the VA/DOD Suicide Prevention conference, Denver, CO.

Lavigne, J. E., Zhou, M., & Gutierrez, P. (2017, May). Cost-utility of blister versus bulk packaging all medications for veterans with post-traumatic stress disorder, bipolar affective disorder, major affective disorder or schizophrenia: Results of a pragmatic randomized trial. Presented at the 22nd annual meeting of the International Society for Pharmacoeconomics and Outcomes Research, Boston, MA.

Acosta, M., Osman, A., Gutierrez, P. M., Bagge, C. L., Freedenthal, S., Wong, J. L., & Pirani, S. (2016, May). *The Multidimensional Revenge Attitudes Inventory: Validation of Scores on a New Measure of Revenge*. Presented at the meeting of the Association for Psychological Science, Chicago, IL.

Hanson, J. E., Soberay, K., Dwyer, M., Gutierrez, P. M., & Plant, A. (2016, April). Understanding the Relationship of TBI, Severe Insomnia, and Suicidal Behaviors in Active Duty, Veteran, and Civilian Populations. Presented at the 49th Annual Conference of the American Association of Suicidology, Chicago, IL.

Soberay, K., Dwyer, M., Hanson, J. E., Spinks, J., Soberay, A., & Gutierrez, P. M. (2016, April). The Dissemination of Military Research Understood through Altmetrics. Presented at the 49th Annual Conference of the American Association of Suicidology, Chicago, IL.

Gutierrez, P. M., Brenner, L., Wortzel, H., Forster, J., & Leitner, R. Lessons learned about suicide prevention and patient safety from a medication packaging intervention. Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY, October 13, 2015.

- Morris, B., O'Connor, S., Johnson, L. L., Jobes, D. A., Gutierrez, P. M., & Kaminer, B. B. Examining group differences between suicidal veterans classified as wish to live, ambivalent, or wish to die using the suicide index score. Presented at the American Association of Suicidology conference, Los Angeles, CA, April 11, 2014.
- Davidson, C. L., Babson, K. A., Hostetter, T. A., Crowley, K. J., Forster, J. F., Gutierrez, P. M.. *Exploring the relationship between physical activity and suicide risk among Veterans in the Behavioral Risk Factor Surveillance System Questionnaire*. Poster presented at the Suicide and Self-Injury Special Interest Group at the annual Association of Behavioral and Cognitive Therapies Conference, Nashville, TN, November 22, 2013.
- Soberay, K., Dwyer, M., Hanson, J., Ribeiro, J., Gronau, K., Gutierrez, P. M., & Maner, J. Exploring the MSRC common data elements: The relationship between TBI, severe insomnia, and suicidal behaviors in military populations. Presented at the American Psychological Association conference, Honolulu, HI, August 1, 2013.
- Pease, J., Soberay, K., Dwyer, M., Gronau, K., & Gutierrez, P. M. Thwarted belonging makes a modest contribution to suicidal ideation after controlling for universalism and relationships. Presented at the American Psychological Association conference, Honolulu, HI, August 1, 2013.
- Leitner, R., Gutierrez, P. M., Brenner, L., Wortzel, H., Forster, J. E., & Huggins, J. Psychometric properties of the Self-harm Behavior Questionnaire in Veterans. Presented at the American Psychological Association conference, Honolulu, HI, July 31, 2013.
- Dwyer, M. M., Soberay, K., Hanson, J., & Gutierrez, P. M. Military suicide research consortium (MSRC). Presented at the American Association of Suicidology conference, Austin, TX, April 26, 2013.
- Rings, J. A., Gutierrez, P. M., Harwood, J. E. F., & Leitner, R. Examining prolonged grief symptomatology and its relationship to self-directed violence among Veterans. Presented at the Veterans Affairs Mental Health Conference. Baltimore, MD, August 23, 2011.
- Rings, J. A., Gutierrez, P. M., & Harwood, J. E. F. Prolonged grief disorder and its relationship to self-directed violence among Veterans: Preliminary findings. Presented at the Departments of Defense and Veterans Affairs Suicide Prevention Conference. Boston, MA, March 15, 2011.
- Huggins, J., Homaifar, B.Y., Skopp, N.A., Reger, M., Gahm, G., Gutierrez, P., & Brenner, L.A. Suicide prevention through the transformation of data into information. Presented at the Departments of Defense and Veterans Affairs Suicide Prevention Conference. Boston, MA, March 15, 2011.
- Bethhauser, L. M., Allen, E., Brenner, L. A., & Gutierrez, P. M. Centrality of intimate relationships on failed belongingness and perceived burdensomeness in returning combat Veterans. Presented at the International Association for Relationship Research, Lawrence, KS, November, 2009.

- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Huggins, J., Hedegaard, H., Shupe, A., & Chase, M. The Colorado violent death reporting system: Exploring factors associated with suicide in VA and non-VA services utilizing veterans. Presented at the American Psychological Association conference, Toronto, Ontario Canada, August 6, 2009.
- Brausch, A. M., & Gutierrez, P. M. Psychosocial factors related to non-suicidal self-injury in adolescents. Presented at the American Association of Suicidology annual conference, San Francisco, CA, April 17, 2009.
- Ballard, E. D., Jobes, D., Brenner, L., Gutierrez, P. M., Nagamoto, H., Kemp, J., et al. Qualitative suicide status form responses of suicidal veterans. Presented at the American Association of Suicidology conference, Boston, MA, April 18, 2008.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Staves, P., Cornette, M., & Betthausen, L. Pain tolerance and links to increased suicide risk. Presented at the American Association of Suicidology conference, Boston, MA, April 18, 2008.
- Cornette, M. M., DeBoard, R. L., Clark, D. C., Holloway, R. H., Brenner, L., Gutierrez, P. M., & Joiner, T. E. Examination of an interpersonal-behavioural model of suicide: Toward greater specificity in suicide risk prediction. Presented at the International Association for Suicide Prevention conference, Dublin, Ireland, August 31, 2007.
- Brenner, L. A., Gutierrez, P. M., Cornette, M., Staves, P. J., & Betthausen, L. M. Veterans' experiences of habituation to painful stimuli, perceived burdensomeness and failed belongingness. Presented at the American Psychological Association conference, San Francisco, CA, August 19, 2007.
- Fang, Q., Choma, K., Salvatore, A., Mack, T., Bailey, J., & Gutierrez, P. M. Validation of the Pain Distress Inventory using an adolescent inpatient sample. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 19, 2006.
- Brausch, A. M., & Gutierrez, P. M. Adolescent gender differences in reasons for living. Poster presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Swanson, J. D., & Gutierrez, P. M. Gender, social support, and student suicidality. Poster presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Kopper, B. A., Osman, A., Gutierrez, P. M., Williams, J. E., & Barrios, F. X. Suicide Resilience Inventory-25: Validation with normal and adolescent psychiatric inpatients. Poster presented at the 2005 APA conference, Washington, DC.
- Kopper, B. A., Osman, A., Barrios, F. X., Gutierrez, P. M., & Williams, J. E. The Beck Depression Inventory-II with nonclinical and inpatient adolescents. Poster presented at the 2005 APA conference, Washington, DC.

- Brausch, A. M., & Gutierrez, P. M. Ethnic differences in body image, affect, and eating behaviors and the impact of media exposure. Presented at the Association for the Advancement of Behavior Therapy conference, New Orleans, LA, November 11, 2004.
- Muehlenkamp, J. J., & Gutierrez, P. M. Validation of the Self-Harm Behavior Questionnaire in adolescents. Presented at the Association for the Advancement of Behavior Therapy conference, New Orleans, LA, November 11, 2004.
- Linden, S., Osman, A., Barrios, F. X., Kopper, B. A., Williams, J. E., & Gutierrez, P. M. Structure of the Adolescent Psychopathology Scale (APS) clinical subscales in psychiatric inpatients. Presented at the Association for the Advancement of Behavior Therapy conference, New Orleans, LA, November 11, 2004.
- Osman, A., Williams, J. E., Barrios, F. X., Kopper, B. A., Gutierrez, P. M., Linden, S. C., & Carlson, N. Development of cutoff scores for the Beck scales in adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 21, 2004.
- Osman, A., Barrios, F. X., Gutierrez, P. M., Kopper, B. A., Williams, J. E., Carlson, N., & Koser, K. Reliability and validity of the Multidimensional Anxiety Scale for Children and the Children's Depression Inventory. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 21, 2004.
- Osman, A., Gutierrez, P. M., Barrios, F. X., Kopper, B. A., Linden, S. C., Carlson, N., & Koser, K. The Reynolds Adolescent Depression Scale 2: Reliability and validity. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 21, 2004.
- Muehlenkamp, J. J., & Gutierrez, P. M. Are self-injurious behaviors and suicide attempts different points on the same continuum? Presented at the Suicide Prevention: Advancing the Illinois Strategic Plan conference, Springfield, IL, September 23, 2004.
- Brausch, A. M., Swanson, J., & Gutierrez, P. M. Parent marital status, depression and suicide. Presented at the American Association of Suicidology conference, Miami, FL, April 16, 2004.
- Konick, L. C., Gutierrez, P. M., Muehlenkamp, J. J., Watkins, R. L., Ward, K. E., & Haase, K. Development of the Spiritual Attitudes and Beliefs Inventory: Phase II. Presented at the Midwestern Psychological Association annual meeting, Chicago, IL, May 8, 2003.
- Konick, L. C., Gutierrez, P. M., & Watkins, R. L. Adult Suicidal Ideation Questionnaire psychometrics. Presented at the American Association of Suicidology annual conference, Santa Fe, NM, April 25, 2003.
- Gutierrez, P. M., & Muehlenkamp, J. J. Understanding differences between self-injurious behavior and suicide attempts in high school students. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.

- Gutierrez, P. M., Osman, A., Brausch, A. M., Muehlenkamp, J. J., Watkins, R. L., & Konick, L. C. Reliability and validity of the Beck scales in the assessment of suicide-related behaviors in adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Gutierrez, P. M., Osman, A., Watkins, R. L., & Muehlenkamp, J. J. Potential racial differences in adolescent suicide risk. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Osman, A., Gutierrez, P. M., Kopper, B. A., Barrios, F. X., Boyle, T., & Duncan, A. The Inventory of Suicide Orientation - 30: Further validation with adolescent inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Osman, A., Linden, S., Gutierrez, P. M., Barrios, F. X., Kopper, B. A., & Forman, K. Validity of the Adolescent Psychopathology Content Scales (APS) in Pediatric Medical Institute for Children (PMIC) inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Konick, L. C., Wrangham, J. J., Gutierrez, P. M., Blacker, D., Watkins, R. L., Aalders, G., Giannerini, J., Miller, M. J., Rapp, J. M., Shayne, L. E., & Ward, K. E. Development of the Spiritual Attitudes and Beliefs Inventory (SABI). Presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL, May 2, 2002.
- Gutierrez, P. M., Wrangham, J., Konick, L., Osman, A., & Barrios, F. X. Does ethnicity influence adolescent suicide risk? Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 12, 2002.
- Wrangham, J., Gutierrez, P. M., Osman, A., & Barrios, F. X. Validation of the PANSI with minority young adults. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 12, 2002.
- Konick, L. C., Brandt, L. A., & Gutierrez, P. M. School-based suicide prevention programs: A meta-analysis. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 12, 2002.
- Gutierrez, P. M., Osman, A., Kopper, B. A., & Barrios, F. X. Use of the Multi-Attitude Suicide Tendency Scale with minority individuals. Presented at the meeting of the Midwestern Psychological Association, Chicago, IL, May 4, 2001.
- Valentiner, D., Gutierrez, P. M., Deacon, B., & Blacker, D. Factor structure and incremental validity of the Anxiety Sensitivity Index for Children in an adolescent sample. Presented at the annual meeting of the Society for Research in Child Development, Minneapolis, MN, April 21, 2001.
- Gutierrez, P. M., Rodriguez, P. J., & Garcia, P. Minority suicide risk. Presented at the American Association of Suicidology annual conference, Los Angeles, CA, April 13, 2000.

- Kopper, B. A., Gutierrez, P. M., Osman, A., Barrios, F. X., Baker, M. T., & Haraburda, C. M. Reasons for Living Inventory for Young Adults: Psychometric properties. Presented for Division 17 - Counseling Psychology - at the annual convention of the American Psychological Association, Washington, DC, August 5, 2000.
- Kopper, B. A., Gutierrez, P. M., Osman, A., Barrios, F. X., & Bagge, C. L. Assessment of suicidal ideation in college students. Presented for Division 17 - Counseling Psychology - at the annual convention of the American Psychological Association, Washington, DC, August 5, 2000.
- Gutierrez, P. M., Rubin, E. C., & Blacker, D. A preliminary investigation of the role of suicide exposure and attitudes about death on adolescent suicidal ideation. Presented at the Midwestern Psychological Association annual conference, Chicago, IL, May 4, 2000.
- Martin, H., & Gutierrez, P. M. The role of mediating factors on the long-term relationship between early parental death and later depression and anxiety. Presented at the Midwestern Psychological Association Annual Conference, Chicago, IL, May 4, 2000.
- Kopper, B. A., Osman, A., Gilpin, A. R., Panak, W. F., Barrios, F. X., Gutierrez, P. M., & Chiros, C. E. The Multi-Attitude Suicide Tendency Scale: Further validation with adolescent psychiatric inpatients. Presented at the annual convention of the American Psychological Association, Boston, MA August 22, 1999.
- Kopper, B. A., Osman, A., Linehan, M. M., Barrios, F. X., Gutierrez, P. M., & Bagge, C. L. Validation of the Adult Suicide Ideation Questionnaire and the Reasons for Living Inventory in an adult psychiatric inpatient sample. Presented at the annual convention of the American Psychological Association, Boston, MA August 22, 1999.
- Osman, A., Bagge, C. L., Barrios, F. X., Gutierrez, P. M., & Kopper, B. A. Receiver operating characteristic curve analyses of the Beck Depression Inventory - II in adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 9, 1998.
- Osman, A., Bagge, C. L., Gutierrez, P. M., Kopper, B. A., & Barrios, F. X. Validation of the Reasons for Living Inventory for Adolescents (RFL-A) in a clinical sample. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 9, 1998.
- Kopper, B. A., Osman, A., Hoffman, J., Gutierrez, P. M., & Barrios, F. X. Reliability and validity of the BDI-II with inpatient psychiatric adolescents. Presented at Division 12 - Clinical Psychology - at the annual convention of the American Psychological Association, San Francisco, CA, August 16, 1998.
- Gutierrez, P. M., & Hagstrom, A. H. Uses for the Multi-Attitude Suicide Tendency Scale. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 17, 1998.
- Gutierrez, P., & Williams, J. Children's understanding of death. Presented at the Midwestern Psychological Association annual meeting, Chicago, IL, May, 3, 1991.

GRANTS:

Current

3/16-3/21 Department of Defense, Military Operational Medicine Research Program, grant; Principal Investigator: jointly with Thomas Joiner, PhD, Florida State University; **\$14,850,247.00** [additional **\$5,149,753.00** for option period years 3-5] for *Military Suicide Research Consortium: Extension to New Opportunities and Challenges*.

Completed

1/16-5/17 Department of Defense, Defense Suicide Prevention Office; Military Advisory Board Member for *Community Partners in Suicide Prevention*. A grant given to the American Association of Suicidology, Principal Investigator Craig Bryan, PsyD.

3/11-3/17 Department of Defense, Military Operational Medicine Research Program, grant; Co-Investigator; **\$3,400,000** for *A Randomized Clinical Trial of the Collaborative Assessment and Management of Suicidality vs. Enhanced Care as Usual for Suicidal Soldiers*.

7/12-9/16 Military Suicide Research Consortium; Principal Investigator; **\$2,381,228** for *Toward a Gold Standard for Suicide Risk Assessment for Military Personnel*.

9/10-9/16 Department of Defense, Military Operational Medicine Research Program, grant; Principal Investigator: jointly with Thomas Joiner, PhD, Florida State University; **\$15,000,000 (additional \$15,000,000 going to FSU)** for *Military Suicide Research Consortium*.

10/12-9/15 Department of Veterans Affairs National Center for Patient Safety; Advisory Board member (PI Monica Matthieu, PhD, LCSW); **\$569,222** for *Patient Safety Center of Inquiry for Suicide Prevention*.

3/11-2/13 Department of Defense, Military Operational Medicine Research Program, grant; Consultant (PI Steven Vannoy, PhD, MPH); **\$1,354,386** for *Development and Validation of a Theory Based Screening Process for Suicide Risk*.

9/09-9/14 Department of Defense, Military Operational Medicine Research Program, grant; Principal Investigator; **\$1,173,408** for *Blister Packaging Medication to Increase Treatment Adherence and Clinical Response: Impact on Suicide-related Morbidity and Mortality*.

5/09-5/10 Colorado TBI Trust Fund Education grant; **\$8427** to support the hosting of a conference of national experts in suicide safety planning and TBI rehabilitation.

5/08-5/09 Colorado TBI Trust Fund Education grant; **\$5,000** to support the hosting of a conference of national experts in assessment of TBI and suicide risk and the role of executive dysfunction in linking the two problems.

HONORS AND AWARDS:

2014 Roger J. Tierney Award for Service, American Association of Suicidology.

2005 Shneidman Award for Significant Contributions to Suicide Research, American Association of Suicidology

2003 Outstanding Young Alumni, Winona State University

PROFESSIONAL SERVICE:

9/17-present Member U.S. Air Force Suicide Prevention Solutions Working Group (AF SPSWG)

1/16-present Member Colorado Steering Team, Colorado-National Collaborative for Suicide Prevention, Colorado Office of Suicide Prevention, Colorado Office of Public Health and Environment

10/15-present University of Colorado School of Medicine Faculty Promotions Committee

2015 Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Extramural Research Program Office, Special Emphasis Panel Member, Evaluating Innovative and Promising Strategies to Prevent Suicide among Middle-Aged Men (RFA-CE-15-004)

6/14-8/14 Expert Adviser for the Royal Australian & New Zealand College of Psychiatrists Clinical Practice Guidelines Project on Deliberate Self-harm, Prof. Gregory Carter, Chair

1/12-10/15 Department of Psychiatry Faculty Promotions Committee

1/12-present Editorial Board Member, *Archives of Suicide Research*, Barbara Stanley, PhD, Editor-in-Chief

4/09-present Associate Editor, *Suicide and Life-Threatening Behavior*, Thomas Joiner, PhD, Editor-in-Chief.

4/09-4/11 Past-president, Board position, of the American Association of Suicidology.

3/09-12/09 U. S. Army Suicide Reduction and Prevention Research Strategic Planning Workgroup, Soldier Identification and Case Management Expert Lead.

- 5/07-10/08 Member of the International Advisory Board for the Australian National Study of Self Injury (ANESSI), Professor Graham Martin, Director.
- 4/07-4/09 President of the American Association of Suicidology.
- 3/06-3/07 Reviewer for National Registry of Evidence-based Programs and Practices, Substance Abuse and Mental Health Services Administration.
- 4/05-4/07 President-Elect of the American Association of Suicidology.
- 2/04-4/09 Consulting Editor and Editorial Board member, *Suicide and Life-Threatening Behavior*, Morton M. Silverman, M.D., Editor-in-Chief.
- 11/02-6/06 Member, Illinois Suicide Prevention Strategic Planning Task Force, Illinois Department of Public Health.
- 3/02-1/06 Member, American Association of Suicidology Institutional Review Board.
- 4/00-4/03 Director, Research Division, American Association of Suicidology.
- 4/99-present Ad hoc reviewer for *Psychiatry Research*; *Journal of Personality Assessment*; *American Journal of Public Health*; *Internal Journal of Circumpolar Health*; *Death Studies*; *Social Problems*; *Journal of Adolescent Research*; *Child Abuse and Neglect*; *British Journal of Clinical Psychology*; *Journal of Clinical and Consulting Psychology*; *Journal of Abnormal Psychology*; *International Journal of Psychology*; *Archives of Suicide Research*; *American Journal of Orthopsychiatry*; *Journal of Mental Health Counseling*; *Crisis*.
- 1998-2002 Member, North Central Association Outcomes Endorsement Team for Auburn High School, Rockford, IL.
- 7/98-4/00 Chair, Publications Committee, American Association of Suicidology.
- 1998-2006 Director, Adolescent Risk Project, Auburn High School, Rockford, IL. Combined research and suicide risk screening project.
- 1997-2006 Faculty Associate of the Center for Latino and Latin-American Studies at Northern Illinois University.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

- 12/15-present Society for Implementation Research Collaboration, Founding Member
- 2010-present International Academy for Suicide Research, Fellow
- 2007-present Colorado Psychological Association
- 2003-2010 International Academy for Suicide Research, Associate Member

1999-present APA Div. 12, Section VII, Clinical Emergencies and Crises

1998-2010 APA Div. 53, Society of Clinical Child and Adolescent Psychology

1997-2007 Midwestern Psychological Association

1996-present American Association of Suicidology

**A2. Efficacy of a Computerized Cognitive Behavioral Treatment for Insomnia:
Increasing Access to Insomnia Treatment to Decrease Suicide Risk
PI: Sarra Nazem, PhD**

Summary of Progress: In the fourth quarter, we completed extensive QA testing of the study platform (e.g., assessment/diary entry and export, email content and firing rules, randomization confirmation, intervention content) with BeHealth Solutions, finalizing the study platform for recruitment launch. Recruitment for the study has begun; initial response rate from study invitation letters has been strong. We have maintained regular study team meetings and meetings with BeHealth Solutions.

Regulatory:

Initial IRB Approval Date: October 3, 2017

Initial HRPO Approval Date: December 8, 2017

Recruitment:

Total projected enrollment: 226

Recruitment start date: March 26, 2018

Projected quarterly enrollment: 65

Subjects assessed for eligibility this quarter: 5

Number excluded: 4

Did not meet inclusion/exclusion criteria: 4

Declined to participate: 0

Other: 0

Subjects enrolled this quarter: 0

Subjects withdrawn this quarter: N/A

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
Major Task 1: Study Start Up	Months 1-6	Elements completed: study protocol refined, regulatory documents approved, staff hired & trained, web-based platform/database infrastructure finalized.

Major Task 2: Randomized Controlled Trial	Months 6-22	Worked closely with BeHealth to complete, test, and ready study platform. Opened study for enrollment and began recruitment and screening.
Major Task 3: Follow-up Data	Months 14-34	N/A
Major Task 4: Final Reports	Months 35-36	N/A
Major Task 5: Ongoing Regulatory Compliance	Ongoing	The initial submissions have been approved by all regulatory bodies.

Major findings, results, and/or significance for this project during this quarter: Due to the management plan executed by the PI this quarter, performance by BeHealth was improved and we were able to successfully finalize the study platform to launch recruitment this quarter. Prior established procedures by the study team contributed to a seamless initiation for recruitment/screening immediately upon study platform completion.

Goals for the next quarter: In the next quarter, we will continue study recruitment/enrollment and will begin collection of pre-baseline sleep diary and baseline assessment data. We will also begin post-intervention assessments.

Problems, challenges and plans to address them: Due to project mismanagement by BeHealth, recruitment and enrollment was delayed and we are behind our SOW planned enrollment numbers. The PI will ensure that the study team implements and executes an accelerated recruitment strategy to optimize enrollment in the first and second quarters of year 2. The PI will continue to maintain frequent contact with BeHealth CEO, CSO, and staff to ensure that they maintain appropriate management of the study platform and that all data are transferred to the study team in a timely fashion.

Publications, Presentations, and Media Requests: N/A

A3. Interoceptive deficits and suicidality
PI: April Smith, PhD

Summary of Progress: In early January 2018, the first data request was processed. After preliminary data-cleaning, another data request was processed on February 26, 2018. Approximately 80% of data cleaning and coding is now complete; the remaining 20% of cleaning includes coding suicide attempt lethality for roughly 2000 participants, which will be necessary for Aim 2. Additionally, preliminary exploratory factor analyses necessary for completing Aims 1-3 have been completed.

Regulatory:

Initial IRB Approval: Miami University Exempt Determination on December 5, 2017.

Initial HRPO Approval: Determined this is Research Not Involving Human Subjects Determination on January 4, 2018. No further requirement for review by HRPO.

Recruitment: N/A

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
1. Submit Human Subjects Exempt IRB application to Miami University IRB and address any requested IRB application revisions	Months 1-3	Complete
2. Submit application to Human Research Protection Office	Months 1-3	Complete
3. Create syntax to classify participants into relevant suicide groups	Months 3-5	This coding has been completed and verified as of 3/20/18.
4. Classification and inter-rater reliability of suicide attempt lethality	Months 3-5	This is an ongoing task. Attempt lethality has been coded for roughly 4000 participants. Coding is needed for another 2000 participants.
5. Complete measurement model for interoceptive deficits latent variable to determine which indicators should be retained.	Months 5-7	The preliminary measurement model has been completed. The team is currently ensuring the accuracy of this model.

Major findings, results, and/or significance for this project during this quarter: As noted in our preliminary analysis plan, we conducted an exploratory factor analysis on the CDE item-defined interoceptive deficits latent variable. Modification indices suggest dropping CDE item 38 would greatly improve model fit. After doing so, our 5-item interoceptive deficits latent variable achieved acceptable fit, and all items loaded significantly onto one factor. We are now able to proceed to testing Aims 1-3.

Goals for the next quarter: Goals for the upcoming project quarter are to: (1) finish classification of suicide attempt lethality and establish inter-rater reliability, and (2) complete multigroup confirmatory factor analysis to test for configural, weak, and strong factorial invariance between suicidality groups.

Problems, challenges and plans to address them: N/A

Publications, Presentations, and Media Requests: N/A

A4. Three Year Follow-up of Study on Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans
PI: Lora Johnson, PhD

Summary of Progress: We have gained IRB approval at all involved sites and are in the process of obtaining HRPO approval.

Regulatory:

Initial IRB Approval Date: December 20, 2017

Initial HRPO Approval Date: Pending

Recruitment:

Total projected enrollment: 30

Recruitment start date: Expected June 2018

Projected quarterly enrollment: 15

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
Refine eligibility criteria, exclusion criteria, screening protocol	Months 1-3	Complete
Finalize consent form & human subjects protocol	Months 1-3	Complete
Finalize semi-structured assessment	Months 1-3	Complete
Coordinate with Sites for IRB protocol submission and approval	Months 1-3	Complete
Obtain HRPO approval	Months 1-3	In Progress

Major findings, results, and/or significance for this project during this quarter: N/A

Goals for the next quarter: In months 3-5, we will be providing training in data abstraction to all research staff and begin data extraction.

Problems, challenges and plans to address them: N/A

Publications, Presentations, and Media Requests: N/A

A5. Establishing Measurement Equivalence of MSRC Database Assessments Across Demographic Groups
David Vogel, PhD

Summary of Progress: We have obtained IRB approval from both Iowa State University and HRPO. We have received the dataset from MSRC and examined it to determine which demographic features of the sample will support invariance testing and refined the data analytic plan. We will begin to run the ME/I analyses in the coming weeks.

Regulatory:

Initial IRB Approval: Iowa State University Exempt Determination on January 25, 2018.

Initial HRPO Approval: Determined this is Research Not Involving Human Subjects Determination on February 26, 2018. No further requirement for review by HRPO.

Recruitment: N/A

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
1. Refine data analytic plan	Months 1-3	Complete
2. Coordinate University IRB and HRPO review	Months 1-3	Complete
3. Finalize IRB protocol submission	Months 1-3	Complete
Milestone Achieved: University IRB approval for all protocols	Month 3	Complete
Milestone Achieved: HRPO Approval for all protocols.	Month 6	Complete

Major findings, results, and/or significance for this project during this quarter: N/A

Goals for the next quarter: We are ahead of schedule, as we allotted 6 months to receive all approvals necessary for the project. As such, we are going to move ahead with running ME/I analyses in Quarter 2.

Problems, challenges and plans to address them: N/A

Publications, Presentations, and Media Requests: N/A

A6. Profiles of Behavioral Warning Signs for Suicide Attempts in the Prediction of Future Suicidality
PI: Courtney Bagge, PhD

Summary of Progress: The contract has been finalized with DRI and the project has been approved by the local IRB. We have also hired a project assessor and training is in progress.

Regulatory:

Initial IRB Approval Date: March 26, 2018

Initial HRPO Approval Date: Pending

Recruitment:

Total projected enrollment: 181

Recruitment Start Date: Pending

Projected Quarterly Enrollment: 54

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
1. Prepare for Project	Months 1-3	The project has been approved by the local IRB. We have hired a project assessor and the creation of databases is in progress.

Major findings, results, and/or significance for this project during this quarter: N/A

Goals for the next quarter: We are preparing the HRPO submission. The project assessor will complete training and the databases will be finalized.

Problems, challenges and plans to address them: N/A

Publications, Presentations, and Media Requests: N/A

A7. Couples Crisis Response Planning to Reduce Post-Discharge Suicide Risk
PI: Alexis May, PhD

Summary of Progress: The study's objectives are to determine the needs and preferences of service members and their partners for suicide prevention interventions (Phase 1) and test the effect of the C-CRP, a targeted single-session couples intervention on suicide ideation among post-9/11 military service members and veterans.

This Quarter, contracting was completed and the IRB submission for Phase 1 of the project was submitted to the University of Utah.

Regulatory:

Initial IRB Approval Date: Pending

Initial HRPO Approval Date: Pending

Recruitment:

Total Projected Enrollment: Phase 1: 50 couples; Phase 2: 4 pilot couples and 78 study couples

Recruitment Start Date: Pending

Projected Quarterly Enrollment: Phase 1: 50; Phase 2: 8-13

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
1. Obtain IRB approvals	Months 1-6	The initial IRB application for Phase 1 of the project was submitted to the University of Utah on March 30, 2018.
2. Hire and train research staff	Months 3-9	Two possible staff members (a Utah-based project coordinator and a study therapist) have been identified.
3. Begin and complete Phase 1 data collection	Months 1-9	The Couples Health Needs Assessment (CHNA) for Phase 1 was finalized.

Major findings, results, and/or significance for this project during this quarter: N/A

Goals for the next quarter: During the next Quarter (Months 2-4 of the project) we will continue to pursue IRB and HRPO approval for Phase 1 and Phase 2 of the study. We will program the Qualtrics survey and database for Phase 1 (the online portion of the project). We will also hire and begin to train a Project Coordinator and a Research Therapist.

Problems, challenges and plans to address them: N/A

Publications, Presentations and Media Request: N/A

A8. Enhancing Identification of Suicide Risk among Military Service Members and Veterans: A Machine Learning Approach to Suicidality
PI: Andrew Littlefield, PhD

Summary of Progress: IRB and HRPO approvals have been obtained for all sites.

Regulatory:

Initial IRB Approval: Texas Tech University Exempt Determination on January 25, 2018;
Harvard University Determination of Not Human Subjects Research on January 26, 2018;
University of Rochester Determination of Not Human Subjects Research on February 6, 2018;
University of Mississippi Medical Center Determination of Not Human Subjects Research on February 7, 2018.

Initial HRPO Approval: Determined this is Research Not Involving Human Subjects
Determination on March 20, 2018. No further requirement for review by HRPO.

Recruitment: N/A

Progress in relation to the statement of work tasks and objectives:

Task	Timeline	Progress
1. IRB/HRPO Approvals	Months 1-6	Complete
Milestone Achieved: Local IRB approval and TTU and subcontract sites.	Months 2-3	Complete
Milestone Achieved: HRPO Approval for all protocols.	Month 5-6	Complete

Major findings, results, and/or significance for this project during this quarter: N/A

Goals for the next quarter: Next quarter we will begin data cleaning and preparing the data for analysis. We will examine distributions of all CDE variables.

Problems, challenges and plans to address them: N/A

Publications, Presentations, and Media Requests: N/A

MSRC 1.0 D&I Readiness Working Group Final Report

MSRC 1.0 D&I Readiness Working Group Final Report

MSRC 1.0 Intervention: Window to Hope (WtoH)

MSRC 1.0 Funded Study: Window to Hope: Evaluating a Psychological Treatment for Hopelessness among Veterans with Traumatic Brain Injury (TBI) and Pilot Study of an Active Control Problem Solving Therapy for Suicide Prevention (PST-SP) Among Veterans with Moderate to Severe TBI

PI: Lisa Brenner, PhD, ABPP

Materials Included:

- MSRC 1.0 Intervention Summary for the D&I Readiness Working Group
- Intervention Summary Supplemental Materials
- MSRC 1.0 Working Group Final Report

MSRC 1.0 Intervention Summary for the D&I Readiness Working Group

Intervention	Window to Hope (WtoH)						
Intervention Description	Psychological Intervention for the Treatment of Hopelessness among Veterans with Moderate to Severe TBI The WtoH program was developed from principles and therapeutic techniques drawn from cognitive behavioral therapy, as adapted for TBI. It is structured around 4 core therapeutic strategies: behavioral activation, cognitive restructuring, problem-solving, and relapse prevention. The central metaphor is a Window of Hope, with the core therapeutic strategies represented by each of 4 window panes. In addition, a therapeutic rationale is provided for each section, making explicit ways in which the various strategies could contribute to alleviating hopelessness. For the final component, therapeutic strategies from the field of posttraumatic growth were substituted for the more standard techniques used to address relapse prevention. The program was originally developed in Australia for civilians with severe TBI. In its first RCT, Simpson and colleagues noted clinically significant reductions in hopelessness among those who completed WtoH when compared with those in a usual care waitlist (WL) control group (effect size $d = 1$). Furthermore, these gains were maintained or improved for 75% of participants at 3-month follow-up. Given these promising findings, the intervention was cross-culturally adapted for US Veterans and delivered at the Denver VA Medical Center in a small group format (1 therapist and 2 participants). Dyads provide an option between individual and group-based therapy, allowing for the tailoring of therapy to the individual, but also with the benefits of peer-based normalization and validation of experiences, as well as opportunities for stronger emotional expression, greater interaction, and social facilitation. We posit that this version developed for US Veterans is not specific to Veterans and could be delivered to non-Veterans (e.g., active duty Servicemembers). This intervention is not intended for those during the acute recovery stage. WtoH is aimed at those who are at least 1 year post moderate to severe TBI.						
PI	Lisa A Brenner, PhD, ABPP, Rp						
POCⁱ	Brenner, Lisa A.						
POC contact	303-399-8020 x2571						
Grant Summary	Award No. (W81XWH-10-2-0178, Proposal No. 27 09162006) for \$986,789.31						
Recruitment Site(s)ⁱⁱ	Denver VAMC						
Suicidality Outcomeⁱⁱⁱ	Suicidal ideation measured by Beck Scale for Suicide Ideation (BSS secondary)						
Other Target Outcome^{iv}	Hopelessness measured by Beck Hopelessness Scale (BHS; primary), depression measured by Beck Depression Inventory-II (BDI-II; secondary)						
Participants Included (check all that apply)	<table border="0"> <tr> <td>☐ Active Duty</td> <td>☐ Reserve</td> <td>☐ National Guard</td> </tr> <tr> <td>☒ OEF/OIF/OND Veterans</td> <td>☒ Veteran Previous Eras</td> <td>☐ Civilians</td> </tr> </table>	☐ Active Duty	☐ Reserve	☐ National Guard	☒ OEF/OIF/OND Veterans	☒ Veteran Previous Eras	☐ Civilians
☐ Active Duty	☐ Reserve	☐ National Guard					
☒ OEF/OIF/OND Veterans	☒ Veteran Previous Eras	☐ Civilians					
D&I Materials Please describe D&I materials including manuals, toolkits, apps, websites, forms, handouts, PowerPoint presentations, web-based trainings, demonstration videos, posters, messaging information, SharePoint, etc.							

Describe: Currently we have 2 WtoH Program Manuals (Clinician and Client versions) developed by study team in Word/Adobe. The manuals include detailed instructions to clinicians for the delivery of the intervention, as well as handouts, worksheets, and pre- and post-evaluations for each session. Handouts are pages from the manual providing content about the program in an accessible way. For example, a handout on common challenges after TBI, and symptoms of depression. The worksheets were pages with activities (written and experiential) for the group participants to complete. For example, asking participants how impacted they were after their brain injury, and asking how they normally act when feeling down. Pre- and post-evaluations are called “Taking the pulse” and include questions on current hopefulness and happiness ratings on a 1-10 scale. There is also an existing study recruitment flyer that could be modified to advertise groups. We have previously purchased a stock “Window to Hope” image to brand the program. There have been numerous powerpoint presentations describing the intervention that could be adapted for training purposes. We also created and tested an intervention fidelity checklist to monitor clinician adherence to the manual.

Proposed D&I materials would include professionally re-mastered/printed manuals, with a central website portal to host an online training toolkit with downloadable manuals, powerpoint, and/or other web-based trainings to ensure fidelity. Additional resources may be allocated to in person trainings for clinicians, as well as ongoing fidelity/consultation during delivery of the intervention. Posters/flyers to attract patients to the group would be professionally produced using existing WtoH image/design (or they could be re-designed based on stakeholder input).

Readiness for Implementation
using a combination of RE-AIM and Implementation Outcome Frameworks

INSTRUCTIONS: Below you will find a list of implementation domains to report your data to date. It is not expected that your project will have data for all of these domains. If none, check “no evidence”, but feel free to comment within the description box. If you do have data, please also check all sources including a clinical^v or implementation^{vi} study or from leadership^{vii} or other stakeholder input^{viii}. Please specify if from Department of Defense or Veteran vs. civilian settings.

Reach

Participation rate among clients approached and representativeness of those who participate compared to those for whom this intervention is targeted. Alternatively, the penetration or integration of this intervention within a service setting and its subsystems defined by # clients receiving service/# clients eligible or # providers offering service/# providers trained

Evidence from: ☒ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☐ No evidence	Description: According to DVBIC, over 35,000 Servicemembers have sustained moderate to severe TBI since 2000 (http://dvbic.dcoe.mil/dod-worldwide-numbers-tbi). Based on research that about 35% of individuals with moderate to severe TBI experience moderate to severe hopelessness after injury (Simpson GK, Tate RL. Suicidality after traumatic brain injury: demographic, injury and clinical correlates. Psychol Med. 2002;32(4):687–697.), there are roughly ~12,250 Servicemembers who could potentially benefit from this intervention. This is a conservative estimate of reach as there are many more Servicemembers who could benefit if clinical settings include those with undetermined and/or complicated mTBI with persistent symptoms and hopelessness. This “denominator” is also an underestimate because it does not include those who suffered a significant TBI from prior eras. In this study, a total of 815 potential participants expressed interest and were screened for eligibility. Many Veterans screened were excluded due to the stringent eligibility criteria inherent to RCTs (e.g., no history of moderate to severe TBI (n=346, 45.3%) or absent moderate to severe hopelessness (n=128, 16.8%)). However, we also experienced various barriers to participation that impacted the reach of the research, and could apply in clinical settings. Reasons for not participating included no interest in attending groups or participating in the study (n=73, 9.6%), unable to travel to Denver VA for groups (n=42, 5.5%), and problematic consumption of alcohol and/or other substances (n=20, 2.6%). There were also other less common reasons such as the participant being less than one-year post-qualifying injury, involvement with the justice system, and ineligibility for care with the VA. Many of these recruitment challenges would be relevant considerations for implementation in clinical settings. Of the remaining 51 who screened in and were scheduled for a baseline assessment, 6 participants were excluded during the baseline assessment due to not meeting eligibility criteria, and one additional participant withdrew at baseline due to no longer being interested. As a result, 44 participants were randomized to the two arms. Results were analyzed according to the allocated group, such that 15 participants from the intervention first arm with T2 data and 20 participants from the waitlist first arm with T2 data were included in the primary analysis (35/44 = 79.5% of those randomized were retained in analysis). Among those analyzed, there were no differences between groups in rates of attendance. In the intervention first arm, participants attended a mean of 7.8 sessions (SD 2.9), median 8.5 with range of 0 to all 10 sessions. In the waitlist arm, participants attended a mean of 8.7 sessions (SD 1.5), median 9 with range of 5 to all 10 sessions. These results indicate good retention of participants in the program itself and during the waitlist period. While the sample size is relatively modest, these results are promising, especially in the context of many prior findings of significant dropout in mental health intervention research and clinical settings. Regarding the 9 WtoH participants who were randomized, but not included in the analyses: Within the intervention first group, 7 participants did not complete the Time 2 assessment (2 participants withdrew due to no longer being interested in participating and, 5 were lost to follow-up, such that attempts to reach them were unsuccessful). One was later found to have become incarcerated during the Time 2 assessment period. Within the WL group, 2 participants did not complete the Time 2 assessment (1 participant withdrew due to no longer being interested in participating and members of

	the study team were unable to reach the other participant, who was later found to have been incarcerated during the Time 2 assessment period). While the research team made much effort to maintain contact at follow-up, incarceration and lost to follow-up are two barriers we experienced that would likely apply in clinical settings. We found that regular reminder calls the day prior to group classes, and compensation for travel to and from groups mitigated our losses to follow-up. Other adaptations included mailed reminder letters upon request, and due to the small group size, we were able to coordinate make-up group times if both participants had a scheduling conflict.

Evidence for this Clinical Intervention ^{ix}	
Suicidality Outcome Category	☐ Strong ☐ Moderately Strong ☐ Moderate ☒ Minimal ☐ None
Other Target Outcome Category	☒ Strong ☐ Moderately Strong ☐ Moderate ☐ Minimal ☐ None
Description of Evidence: These results were recently published in the Journal of Head Trauma Rehabilitation: Brenner LA, Forster JE, Hoffberg AS, Matarazzo BB, Hostetter TA, Signoracci G, Simpson GK (early online 2017). Window to Hope: A Randomized Controlled Trial of a Psychological Intervention for the Treatment of Hopelessness among Veterans with Moderate to Severe TBI. Journal of Head Trauma Rehabilitation. doi: 10.1097/HTR.0000000000000351 http://journals.lww.com/headtraumarehab/Abstract/publishahead/Window_to_Hope_A_Randomized_Controlled_Trial_of.99527.aspx Analysis 1 = Compare the Time 2 BHS (primary), BDI and BSS (secondary) scores between the groups controlling for the corresponding baseline scores and considering the clinically relevant potential confounders which included age, lifetime history of mood, anxiety, substance abuse, or psychotic disorders, and history of a suicide attempt. Analysis 2 = Contrasted the change from Baseline to Time 2, with the change from Time 2 to Time 3 within the Waitlist group only (for the BHS, BDI and BSS). This allows the waitlist participants to serve as their own control such that the only variable to control for was change in the waitlist period. Analysis 3 = Change from Baseline to Time 3 within the WtoH intervention first group only for BHS, BDI and BSS. As this change was not compared to a control change, baseline values were not accounted for. Suicide ideation: Analysis 1: A trend was observed at p=0.07 for the BSS where those initially allocated to the WtoH intervention had an estimated mean Time 2 score of 2.0 (95% confidence interval (CI): 0, 5.1) and the WL group had an estimated mean Time 2 score of 5.8 (95% CI: 3.1, 8.5) such that the WtoH group had a lower Time 2 ideation score. Analysis 2: No difference was found for the BSS with an estimated difference in change of -.01 (95% CI: -3.3, 3.1; p=0.94). Analysis 3: A trend was observed at p=0.06 for the BSS (-3.5 (95% CI: -7.0, 0.12)). We suspect that this trend would have reached significance with more power. While we initially planned for 35 analyzed per group, recruitment eligibility challenges (as noted above) prevented us from reaching this goal. Hopelessness: Analysis 1: After controlling for baseline BHS score, those who received the WtoH intervention had an estimated mean Time 2 score of 8.6 (95% confidence interval (CI): 5.7, 11.5) on the BHS and the WL group had an estimated mean Time 2 score of 13.0 (95% CI: 10.5, 15.5) such that the WtoH group had significantly lower Time 2 hopelessness (p=0.03). Analysis 2: After controlling for the change from Baseline to Time 2, there was a significant difference in change on the BHS between the waitlist period (Baseline to Time 2) and the WtoH period (Time 2 to Time 3) such that on average, participants decreased (improved) by -4.6 points (95% CI: -7.9, -1.3) more in the WtoH period (p=0.01) than the WL period. Analysis 3: The estimated reduction in BHS score was significant (-6.3 points (95% CI: -9.3, -3.2; p=0.0007)). This improvement in hopelessness was also clinically significant, with the average BHS scores decreasing from the severe band (BHS scores 15-20) to the lower end of the moderate hopelessness band (BHS scores 9-14).	

Depression:

Analysis 1: No significant between group differences were noted on the BDI.

Analysis 2: On average, **participants decreased (improved)** on the BDI by -8.7 points (95% CI: -13.8, -3.6) **more in the WtoH period as compared to the WL period (p=0.003).**

Analysis 3: The estimated change in BDI score was significant (-11.6 (95% CI: -18.0, -5.3; p=0.002), meaning **depression scores significantly improved.**

Evidence in Support of Intervention Adoption	
Percentage and representativeness of the organizations or settings that will conduct this intervention	
Acceptability	Perception among leadership, clinicians, Service Member/Veteran, family or other stakeholders that this intervention is agreeable, palatable, or satisfactory
Evidence from: ☒ Clinical study ☒ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	Description: Prior to the RCT, an IRB-approved stakeholder consensus conference was held to culturally adapt the intervention and discuss its acceptability for US Veterans from the original trial among Australian Civilians. This day-long meeting gathered input from various stakeholders including Veterans with TBI, clinicians from Mental Health Service and Rehabilitation Service, family member of Veteran with TBI, and research staff. Details on the Additionally, 4 pilot feasibility/acceptability groups (n=9 pts) were recruited and acceptability outcomes were measured using the Client Satisfaction Questionnaire-8 (CSQ-8), the Narrative Evaluation of the Intervention Interview (NEII; qualitative results), as well as attendance data. These results have been published.* These outcomes were also collected from RCT participants. Overall, the results were favorable, indicating that participants were receptive, the program helpful, the content was appropriate, and that the intervention fills an identified gap in service needs among Veterans with TBI. *Matarazzo BB, Hoffberg AS, Clemans TC, Signoracci GM, Simpson GK, Brenner LA (Sep 2014). Cross-cultural adaptation of the Window to Hope: A psychological intervention to reduce hopelessness among US Veterans with traumatic brain injury. Brain Inj; 28(10): 1238-1247. DOI: 10.3109/02699052.2014.916419
Adoption	Intention, initial decision, or action to try or employ this intervention
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	Description: Although there is no research evidence for adoption, anecdotal reports that clinicians from Mental Health Service and Rehabilitation Service within the Denver VAMC have expressed interest in this intervention. After various talks by Dr. Brenner, attendees have approached us about obtaining access to the manual and training for delivering the intervention. We also have received emailed requests for the training manual.
Appropriateness	Perceived fit, relevance, or compatibility of this intervention for a given practice setting, perceived fit of this intervention to an established need to address a particular issue, and access to Service Members/Veterans who need it
Evidence from:	Description: Group-based interventions such as WtoH are an efficient way to utilize the limited resources (clinicians and rooms) of VA/DoD health care

☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	settings. The peer component to this intervention (being in a group with others who have experienced similar challenges) also seems to be an appropriate and particularly good fit for Veteran and military populations.
Implementation Intervention integrity or the quality and consistency of delivery	
Fidelity	Degree to which this intervention has been implemented as it was prescribed in the original study or as it was intended by the intervention developers
Evidence from: ☐ Clinical study ☒ Implementation study ☐ Leadership ☐ Other stakeholder input ☐ No evidence	Description: During the pilot groups, fidelity adherence was monitored. For Pilot group 1, the sessions were delivered by the intervention's creator and used as a training model for study clinicians. For the remaining pilot groups, all sessions were audio-recorded and checked for fidelity using a checklist developed by the study team. Results from the pilot study indicate that therapists achieved 100% treatment fidelity.* *Matarazzo BB, Hoffberg AS, Clemans TC, Signoracci GM, Simpson GK, Brenner LA (Sep 2014). Cross-cultural adaptation of the Window to Hope: A psychological intervention to reduce hopelessness among US Veterans with traumatic brain injury. Brain Inj; 28(10): 1238-1247. DOI: 10.3109/02699052.2014.916419
Feasibility	Extent to which this intervention can be successfully used or carried out within a given agency or setting such as the ability to take on the demands of this intervention and resources to do so
Evidence from: ☒ Clinical study ☒ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	Description: Prior to the RCT, an IRB-approved stakeholder consensus conference was held to culturally adapt the intervention and discuss its feasibility for US Veterans from the original trial among Australian Civilians. This day-long meeting gathered input from various stakeholders including Veterans with TBI, clinicians from Mental Health Service and Rehabilitation Service, family member of Veteran with TBI, and research staff. Details on the Additionally, 4 pilot feasibility/acceptability groups (n=9 ppts) were recruited and acceptability outcomes were measured using the Client Satisfaction Questionnaire-8 (CSQ-8), the Narrative Evaluation of the Intervention Interview (NEII; qualitative results), as well as attendance data. These results have been published.* These outcomes were also collected from RCT participants. Overall, the results were favorable, indicating that participants were receptive, the program helpful, the content was appropriate, and that the intervention fills an identified gap in service needs among Veterans with TBI. There were some feasibility challenges including space issues inside the Denver VA, group size (e.g., a "group" of 1 if ppt dropped out), and travel distance to attend (participants were drawn from the entire Eastern Colorado Health Care System, but groups were only offered in Denver) *Matarazzo BB, Hoffberg AS, Clemans TC, Signoracci GM, Simpson GK, Brenner LA (Sep 2014). Cross-cultural adaptation of the Window to Hope: A psychological intervention to reduce hopelessness among US Veterans with

	traumatic brain injury. Brain Inj; 28(10): 1238-1247. DOI: 10.3109/02699052.2014.916419
Maintenance and Cost How well does the adoption or use of this intervention hold up in the long term and the extent to which it becomes institutionalized	
Sustainability	Extent to which this intervention has been maintained or institutionalized within a service setting's ongoing, stable operations (presuming it was implemented)
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	No sustainability information to present.
Cost	Cost impact of the implementation effort including: costs of this intervention itself, the implementation of the intervention and the location of service delivery
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	Description: While we don't have evidence on costs, there would be substantial training effort and materials, as outlined in a DRAFT training plan below. We have made efforts to minimize implementation costs through an online-focused delivery method: Window to Hope (WtoH) Intervention – Therapist Training in Military Training Facility Feelings of hopelessness are a strong predictor of who is likely to die by suicide, and studies have shown that reducing feelings of hopelessness can reduce the risk of suicide among various types of patients. This training will educate therapists practicing in military training facilities on using the WtoH Intervention, a problem-solving psychological intervention for the treatment of hopelessness to prevent suicide among active duty military with moderate to severe traumatic brain injury (TBI). Audience/Trainees Therapist, Licensed Social Worker or Community Nurse who work in Military Training Facilities (MTF) with TBI clinics. Note: If MTF is small and without TBI expertise, must have a general psychiatric Rehab floor. Requirements Experience with TBI and serious mental illness (SMI) is required. Master's Degree and background in Cognitive Behavioral Therapy (CBT) recommended. Note: A TBI training module will be provided for those in need prior to the WtoH Intervention training. Training Format

	The training will be delivered online, through self-paced modules. Sessions will be developed for all content areas, as well as introduction to TBI content. This will allow for convenient, self-guided delivery among the busy front line providers. This will also reduce overall training costs and improve scalability. These online trainings will be supplemented with ongoing support, monitoring and supervision by clinician experts in the intervention. Optimal length and type of consultation necessary to maintain fidelity has yet to be determined. Module 1: Pre-Training Traumatic Brain Injury Audience: Those without Rehab/TBI experience Learning objectives: • Identify signs, symptoms, severity levels and types of TBI • Increase clinician skill, comfort level, and confidence managing those with TBI Modules 2 - 10 — WtoH Intervention Training Audience: All This training will need to be developed. Sessions will be based on the WtoH training manual (professionally edited version), and will include role-play experience as well as a post-training transfer-of-learning. A website hub will also include a resource library of materials available on demand, and possibly a listserv or online chat group as a forum for ongoing therapist support. There also may be some cost-savings/efficiency in this program being delivered in groups of 3, while the RCT method described above randomized participants in blocks of 4 (groups of 2). As training and fidelity are likely to create ongoing challenges, and in general DoD settings, clinicians may only identify a few patients with moderate to severe TBI per year, another option would be to create an on-line version of this intervention. That being said, additional trials would be needed to establish an evidence-base.

ⁱ POC is the person DoD or other military partners should contact for more information about the intervention and its dissemination and implementation.

ⁱⁱ Recruitment site is where study participants were identified and recruited (e.g. Fort Carson or Portland VA). If online, please provide recruitment strategy or sites where the study was advertised.

ⁱⁱⁱ Suicidality Outcome must be suicidal ideation or behavior. Other risk factors such as hopelessness and depression are considered other target outcomes.

^{iv} Other Target Outcome is either the outcome or the mechanism of your study.

^v Clinical study would be any study where the focus was outcomes for the clients – efficacy or effectiveness RCT, pilot study, adaptation to a new setting where the focus was client outcomes.

^{vi} Implementation study would be a formal study where the focus was not client outcomes from the intervention but its uptake, acceptability, feasibility, reach, sustainability, etc.

^{vii} Leadership feedback ranges from a clinical guideline or other mandate to more informal input such as focus groups, response to briefings on the intervention, etc.

^{viii} Other stakeholder input would include input from clinicians, other staff such as chaplains, Service Members and their families, Veterans, information technology or other relevant administrative staff, etc.

^{ix} Quality of Evidence for Clinical Intervention categories

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

Window to Hope: A Randomized Controlled Trial of a Psychological Intervention for the Treatment of Hopelessness Among Veterans With Moderate to Severe Traumatic Brain Injury

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Bridget B. Matarazzo, PsyD; Trisha A. Hostetter, MPH; Gina Signoracci, PhD;
Grahame K. Simpson, PhD

Objective: To evaluate the efficacy of a psychological intervention to reduce moderate to severe hopelessness among Veterans with moderate to severe traumatic brain injury (TBI). **Design:** Two-arm parallel group, controlled, randomized crossover trial, with 3-month follow-up for those initially allocated to treatment. Participants were randomly allocated in blocks of 4 on a 1:1 ratio to treatment ($n = 15$) or waitlist ($n = 20$) groups. **Setting:** A Veterans Affairs Medical Center. **Participants:** Veterans between the ages of 26 and 65 years, with a history of moderate to severe TBI, and moderate to severe hopelessness. **Interventions:** A 20-hour manualized small group cognitive-behavioral intervention. **Main Outcome Measures:** Beck Hopelessness Scale (primary), Beck Depression Inventory, and Beck Scale for Suicide Ideation. **Results:** A significant difference between groups was found for postintervention scores on the Beck Hopelessness Scale ($P = .03$). Significant decreases were maintained at follow-up. For those initially allocated to the waitlist group who completed the intervention, treatment gains were noted in decreased hopelessness ($P = .01$) and depression ($P = .003$). **Conclusions:** Findings from this trial provide additional support for the efficacy of this method of psychological treatment of hopelessness among individuals with moderate to severe TBI. **Key words:** cognitive behavior therapy, depression, hopelessness, randomized controlled trial, replication, suicide ideation, suicide prevention, traumatic brain injury, Veterans

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Preliminary analyses presented at IASR/AFSP International Summit on Suicide Research: Preventing Suicide: Progress through Research. October 11 to 14, 2015; New York City, New York, the 11th World Congress on Brain Injury. March 2 to 5, 2016; The Hague, the Netherlands, and the Military Health System Research Symposium. August 15 to 18, 2016; Kissimmee, Florida.

This work was supported by the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs (under Award No. W81XWH-10-2-0178, Proposal No.

09162006). Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the MSRC or the Department of Defense. Additional support was provided by the VA Rocky Mountain MIRECC.

We certify that no party having a direct interest in the results of the research supporting this article has or will confer a benefit on us or on any organization with which we are associated and, if applicable, we certify that all financial and material support for this research (eg, NIH or NHS grants) and work are clearly identified in the title page of the article.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Departments of Defense or the Veterans Affairs or the US Government.

The authors declare no conflicts of interest.

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DOI: 10.1097/HTR.0000000000000351

AMONG INDIVIDUALS seeking care within the Veterans Health Administration (VHA), Brenner and colleagues¹ found that those with a history of moderate to severe traumatic brain injury (TBI) died by suicide at a markedly higher rate than members of the general VHA population. The relationship between history of TBI and death by suicide has also consistently been noted among civilian cohorts.² Nonetheless, there continues to be a dearth of evidence-based suicide prevention interventions for individuals with a history of TBI. In a recent systematic review, Bahraini and colleagues² identified only one prospective study of an intervention (Window to Hope [WtoH]) aimed at preventing suicide among this high-risk cohort. Specifically, Simpson and colleagues³ noted clinically significant reductions in hopelessness among those who completed WtoH when compared with those in a usual care waitlist (WL) control group (effect size $d = 1$). Furthermore, these gains were maintained or improved for 75% of participants at 3-month follow-up.

Hopelessness is widely observed among individuals with severe TBI. In the largest study conducted to date, a 35% rate of moderate to severe hopelessness was reported by individuals with a history of TBI between 1 and 10 years postinjury.⁴ These rates are also reflected in US studies, with researchers reporting rates of hopelessness among those post-TBI, ranging between 32% and 36%.⁵ The broad prevalence of hopelessness after TBI underlies its importance as a strategic outcome of interest, along with depression, which has been shown to be a risk factor for suicidal ideation in this cohort.⁶ Data suggest that hopelessness after TBI is a strong independent predictor of suicidal ideation, with suicidal ideation being a strong predictor of postinjury suicide attempts.⁴

The WtoH program was developed from principles and therapeutic techniques drawn from cognitive-behavioral therapy, as adapted for TBI.⁷ It is structured

around 4 core therapeutic strategies: behavioral activation, cognitive restructuring, problem-solving, and relapse prevention. The central metaphor is a Window of Hope, with the core therapeutic strategies represented by each of 4 window panes. In addition, a therapeutic rationale is provided for each section, making explicit ways in which the various strategies could contribute to alleviating hopelessness. For the final component, therapeutic strategies from the field of posttraumatic growth were substituted for the more standard techniques used to address relapse prevention (see Table 1).⁸ The program was delivered in a small group format (1 therapist and 2 participants). Dyads provide an option between individual and group-based therapy, allowing for the tailoring of therapy to the individual, but also with the benefits of peer-based normalization and validation of experiences, as well as opportunities for stronger emotional expression, greater interaction, and social facilitation.⁹

Efforts to bring WtoH to a US VHA setting commenced with a cross-cultural adaption of the intervention.¹⁰ This process was conducted in 3 stages by members of this team: (1) consensus conference with stakeholders to revise the existing manual; (2) pilot study of the revised manual with US Veterans to examine acceptability and feasibility, as well as providers' ability to maintain adherence to the manual; and (3) review of results with consensus conference attendees and further revisions. Results of the study provided support for the acceptability and feasibility of the intervention (with only minor changes from the Australian program), as well as providers' ability to adhere to the structured manual content with fidelity (for further information regarding this cross-cultural adaptation see Matarazzo et al.¹⁰). On the basis of these findings, a Phase II randomized controlled trial (RCT) of the intervention among Veterans with moderate to severe TBI and clinically significant hopelessness was initiated.

TABLE 1 *Window to Hope session topics*

Session	Therapeutic principle	Goals
1. Getting started	Group formation	Group participants meet, introduce program theme
2. Living a positive lifestyle	Behavioral activation	Examine relationship between affect and lifestyle factors
3. Thoughts and feelings	Socialization to CBT	Learn about the relationship between thoughts and feelings
4,5. Take another look	Cognitive restructuring	How cognitive restructuring can ameliorate distress
6,7. Problem-solving	Problem-solving	To develop a systematic approach to solving problems
8. Problem-solving and recovery	Compensatory techniques	To develop skills to facilitate adjustment to the extent of postinjury recovery
9. Building hope	Relapse prevention: posttraumatic growth	To identify means of building hope after TBI, self-esteem
10. Building hope	Relapse prevention: posttraumatic growth	Making meaning of TBI, positive expectancy, and building connections

Abbreviations: CBT, cognitive-behavioral therapy; TBI, traumatic brain injury.

The primary hypothesis of this trial was that participants initially allocated to WtoH treatment would report a significant post-treatment reduction in hopelessness compared with those initially allocated to the WL group. The secondary hypothesis was that participants initially allocated to WtoH treatment would report significant posttreatment reductions in suicidal ideation and depression compared with those initially allocated to the WL. Exploratory hypotheses postulated that participants initially allocated to WtoH treatment would report a significant reduction from baseline to the end of the follow-up period in hopelessness, suicidal ideation, and depression, and that all participants would report a significant posttreatment reduction in these outcomes.

METHODS

Design

Evaluation comprised a 2-arm (treatment vs WL) parallel group randomized controlled crossover trial, with blind random allocation to the 2 arms on a 1:1 ratio. The trial is reported in accordance with the CONSORT statement (see Figure 1).^{11,12}

Sample

To recruit participants, flyers were distributed in the community and throughout the local VA Medical Center, and presentations about the study were made to Department of Veterans Affairs (VA) clinicians. Potential

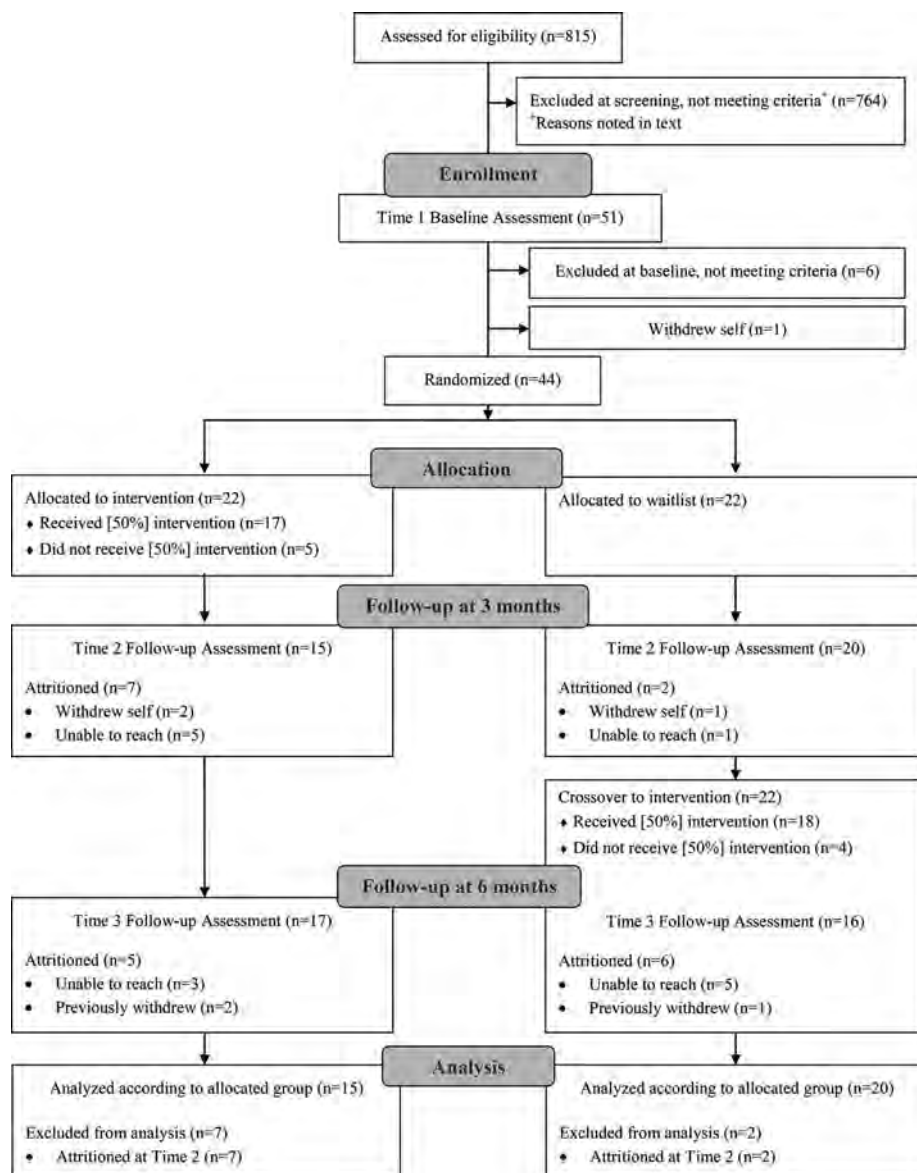


Figure 1. CONSORT Diagram.

participants were also informed about the research study via mailed letters. Screening procedures were utilized to determine the eligibility of potential participants on the basis of the following inclusion criteria: US military Veterans eligible for care within the VHA; age 18 to 65 years; history of moderate and/or severe TBI per the Ohio State University TBI Identification Method (OSU TBI-ID)¹³ and at least 1 year post-injury; a Beck Hopelessness Scale (BHS) score 9 or more;¹⁴ no history of alcohol abuse within the last 7 days or nonalcohol substance abuse within 30 days of baseline assessment (with the exception of cannabis, because of legal status in the state) as identified on the Mini-International Neuropsychiatric Interview (MINI)¹⁵; and no diagnosis of any neurological condition(s) other than moderate or severe TBI.

Measures

The study battery was composed of the standardized self-report measures described below. Data were collected on key demographic, injury, cognitive, and psychosocial variables during the baseline assessment, with some repeated measures during the 2 follow-up assessments (T2 and T3). The focus of this report is on primary (BHS) and secondary outcome measures (BDI, BSS), which were administered at baseline to establish and compare sample characteristics across conditions and at T2 and T3 to assess treatment effects.

Primary outcome measure

The Beck Hopelessness Scale (BHS) is a 20-item true/false self-report scale that measures negative expectations about the future held by respondents in the previous week. Scores range from 0 to 20, representing minimal (0-3), mild (4-8), moderate (9-14), and severe (>14) levels of hopelessness. The BHS has excellent internal consistency (Cronbach $\alpha = 0.93$) and strong concurrent validity with clinical ratings of hopelessness ($r = 0.74$) and other measures of hopelessness ($r = 0.60$).¹⁴ BHS scores 9 or more are associated with significantly elevated levels of suicide risk.¹⁶ The BHS was administered at screening and baseline to ensure continued study eligibility (BHS ≥ 9).

Secondary outcome measures

*The Beck Depression Inventory-Second Edition (BDI-II)*¹⁷ is a widely-used self-report instrument measuring the severity of common depressive symptoms. Each of its 21 items is rated on a 4-point Likert scale ranging from 0 to 3; total scores range from 0 to 63, with higher scores indicating greater degrees of depressive symptomatology. Internal consistency reliability (Cronbach α) for the BDI-II has been reported as high (0.91 to 0.93 among

outpatient adults).¹⁷ Beck et al¹⁷ also reported a 1-week test-retest reliability of $r = 0.93$.

*The Beck Scale for Suicide Ideation (BSS)*¹⁸ is a 19-item scale that assesses severity of suicidal ideation within the previous week, with total scores ranging from 0 (no suicidal ideation) to 38. High levels of internal consistency (Cronbach $\alpha = 0.93$) have been reported as well as concurrent validity with the BDI ($r = 0.64$ to $r = 0.75$),¹⁸ and the BHS among those with TBI ($r = 0.60$)¹⁴ and general population samples ($r = 0.52$ to $r = 0.63$).¹⁸

Preintervention screening measure

The Ohio State University TBI Identification Method (OSU TBI-ID) was administered to determine lifetime TBI history (yes/no) and severity.¹³ The OSU TBI-ID is a structured interview designed to address the need for a systematic method of retrospectively assessing lifetime TBI. It has been shown to have good interrater reliability (all intraclass correlation coefficients exceeded 0.80 and 6 of the 7 exceeded 0.90) and validity between lifetime history of TBI and cognitive and behavioral consequences.¹³

Group profile measures

*The Mini-International Neuropsychiatric Interview Version 6.0.0 DSM-IV (MINI)*¹⁵ is a brief, structured psychiatric interview that has been shown to have reliability and validity comparable to those of the Structured Clinical Interview for DSM-III-R Disorders (SCID-P) and the World Mental Health Composite International Diagnostic Interview.^{19,20} The MINI assesses for psychiatric disorders including, but not limited to, hypo/mania (current/past), major depressive episode (current/recurrent), panic disorder (current/lifetime), agoraphobia (current), social anxiety disorder (current), posttraumatic stress disorder, alcohol/substance abuse and dependence (past 12 months), and psychotic disorders including mood disorder with psychotic features (current/lifetime). The anorexia, bulimia, and antisocial personality modules were not administered for this study to reduce participant burden. The MINI was administered at baseline to assess inclusion/exclusion criteria and to describe the sample.

Procedures

Ethics approval was granted by the Colorado Multiple Institution Review Board, the VA Office of Research and Development, the US Army Medical Research and Materiel Command, Office of Research Protections, and Human Research Protection Office. Recruitment took place over a 2^{1/2}-year period (September 2012 to March 2015).

Group facilitators were 3 study clinicians (doctoral degree in psychology or related field) who had received

training regarding the intervention by its developer (GKS) and had achieved 100% treatment fidelity during pilot group monitoring.¹⁰ Before enrollment, participants were screened for eligibility and then scheduled for a baseline assessment. Veterans were enrolled by a member of the study team and completed a baseline assessment within 2 weeks before randomization. Allocation to the study arms was conducted by the study coordinator, and allocation was concealed. A block randomization was used: when a group of 4 participants had been enrolled, they were randomly allocated to a condition using ordered sealed envelopes. All participants remained in the group to which they had been allocated. Those allocated to intervention first were then assigned to a group that met for 10 sessions occurring approximately once weekly for 2 hours each time. The WL group participants were informed that there would be a delay before their group commenced. Members of the WL group continued to receive nonconstrained usual care from the VHA.²¹

Participants from both arms of the trial then completed a T2 follow-up assessment within 2 weeks after the final WtoH session from the intervention first condition. Those initially allocated to the WL group were then provided with the opportunity to cross over and receive the WtoH treatment program. Of the 22 initially allocated to the WL group, 18 attended at least 50% of the sessions. Of the 4 who did not participate, 1 was no longer interested, 1 was hospitalized, and 2 were lost to follow-up. A T3 assessment was administered within 2 weeks after the final WtoH session for the WL group. Whereas, for those initially allocated to the WtoH condition, the T3 data collection comprised a 3-month follow-up, for the WL condition, the T3 data comprised their postgroup assessment. Both the T2 and T3 assessments were administered by an independent assessor who was blind to the participants' group assignment. Participants were reminded not to disclose their treatment condition to the blind assessor, and any inadvertent disclosures were noted.

Treatment program

Session topics, associated therapeutic principles, and goals have been described in some detail in the original trial (see Simpson et al³). In Table 1, a brief outline of the program is provided.

Data analysis

All analyses assumed a 2-sided test of hypothesis with a significance level of .05 and were run in SAS v9.4 (SAS Institute, Cary, North Carolina). Looking post hoc, the analyzed sample of 20 participants from the intervention first group and 15 participants from the WL group with an α of .05 provided 80% power to detect an effect

size of $d = 1$, which is similar to the observed effect of the precultural adaptation of WtoH.³ Baseline demographic and clinical characteristics were compared using Wilcoxon rank sum and Fisher exact tests as appropriate. Baseline BHS scores were calculated as the average of the screening and baseline scores. A per protocol analysis was conducted, with participants in the WtoH group only included if they had completed at least 5 WtoH sessions. Furthermore, all participants were required to have completed the BHS at T2.

There were 3 sets of analyses. First, we wished to compare the T2 BHS (primary), BDI, and BSS (secondary) scores between the groups controlling for the corresponding baseline scores and considering the clinically relevant potential confounders, which included age, lifetime history of mood, anxiety, substance abuse, or psychotic disorders, and history of a suicide attempt. None of the potential confounders reached significance at the .10 level, and as such, none were included in the final models. Therefore, analysis of covariance was used to model T2 outcomes as a function of group and the baseline value of the respective outcome. The estimated mean difference in T2 scores was calculated from these models for each outcome. Given a single primary outcome, no adjustment was made for multiple comparisons.

The second analysis contrasted the change from baseline to T2 with the change from T2 to T3 within the WL group only (for the BHS, BDI, and BSS). This allows the WL participants to serve as their own control such that the only variable to control for was change in the WL period (if participants improved greatly during the WL period, they would no longer have enough "room" to change in the intervention period). We therefore used linear regression with the difference in change as the dependent variable and the WL period change as the only predictor. The estimated mean difference in change was calculated from this model.

The third analysis investigated the change from baseline to T3 within the WtoH intervention first group only for the BHS, BDI, and BSS. This difference was calculated and a 1-sample t test was used to determine whether the estimate was different from zero. As this change was not compared with a control group change, baseline values were not accounted for.

RESULTS

A total of 815 potential participants expressed interest and were screened for eligibility. From this group 764 were excluded. The 2 main reasons for exclusion were no history of moderate to severe TBI ($n = 346$, 45.3%) or absent moderate to severe hopelessness ($n = 128$, 16.8%). Other reasons included the participant not being interested in attending groups/participating in the

study ($n = 73$, 9.6%), having another neurological diagnosis such as stroke ($n = 55$, 7.2%), being outside the age range ($n = 47$, 6.2%), not being able to travel to the VA/attend groups ($n = 42$, 5.5%), or problematically consuming alcohol (7 days prior) or substances ($n = 20$, 2.6%). Less common reasons for exclusion included the participant being less than 1-year post-qualifying injury, involvement with the justice system, ineligibility for care with the VA, moving out of the area, or enrollment in other interventional research studies. Of the remaining 51 who were scheduled for a baseline assessment, 6 participants were excluded during the baseline assessment because of not meeting eligibility criteria, and 1 additional participant withdrew at baseline because of no longer being interested. As a result, 44 participants were

randomized to the 2 arms. Results were analyzed according to the allocated group such that 15 participants from the intervention first arm with T2 data and 20 participants from the WL first arm with T2 data were included in the primary analysis (see Figure 1). Regarding the 9 WtoH participants who were randomized but not included in the analyses, 7 participants from the intervention first group and 2 participants from the WL group did not complete the T2 assessment. From the intervention first group, 2 withdrew because of no longer being interested in participating and 5 were lost to follow-up at T2 such that attempts to reach them were unsuccessful. One was later found to have become incarcerated during the T2 assessment period. Within the WL group, 1 withdrew because of no longer being interested in

TABLE 2 *Demographic Characteristics*

Demographic and military	Initially allocated to waitlist ($n = 20$)	Initially allocated to WtoH ($n = 15$)	Fisher exact P value
Age	54.6 (8.8) 56.5 (29, 65)	47.7 (12.1) 49.0 (26, 64)	.06 ^a
Gender			
Male	19 (95%)	13 (87%)	.71
Female	1 (5%)	1 (7%)	
Transgender	0	1 (7%)	
Race			
Caucasian	10 (53%)	11 (73%)	.30
Other	9 (47%)	4 (27%)	
Marital status			
Married	6 (32%)	6 (40%)	.95
Single	4 (21%)	3 (20%)	
Cohabiting	1 (5%)	1 (7%)	
Divorced/separated	8 (42%)	5 (33%)	
Education			
9-12th grade/no diploma or HS diploma or equivalent	4 (20%)	2 (13%)	.007
Some college or associate degree	16 (80%)	7 (47%)	
Bachelor, graduate, or professional degree	0 (0%)	6 (40%)	
Employment			
Full-time	1 (6%)	0 (0%)	.83
Retired or not employed	12 (67%)	11 (79%)	
Unemployed	5 (28%)	3 (21%)	
Student	2 (10%)	1 (7%)	>.99
Branch			
Army	7 (35%)	7 (47%)	.33
Air force	5 (25%)	4 (27%)	
Navy	3 (15%)	0 (0%)	
Marines	4 (20%)	1 (7%)	
Multiple	1 (5%)	3 (20%)	
Deployed ^b	9 (56%)	12 (80%)	.25
Combat	4 (20%)	9 (60%)	.03
Months in the military	88.6 (83.8) 48 (3, 264)	126.1 (104.4) 86 (24, 384)	.09 ^a
Unique episodes of homelessness ^c	0.68 (1.3) 0 (0, 5)	0.36 (0.50) 0 (0, 1)	.81 ^a

Abbreviations: HS, high school; WtoH, Window to Hope.

^aWilcoxon rank sum test.

^b $n = 16$ waitlist.

^c $n = 19$ waitlist, $n = 14$ WtoH.

TABLE 3 *Baseline clinical characteristics*

Clinical variables	Initially allocated to waitlist (<i>n</i> = 20)	Initially allocated to WtoH (<i>n</i> = 15)	Fisher exact test <i>P</i> value
Lifetime mood disorder	19 (95%)	15 (100%)	> .99
Lifetime anxiety disorder	18 (90%)	13 (87%)	> .99
Lifetime alcohol or substance dependence or abuse	4 (20%)	2 (13%)	.68
Lifetime PTSD	7 (35%)	8 (53%)	.32
Lifetime psychotic disorder	2 (10%)	2 (13%)	> .99
History of a suicide attempt	10 (50%)	10 (67%)	.49
BHS	14.0 (3.1)	16.2 (3.2)	.04 ^a
	14 (8.5, 20)	17 (10.5, 20)	
BDI	28.4 (8.4)	37.6 (11.6)	.01 ^a
	28 (14, 45)	37 (14, 54)	
BSS ^b	4.8 (5.5)	5 (5.8)	.89 ^a
	2 (0, 18)	1.5 (0, 15)	
Sessions of WtoH attended	7.8 (2.9)	8.7 (1.5)	.53 ^a
	8.5 (0, 10)	9 (5, 10)	

Abbreviations: BDI, Beck Depression Inventory; BHS, Beck Hopelessness Scale; BSS, Beck Scale for Suicide Ideation; PTSD, posttraumatic stress disorder; WtoH, Window to Hope.

^aWilcoxon rank sum test.

^b*n* = 19 waitlist, *n* = 14 WtoH.

participating, and members of the study team were unable to reach the other participant, who was later found to have been incarcerated during the T2 assessment period.

Participant demographics and clinical variables are displayed in Tables 2 to 4. Significant between-group differences were observed with the intervention first group having both higher levels of education ($P = .007$) and having served at least 1 combat tour ($P = .03$). Baseline BHS and BDI scores were found to differ between the groups ($P = .04$ and $.01$, respectively) such that participants who received the WtoH intervention first had higher levels of depression and hopelessness. However, the number of WtoH sessions attended by the 2 groups was similar.

Results from the first set of analyses are displayed in Table 5. After controlling for baseline BHS score, those who first received the WtoH intervention had an estimated mean T2 score of 8.6 (95% confidence interval (CI): 5.7 to 11.5) on the BHS and the WL group had an estimated mean T2 score of 13.0 (95% CI: 10.5 to 15.5) such that the WtoH group had significantly lower hopelessness at T2 ($P = .03$). In Figure 2, the unadjusted BHS means (± 2 standard error) for each group at each time point illustrate changes. No significant between-group differences were noted on the BDI. Moreover, a trend was observed at $P = .07$ for the BSS where those initially allocated to the WtoH intervention had an estimated mean T2 score of 2.0 (95% CI: 0 to 5.1) and the WL group had an estimated mean T2 score of

TABLE 4 *Outcome measure summary statistics*

Measure	Initially allocated to WtoH			Initially allocated to waitlist		
	Baseline (<i>n</i> = 15)	Time 2 (<i>n</i> = 15)	Time 3 (<i>n</i> = 14)	Baseline (<i>n</i> = 20)	Time 2 (<i>n</i> = 20)	Time 3 (<i>n</i> = 16)
BHS	16.2 (3.2)	9.2 (5.6)	9.8 (5.6)	14.0 (3.1)	12.6 (5.2)	8.9 (6.9)
BDI	37.6 (11.6)	26.8 (12.9)	24.9 (12.8)	28.4 (8.4)	27.0 (9.4)	17.9 (12.0)
BSS	5.0 (5.8) ^a	2.0 (3.9) ^a	1.9 (3.7) ^b	4.8 (5.5) ^a	5.8 (6.9) ^a	4.9 (7.3) ^b
	1.5 (0, 15)	0 (0, 13)	0 (0, 11)	2.0 (0, 18)	2.0 (0, 19)	0 (0, 18)

Abbreviations: BDI, Beck Depression Inventory; BHS, Beck Hopelessness Scale; BSS, Beck Scale for Suicide Ideation; WtoH, Window to Hope.

^a*n* = 19 waitlist, *n* = 14 WtoH.

^b*n* = 15 waitlist, *n* = 13 WtoH.

TABLE 5 Primary analysis—model time 2 as a function of group and baseline outcome

	Model <i>F</i> -value, <i>p</i> -value	<i>R</i> ²	Initially allocated to waitlist (<i>n</i> = 20)	Initially allocated to WtoH (<i>n</i> = 15)	Estimated difference in time 2 means	<i>P</i> value for difference
BHS	<i>F</i> = 3.03, <i>P</i> = .06	<i>R</i> ² = 0.16	13.0 (10.5, 15.5)	8.6 (5.7, 11.5)	4.4 (0.52, 8.3)	.03
BDI	<i>F</i> = 6.26, <i>P</i> = .005	<i>R</i> ² = 0.28	29.3 (24.8, 33.9)	23.7 (18.4, 29.0)	5.6 (−1.7, 12.9)	.13
BSS ^a	<i>F</i> = 2.91, <i>P</i> = .07	<i>R</i> ² = 0.16	5.8 (3.1, 8.5)	2.0 (0, 5.1)	3.8 (−0.29, 8.0)	.07

Abbreviations: BDI, Beck Depression Inventory; BHS, Beck Hopelessness Scale; BSS, Beck Scale for Suicide Ideation; WtoH, Window to Hope.

^a*n* = 19 waitlist, *N* = 14 WtoH.

5.8 (95% CI: 3.1 to 8.5) such that the WtoH group had a lower T2 ideation score.

For the WL-only analysis, after controlling for the change from baseline to T2, there was a significant difference in change on the BHS between the WL period (baseline to T2) and the WtoH period (T2 to T3) such that, on average, participants decreased (improved) by −4.6 points (95% CI: −7.9 to −1.3) more in the WtoH period (*P* = .01) than in the WL period (see Figure 2). Similarly, on average, participants decreased (improved) on the BDI by −8.7 points (95% CI: −13.8 to −3.6) more in the WtoH period than in the WL period (*P* = .003). No difference was found for the BSS, with an estimated difference in change of −.01 (95% CI: −3.3 to 3.1; *P* = .94).

In examining the change from baseline to T3 for participants initially allocated to the WtoH intervention, significant improvements (decreases in score) were observed for both the primary (BHS) and one secondary (BDI) outcome measures. The estimated change in BHS score was −6.3 points (95% CI: −9.3 to

−3.2; *P* = .0007). This improvement was also clinically significant, with the average BHS scores decreasing from the severe band (BHS scores 15–20) to the lower end of the moderate hopelessness band (BHS scores 9–14) (see Figure 2). The estimated change in BDI score was also significant (−11.6; 95% CI: −18.0 to −5.3; *P* = .002), with a trend observed at *P* = .06 for the BSS (−3.5; 95% CI: −7.0 to 0.12).

DISCUSSION

As noted earlier, before this trial the only prospective study of an intervention (WtoH) aimed to prevent hopelessness, a risk factor for suicide among the high-risk cohort of individuals with a history of moderate to severe TBI was conducted by Simpson and colleagues.³ As the sample size from the trial was relatively small (treatment *n* = 8, WL *n* = 9), Simpson et al suggested that the results “needed to be replicated in a larger sample.”^{3(p298)} Findings from this larger, though still relatively modest, VHA sample, provide additional support for the efficacy of WtoH. That is, those initially allocated to WtoH treatment experienced clinically and statistically significant less T2 hopelessness when compared with those initially allocated to the WL group. For those initially allocated to the WtoH treatment, this was maintained during the follow-up period, with clinically and statistically significant differences noted between baseline and T3. Of importance, comparable changes in BHS scores between T2 and T3 were also noted among those initially allocated to the WL group who received the intervention.

In this trial, challenges associated with measuring depression and suicidal ideation were in part related to the significant variability in scores (BDI) and standard scoring procedures of the BSS (ie, not all items are administered if the person does not meet continuation criteria on the initial items). Nonetheless, among those initially allocated to the WL group, on average, participants demonstrated greater improvement on the BDI during the WtoH period as compared with the WL period. Although not statistically significant, those initially allocated to the WtoH intervention also experienced

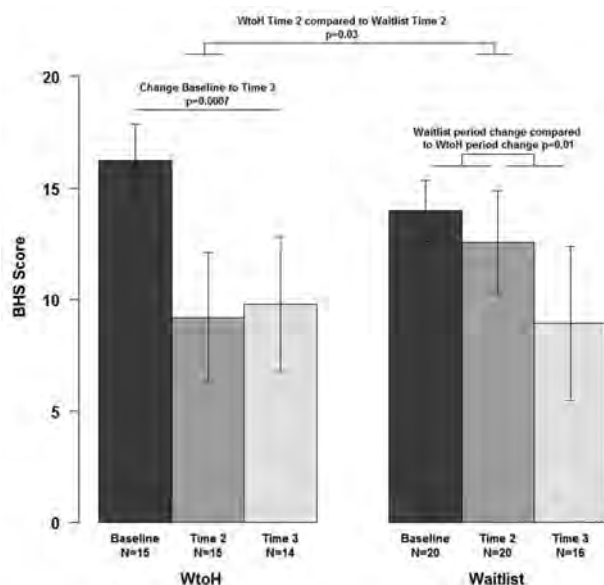


Figure 2. BHS Scores by Group Over Time.

lower depression scores, as compared with the WL group. Notably, clinically and statistically significant changes on the BDI were noted between baseline and T3 for those initially allocated to the WtoH group.

As with all trials, there are some limitations. As stated earlier, measurement among the highly heterogeneous cohort of those with moderate to severe TBI continues to be challenging. Exploring new and innovative strategies for measuring domains of interest is indicated. It is worth noting that significant efforts were made to ensure that all participants endorsed moderate to severe hopelessness (BHS > 9) at baseline, which likely contributed to the significant declines noted earlier. Implementing similarly rigorous criteria for secondary outcomes (BDI, BSS) would have limited feasibility. Nonetheless, this may have contributed to mixed results. Moreover, as participants were recruited from the population of individuals post-acute injury, TBI history was ascertained using the OSU TBI-ID versus some other more objective measure (eg, neuroimaging). The total sample size was still somewhat small, thereby potentially limiting generalizability. Finally, this study was designed (ie, statistical analyses as noted earlier) and funded to determine the efficacy of a specific dose of the intervention (at least 5 WtoH sessions). Intention-to-treat analyses were considered; however, it was determined that this potentially overly cautious approach was not well matched with study aims.^{22,23} On the basis of the findings from this study, implementation of such methods in future larger trials would certainly be warranted.

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ORIGINAL ARTICLE

Cross-cultural adaptation of the Window to Hope: A psychological intervention to reduce hopelessness among US Veterans with traumatic brain injury

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Abstract

Primary objective: To conduct a cross-cultural adaptation of Window to Hope (WtoH), a treatment to reduce hopelessness after traumatic brain injury (TBI), from the Australian civilian context to that of US Veterans.

Research design: Three-stage mixed-methods approach.

Methods: Stage 1: Consensus conference with stakeholders to revise the manual. Stage 2: Pilot study of the revised manual with US Veterans to examine acceptability, feasibility and fidelity. Stage 3: Review of results with consensus conference attendees and further revisions.

Results: Stage 1: Conference attendees reached 100% consensus regarding changes made to the manual. Stage 2: Qualitative results yielded themes that suggest that participants benefitted from the intervention and that multiple factors contributed to successful implementation (Narrative Evaluation of Intervention Interview, User Feedback Survey-Modified, Post-Treatment Interviews). Therapists achieved 100% treatment fidelity. Quantitative results from the Client Satisfaction Questionnaire-8 suggest that the intervention was acceptable. Stage 3: The culturally adapted manual was finalized.

Conclusions: Results of this study suggest that the revised WtoH manual is acceptable and feasible. US therapists exhibited adherence to the protocol. The three-stage methodology was successfully employed to cross-culturally adapt an intervention that is well-suited for a Phase II randomized controlled trial among US military Veterans.

Keywords

Cognitive behaviour therapy, mental health, suicide prevention

History

Received 4 October 2013

Revised 3 February 2014

Accepted 15 April 2014

Published online 19 June 2014

Introduction

Since the commencement of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), suicide rates have risen among all branches of the US military [1], with more than 1100 members of the Armed Forces dying by suicide between 2005–2009 [2]. Moreover, the suicide rate has more than doubled among active duty Army personnel during this same period of time [3].

In addition, OEF/OIF military personnel are sustaining traumatic brain injuries (TBI) secondary to combat exposure [4]. TBI is often described as a ‘signature injury’ of the OEF/OIF conflicts, with estimates suggesting that 8–20% of those who served have sustained a TBI [5]. Research also suggests that TBIs are common among Veterans from previous conflicts (e.g. Vietnam [6]).

Suicides after TBI have been documented among Veterans from successive armed conflicts since the First World

War [7–9]. Current reports continue to support that history of TBI is a risk factor for future suicidal behaviour [10, 11]. Seminal work by Teasdale and Engberg [11] suggested that civilian patients with a history of TBI were 2.7–4-times more likely to die by suicide when compared to members of the general population [11]. Similarly, growing evidence among the Veteran population confirms that there is a greater risk of death by suicide after TBI. In a large study of 7850472 Veterans receiving Veterans Health Administration (VHA) services, 49626 Veterans were diagnosed with mild and moderate-to-severe TBI. Among this sub-set, death by suicide occurred at 1.98- (mild TBI) and 1.34- (moderate-to-severe TBI) times the rate of the general VHA population [10]. This significantly increased risk across all levels of TBI severity was identified after controlling for important confounding factors such as psychiatric diagnoses and demographics [10]. Despite the clinical seriousness of this problem, there are scarce evidence-based psychological or pharmacological interventions for mental health problems [12] or for suicide [13] among Veterans with TBI.

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In the general population, hopelessness is an important and modifiable risk factor for suicide [14]. Specifically, research has found that hopelessness is a stronger predictor of suicide than depression itself [15, 16]. Among people with TBI, hopelessness is a strong predictor of suicidal ideation, with suicidal ideation a strong predictor of post-injury suicide attempts [17].

Window to Hope (WtoH), a cognitive-behavioural treatment programme, was devised to reduce hopelessness among people with severe TBI in the chronic phase of their injury (i.e. greater than 1 year). The programme was evaluated by means of a randomized controlled trial (RCT) [18]. The results of the trial were promising. The treatment group reported a significant reduction in hopelessness compared to a comparison group receiving standard care ($p=0.002$). There was a strong treatment effect ($d=1$), with the majority of participants maintaining or experiencing a further decrease in hopelessness at 3 months follow-up [18]. The trial was well designed, rated as at eight out of 10 on the PEDRO scale by the PsycBITE database [19]. As the only validated treatment that specifically targeted suicide risk after TBI [13], testing the efficacy of WtoH within the US Veteran context was considered an important priority.

There is broad international consensus for the importance of implementing evidence-based interventions to treat mental health problems after TBI [20]. However, there has been limited discussion about how this might be achieved at a country-by-country level. In most hierarchies of evidence, a single well-designed RCT is not sufficient grounds for establishing a 'practice standard' [21]. In the current replication process with US Veterans there were additional considerations. The original trial was conducted on a modest sample ($n=17$), and among civilians recruited from a single rehabilitation service from another country. Therefore, the investigators deemed that a Phase II replication trial was an important intermediate step to broader implementation of WtoH within the US Veteran context.

Preliminary to the conduct of any such trial, the cross-cultural adaptation of the programme was crucial. Research suggests that mental health interventions may be more effective when they are adapted for a specific cultural group [22]. The current adaptation process involved two cross-cultural transitions, from a civilian to a military context and at a national cultural level, from an Australian to a US context.

Awareness and appreciation of military culture has been identified as critical to delivering mental health services to Veterans [23]. Specifically, those working with Veterans should be aware of how factors such as shared language, norms, values and training experiences may impact care [23, 24]. For example, skills taught within military culture tend to be 'specific, concrete and action oriented' ([25], p. 104). Bryan et al. [25] suggested that, similarly, suicide prevention-related strategies for this population should have the same characteristics and that patients should be taught not only what to do and when to do it, but also shown *how* to do it.

In terms of national cultural factors, Australian and US cultures have many etics (common factors) that facilitate cross-cultural adaptation. This is supported by their similar ratings on the United Nations Human Development Index

(HDI) [26], one index of cultural proximity. Despite these common factors, there may be important emics (aspects unique to each culture) which could impact the successful implementation of the WtoH intervention. Thus, national cultural differences were also incorporated into the adaptation process.

To the best of the authors' knowledge, Gan et al. [27] provided the first detailed account of the adaptation of a psychological/psychosocial intervention programme across client groups (i.e. from adults to adolescents) in the field of acquired brain injury. The procedures devised by Gan et al. [27] provided the model for the current study.

Design

The cross-cultural adaptation of the WtoH intervention utilized a mixed-methods approach which was implemented across three distinct stages, as outlined in Figure 1. The first stage involved hosting a consensus conference, utilizing Nominal Group Technique (NGT) procedures (e.g. Larkins et al. [28]), in which key community stakeholders learned about the intervention and worked together to reach consensus regarding necessary modifications to the original WtoH treatment manual. The second stage of the cross-cultural adaptation included conducting four pilot groups with US therapists and Veterans and collecting baseline and follow-up data to assess the feasibility and acceptability of the revised WtoH intervention, as well as therapist adherence to the protocol (i.e. fidelity). Feasibility refers to the ease with which the intervention can be implemented, whereas acceptability refers to the sustainability of intervention [29]. Fidelity is the extent to which the intervention can be delivered as intended [29]. The pilot groups also provided the opportunity to fine tune the content and format of the adapted WtoH intervention [29]. During the third stage of the adaptation process, the authors re-convened by phone with the participants who attended the original consensus conference to review the results from Stages 1 and 2. During this stage, participants were also provided the opportunity to offer final feedback regarding the WtoH cross-cultural adaptation.

Stage 1: Expert consensus conference and revision of the original WtoH manual

Participants

In order to recruit diverse stakeholders to attend the consensus conference, the authors sought professionals familiar with Veterans, mental health and recovery models, rehabilitation and/or TBI. As suggested by Hussler et al. [30], members of the Veteran community were also included as participants. Ten individuals were invited and nine attended. Characteristics of the consensus conference attendees are presented in Table I. The developer of the original WtoH intervention (GKS) and the Veterans Integrated Service Network 19 Mental Illness Research, Education and Clinical Center (VISN 19 MIRECC) research staff (four psychologists and one research assistant) were also in attendance and one of the study psychologists (BBM) served as the moderator of the conference.

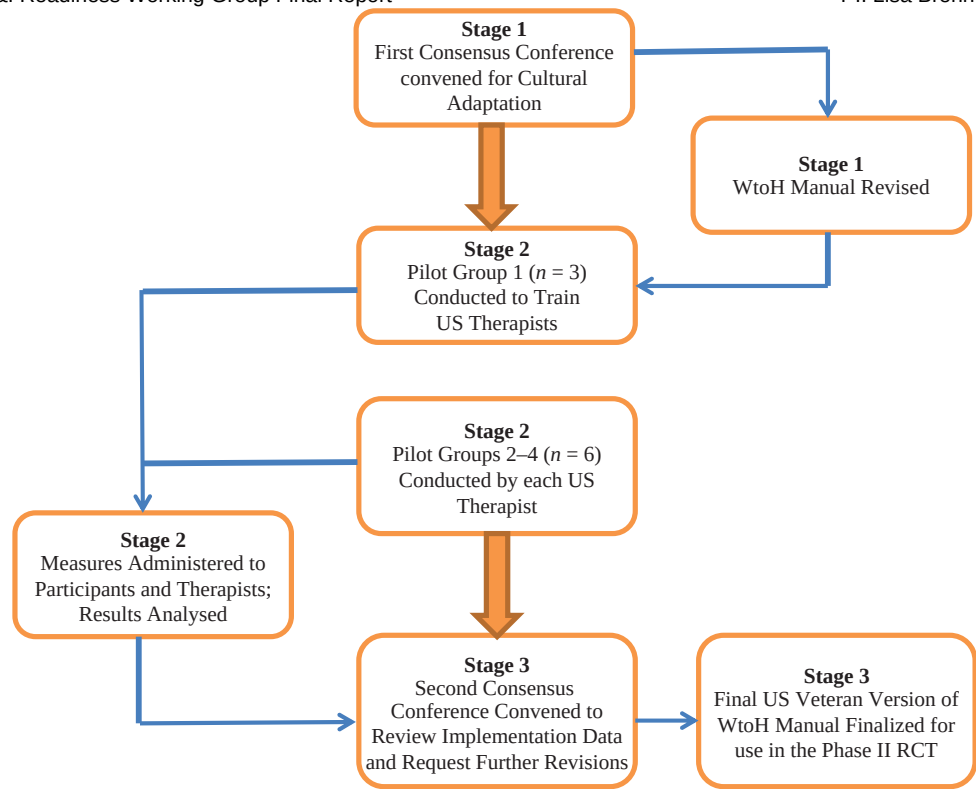


Figure 1. Three-stage study design.

Table I. Consensus conference participant characteristics.

Primary Expertise	VA Medical Center Service	Gender	Veteran status
Peer Support Specialist ^a , TBI Survivor	Mental Health	Male	Veteran
Peer Support Specialist ^a , Parent of TBI Survivor	Mental Health	Female	Veteran
Clinical Psychology	Mental Health	Female	Civilian
Clinical Psychology	VISN 19 MIRECC ^b	Female	Civilian
Rehabilitation Psychology	Spinal Cord Injury	Female	Civilian
Neuropsychology	Patient Focused Care	Female	Civilian
Neuropsychiatry	VISN 19 MIRECC ^b	Male	Civilian
Social Work	VISN 19 MIRECC ^b	Female	Civilian
Post-deployment Needs ^c	OEF/OIF/OND ^c Clinic	Male	Veteran

^aPeer Support Specialist: A Veteran with a mental health and/or co-occurring condition who has real-world experience in helping other Veterans cope and identify recovery-related tools and resources.

^bVISN 19 MIRECC: Veterans Integrated Service Network 19 Mental Illness Research, Education and Clinical Center.

^cThe OEF/OIF/OND (Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn) Clinic specializes in providing case management services to Veterans who were deployed to OEF/OIF/OND and focuses on post-deployment and transition-related issues.

Procedures

Attendees participated in a day-long consensus conference to adapt the WtoH treatment manual for the US Veteran population. Prior to the consensus conference, local Institutional Review Board (IRB) approval was obtained and each attendee was provided with relevant journal articles, the meeting agenda, charge for the day, a copy of the original WtoH manual and an initial list of suggested changes (described below) to the manual, as identified by research staff. To begin the consensus conference, attendees were introduced to one another and reminded of the day's agenda and the purpose of the meeting.

The following conference procedures were consistent with the NGT for conducting consensus conferences (e.g. Larkins et al. [28]). The moderator provided the attendees with a list

of the 10 sessions included in the original WtoH intervention, which covers seven different topics (see Table II). Attendees were then asked, 'From your perspective as a provider, Veteran and/or family member, what topics related to Veterans with a history of TBI would be important to cover in the WtoH treatment?' Conference attendees were given time to individually brainstorm regarding any topics in addition to the original seven they thought may be important to include in the revised manual. Attendees ranked up to 10 topics that they felt were important to include in the adapted version of the manual. They were told that this list could include the original WtoH topics and/or any new topics they identified during brainstorming. Attendees wrote down desired topics on separate index cards, which were numbered 1–10, and did not include any identifying information on the cards in order to preserve anonymity.

Session	Therapeutic principle	Goals
1. Getting started	Group formation	Group participants meet, introduce programme theme
2. Living a positive lifestyle	Behavioural activation	Examine relationship between affect and lifestyle factors
3. Thoughts and feelings	Socialization to CBT	Learn about the relationship between thoughts and feelings
4, 5. Take another look	Cognitive restructuring	Learn how cognitive restructuring can ameliorate distress
6, 7. Problem-solving	Problem-solving	Develop a systematic approach to solving problems
8. Problem-solving and recovery	Compensatory techniques	Develop skills to facilitate adjustment to the extent of post-injury recovery
9. Building hope	Relapse prevention: Post Traumatic Growth	Identify means of building hope after TBI, self-esteem
10. Building hope	Relapse prevention: Post Traumatic Growth	Making meaning of TBI, positive expectancy and building connections

Table III. Key changes made to the US veteran version of WtoH.

Australian Civilian Version	US Veteran Version
National Cultural Changes	
European spelling (e.g. realise)	American spelling (e.g. realize)
Australian food pyramid	US Department of Agriculture 'My Healthy Plate'
Australian Quit Line	US Smoking Cessation Hotline
Australian activities (e.g. netball)	American activities (e.g. football)
Australian phrases (e.g. 'having a good mortgage')	American phrases (e.g. 'being able to purchase a home')
Civilian to Veteran Cultural Changes	
Australian Civilian Version	US Veteran Version
Standard brief relaxation breathing exercises	Include common military experiences when teaching skills (e.g. refer to tactical breathing when teaching deep breathing)
'Hero' refers generally to people facing physical danger or taking on major social challenges (e.g. facing down discrimination)	Consider Veteran culture with word choice (e.g. how using the word 'hero' may impact Veterans)

Research staff collected all of the cards, then read aloud and recorded all #1 ranking responses, then all #2 responses and so on until all responses were read and recorded. The moderator then facilitated attendee discussion and clarification of the topics. Similar items were grouped together through this collaborative process. Prior to finalizing grouped response topics, the moderator checked with attendees to ensure that the wording of the topic accurately reflected the responses provided.

After the topics to include were agreed upon, the attendees discussed the order in which they should be presented within the manual. Finally, research staff reviewed and requested feedback regarding the suggested changes to the manual that were identified by the research team prior to the consensus meeting. These changes were related to word choice and images used in the manual and were based on identified differences between both military and civilian and Australian and US cultures. Attendees were then given the opportunity to suggest additional changes.

Results

Among the attendees, there was 100% consensus that all seven original WtoH topics should continue to be included in the cross-cultural adaptation of the intervention and that the topics should remain in the original order. Attendees also identified 12 additional topics for consideration. After discussing these topics, the attendees grouped them into the following six domains: psychoeducation, resources, family relationships, vocational assistance, distress tolerance and the role of medications. The attendees continued discussing each of these potential new topics for inclusion in the revised

manual. To facilitate this discussion, additional information about the specific content of the WtoH sessions was provided (GKS). With this information, attendees reached 100% consensus that the suggested six domains should not be added to the revised WtoH treatment manual. Attendees agreed that the topics of psychoeducation and distress tolerance were adequately addressed in the manual; resources, vocational assistance and family relationships could easily be discussed in the context of the group if these topics arose; and the role of medications was beyond the scope of the intervention.

Following completion of the NGT procedures, research staff and conference attendees reviewed suggested changes to the treatment manual. Attendees concurred with the 10 idiosyncratic changes to wording and images suggested by the research staff. Attendees also identified 22 additional changes to be made that accounted for differences between both Australian and US culture and military and civilian culture. The key changes are provided in Table III. In summary, the changes reflected the replacement of idiosyncratic language with broad, inclusive wording that was more relevant to the US Veteran population. Of note, because the salience of the Veteran-specific changes will vary with respect to a participant's military experiences, they were not explicitly added to the worksheets in the participant manual, but will be suggested to the provider in the therapist manual.

Revision of the treatment manual

In preparation for Stage 2 of this study, the WtoH treatment manual was revised by the research team. Minutes taken from

the consensus conference were utilized to ensure that changes made reflected the consensus obtained during the initial conference.

Stage 2: Pilot groups: Examining feasibility, acceptability and fidelity

Participants

Prior to commencing recruitment, local IRB approval was obtained. Potential participants were recruited through the use of flyers that were distributed throughout the Department of Veterans Affairs Medical Center (VAMC) where the study took place and in the community. Presentations were also made to clinical staff at the VAMC for recruitment purposes. Screening procedures were utilized to determine eligibility status of potential participants based on the following criteria: age between 18–89; positive history of moderate and/or severe TBI per the Ohio State University TBI-Identification Method [31]; and no history of alcohol abuse within 7 days or non-alcohol substance abuse within 30 days of baseline assessment as identified on the MINI International Neuropsychiatric Interview (MINI) [32].

Thirty-two potential participants expressed interest in the study and were screened for the pilot groups. Twenty did not meet eligibility criteria. Of the 12 who met inclusion criteria, nine were consented (see Figure 2). The nine enrolled participants were all male with an average age of 54.4 years (range = 28–67 years). Eligible participants were enrolled in the study into groups of two or three Veterans each. These small groups were consistent with delivery of the original WtoH intervention and were conducted in such a manner to

manage participants’ potential difficulties with attention and cognitive fatigue. Limiting the group size also provided time to pace the rate at which new concepts were introduced and to ensure that each participant was able to understand key ideas.

Procedures

Four pilot groups were conducted utilizing the revised WtoH treatment manual. Prior to the commencement of each group, participants were screened and baseline data were collected. Pilot Group 1 was facilitated by GKS and provided training for the three US therapists, all Psychologists (BBM, TAC, GMS), who would deliver WtoH in the Phase II trial. Pilot Group 1 was delivered over 10 consecutive working days.

Pilot Groups 2–4 were facilitated individually by each study therapist who had been trained during Pilot Group 1. These groups were held twice a week for 5 weeks, for ~2 hours per session. Thus, all pilot group participants were offered the full 20 hours of the intervention. Pilot Group 1 was audio and video recorded for training purposes and Pilot Groups 2–4 were audio recorded for treatment fidelity purposes. Due to the condensed delivery adding to participant burden, Pilot Group 1 participants were also compensated for their time and travel to each session. Attendance logs were maintained to collect data regarding the feasibility of the intervention. Treatment fidelity was assessed for each session of Pilot Groups 2–4 through use of a Fidelity Rating Checklist created for the WtoH intervention by an independent rater (LAB). To further facilitate training and fidelity, LAB facilitated discussion and feedback as it related to the checklist.

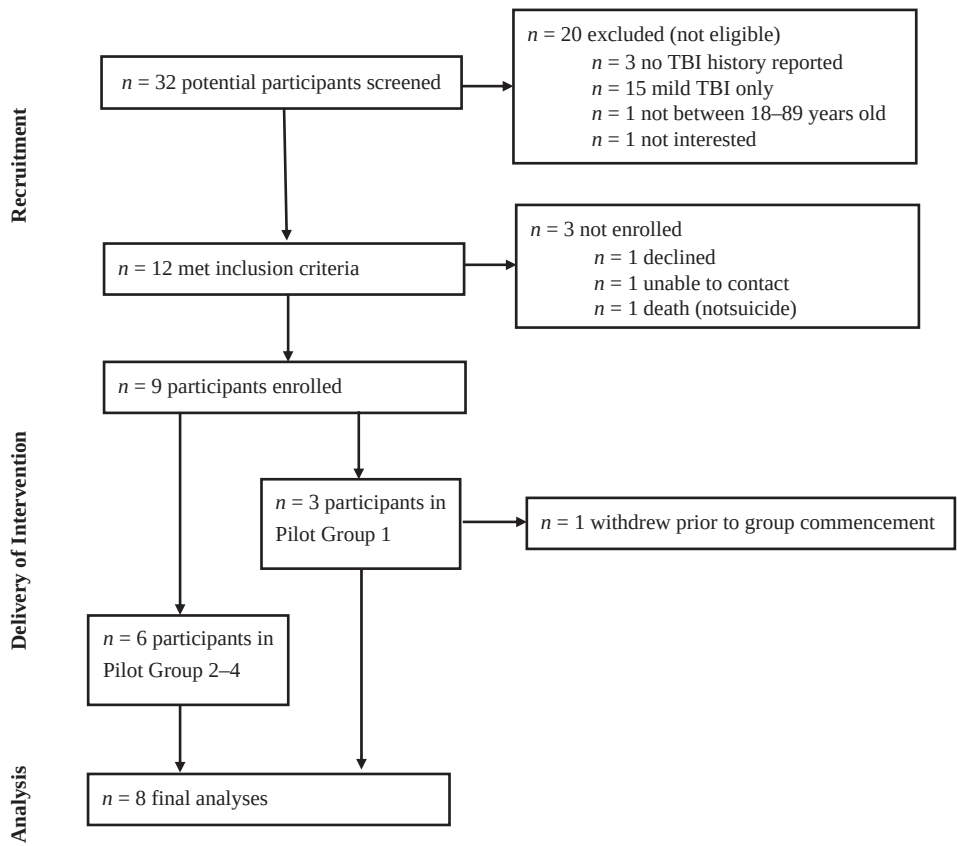


Figure 2. Stage 2 participant flow diagram.
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Within 2 weeks of completion of the pilot groups, participants completed follow-up assessments related to the acceptability and feasibility of the intervention. Additionally, study therapists completed measures (i.e. User-Feedback Survey-Modified and Post-Treatment Interviews) also related to acceptability and feasibility. The results from one of the Post-Treatment Interviews was not correctly electronically saved and, thus, these data are missing from the results presented below.

Measures

Participant measures

Client Satisfaction Questionnaire-8 (CSQ-8 [33]). The CSQ-8 is an eight-item questionnaire that was used to assess participants' satisfaction with therapy at the post-treatment follow-up visit. Data from the CSQ-8 were used to inform the acceptability of the intervention to the participants as well as feasibility. This measure has been used frequently for evaluating standard community mental healthcare [33–35].

Narrative Evaluation of Intervention Interview (NEII [36]). The NEII, administered at the follow-up visit by research staff, is a 16-item semi-structured interview that is designed to help participants evaluate and describe the process and outcome of an intervention [36]. These data informed the acceptability of the intervention to participants in addition to feasibility. The NEII has been used to evaluate treatments for seriously mentally ill adults and has been shown to elicit participant responses regarding an intervention without referring to any expected outcome [37].

Therapist measures

User Feedback Survey-Modified (UFS-M [38]). A modified version of an existing user feedback survey [38] was used to obtain therapists' feedback regarding implementation of WtoH following Pilot Groups 2–4. These data were used to inform acceptability of the intervention to the therapists as well as feasibility. The study therapists responded to closed- and open-ended questions regarding their experience implementing WtoH.

Post-treatment interviews. Post-treatment interviews were conducted and transcribed by LAB at the end of Pilot Groups 2–4 to inform acceptability of the intervention to the therapists as well as feasibility. Study therapists were interviewed individually and asked about: (1) their general perception of WtoH; (2) barriers and facilitators to

implementation; and (3) recommendations regarding possible revisions.

Fidelity rating checklist. The checklist was developed for the purpose of this study and was adapted from other commonly used fidelity rating scales, such as the Cognitive Therapy Scale [39]. The checklist was designed to capture therapists' adherence to two components of the intervention, content and process. Content refers to the topics and information included in the manual. Process was defined as facilitation of group discussion, participant learning and meaning making.

Analyses

Quantitative data was analysed descriptively. Responses to qualitative measures were reviewed by LAB. The responses were coded and universal themes were identified until the point of saturation was reached [40], such that no new themes were identified [41]. The identified themes are presented below.

Results

Acceptability

The data regarding the CSQ-8 is displayed in Table IV. Total scores can range from 8–32. The mean score from WtoH participants was 26.5 (SD = 4.44, Range = 17–30).

Responses on the NEII were typically brief in nature (e.g. a few words to one or two sentences). Analysis identified two primary themes in Veterans' responses to questions posed on the NEII, which suggested that they benefitted from the programme and were able to identify specific changes they made in response to treatment participation. One Veteran spoke about how he benefitted from the intervention's focus on hopelessness, noting that participating in the group gave him a 'better understanding of how to deal with hopelessness and that you just should not give up. That there is hope out there'. Another participant mentioned the following specific changes as a result of his experience of participating in the group, 'Change in my outlook of hopefulness, it make me more hopeful'. A third Veteran highlighted changes stating,

It definitely helped me. It got me thinking on whole different levels. Before I started, I was all wound up and looking at things really one way. This programme you know I have been looking at things from a whole different perspective... I helped myself. That is the only way I can put it. I just look at myself differently. It made me feel better about myself.

Table IV. Client satisfaction questionnaire-8 results.

Item	Anchors	Range	Mean
Quality of Services	Excellent (4) to Poor (1)	3–4	3.75
Kind of Service	Yes, Definitely (4) to Definitely Not (1)	2–4	3.13
Needs Met	Almost All (4) to None (1)	1–3	2.63
Recommend to Friend	Yes, Definitely (4) to Definitely Not (1)	3–4	3.75
Help Satisfaction	Very Satisfied (4) to Quite Dissatisfied (1)	2–4	3.38
Deal with Problems	Great Deal (4) to Make Things Worse (1)	2–4	3.50
Overall Satisfaction	Very Satisfied (4) to Quite Dissatisfied (1)	2–4	3.13
Return to Program	Yes, Definitely (4) to Definitely Not (1)	2–4	3.25

Moreover, ‘other than [one Veteran] remembering unpleasant situations’ none of the programme elements were identified by the participants as being undesirable. No themes were identified with respect to Veterans not benefitting from the intervention.

The positive impact of WtoH was also noted by therapists on the UFS-M. The primary theme identified via analysis of the UFS-M responses reflected therapists’ impressions that Veterans benefitted from the intervention and no contradictory themes were identified. For example, one therapist stated, ‘Veterans appeared to benefit from problem-solving about their specific job situations. They appeared to experience relief and hope as a result’. Another therapist wrote,

The participants seemed energized by the programme—one a generalized increase in hopefulness, the second more acceptance and normalizing that the memory difficulties he was experiencing were not a personal failing but a sequelae of the injury that he could start learning to live with.

Feasibility

During post-treatment interviews therapists noted a number of factors facilitating successful implementation and delivery of the programme, including the detailed manual, small group sizes and group interactions. Barriers included group members with differences in injury severity, inconsistent participant attendance; and some topic areas that were more abstract and existential in nature (e.g. overarching life goals and finding purpose in life) and seemingly difficult for participants to understand. One therapist also suggested that the order of the final two sessions should be switched to facilitate delivery of the intervention.

Themes identified on the UFS-M suggested that the therapists felt ease in delivering the intervention and no themes with respect to difficulty with delivery were discovered. For example, one of the therapists noted, ‘Fairly easy treatment to administer once the therapist has gone through the protocol at least once’. Another wrote, ‘I appreciate the structure of the model. I think it gives therapists clear objectives and guidance while also providing opportunities for therapists to respond to the group as needed’.

Participant responses to the NEII overwhelmingly indicated that they would recommend the programme to other Veterans. For example, one Veteran stated, ‘If they have a head injury, I would surely recommend it [WtoH] because like I said the tools and the information that you get through the programme is really helpful’. Additionally, one item on the CSQ-8 asked participants if they would recommend the service to a friend if they were in need of similar help. The average response on this item was 3.75, with 3 indicating ‘Yes, I think so’ and 4 indicating ‘Yes, Definitely’.

In terms of group attendance, nine participants initially enrolled in the pilot groups (three in Pilot Group 1 and two each in Pilot Groups 2–4; see Figure 1). One participant (from Pilot Group 1) withdrew from the study prior to the pilot group starting and, thus, did not complete the follow-up assessment. One participant (from Pilot Group 4) stopped

attending group after three sessions, but did complete the follow-up assessment. The remaining seven participants had an attendance rate of 90% or higher across the 10 treatment sessions.

Fidelity

To assess adherence for Pilot Groups 2–4, each therapist’s audio-taped sessions were reviewed by at least one other study therapist who completed the Fidelity Rating Checklist. Additionally, LAB also reviewed 30% of randomly sampled sessions. To achieve fidelity in a given session, the therapist was required to present each content-related item and exhibit each process-related behaviour listed on the checklist. Each therapist achieved 100% fidelity for each session of Pilot Groups 2–4. Finally, LAB and study therapists met weekly to discuss delivery of the intervention to ensure fidelity.

Stage 3: Final development of US Veteran version of WtoH treatment manual

Participants and procedures

Following completion of the pilot groups and collection of post-treatment data, a follow-up meeting to the original consensus conference was convened by phone to review the results from the pilot groups. All attendees from the consensus conference held during Stage 1 were invited to attend by phone. Three attendees from the initial consensus conference, plus six members of the WtoH research team attended the follow-up conference. During this meeting, previously agreed upon edits to the manual were presented along with pilot group acceptability, feasibility and fidelity results. Additionally, attendees were provided with the opportunity to suggest additional revisions to the treatment manual.

Results

One attendee suggested an additional modification to the treatment manual. Both the original and revised manual contained an Australian media story that was used by the therapist to facilitate a discussion on hope and self-esteem. The attendee suggested replacing the Australian media story with a US Veteran’s story and specifically recommended utilizing the Department of Veteran’s Affairs (VA) online resource, *Make the Connection* [42], which contains a video featuring a Veteran TBI survivor, for this purpose. Attendees reported 100% concurrence regarding the decision to replace the original media story and also agreed with all previous changes that had been made to content and formatting of the manual. The research team received permission to incorporate content from the *Make the Connection* website into the revised WtoH intervention manual.

Two additional modifications were made to the programme based on feedback provided by the therapists. First, the original WtoH manual utilized the saying, ‘Stop, Revive, Survive’ to teach participants how to increase positive self-talk (Session 4). Although this saying is well-known in Australia, it is not a saying that is familiar within US culture. Study therapists proposed that the saying, ‘Stop, Drop and Roll’ (a more culturally relevant US saying) be utilized

instead and all study team members agreed to make this modification for the RCT. Second, a key image utilized as a didactic device for Sessions 9–10 was upgraded. These accepted changes yielded a final version of the treatment manual to be implemented during the RCT with US Veterans.

Discussion

The present study utilized a rigorous mixed-methods approach to achieve the goal of developing a cross-cultural adaptation of the WtoH treatment. The findings suggest that the US Veteran adapted version of the WtoH intervention is acceptable and feasible to both US Veterans and VA treatment providers. Additionally, no significant cultural barriers with respect to the content of the treatment were identified. While the overall content of the programme remained the same, important idiosyncratic changes were made to increase the cultural relevance of the treatment to the US Veteran population. Results regarding fidelity to the treatment model suggest that the WtoH intervention can be successfully implemented by a variety of therapists in the VA setting, not just the developer of the intervention.

The implementation data obtained in this study suggested that the three-stage methodology employed was an effective procedure not only for culturally adapting the intervention, but also for providing data regarding implementation of the adaptation. Multiple stakeholders were included in the adaptation, which likely contributed to the success of the methodology. It has been suggested that, in conducting cross-cultural adaptations, researchers achieve a balance between meeting the needs of the population being served and the maintenance of scientific integrity through the inclusion of key stakeholders [43]. Of note, Veteran stakeholder input was obtained throughout the adaptation process. Veterans were involved as community stakeholders in the development of the adaptation and also as participants in the pilot groups.

The types of modifications that were made to the WtoH intervention also likely contributed to the success of the adaptation. The changes made were consistent with the need to include culturally relevant content while preserving the active components of the treatment, two aspects of cross-cultural adaptation highlighted in the literature. Research suggests that interventions adapted for specific populations are 4-times more effective than interventions that are provided to patients from a multitude of cultural backgrounds [22]. Cardemil et al. [44] highlight the importance of including culturally relevant content in mental health interventions. The authors note that, with CBT-based interventions, such as WtoH, this can be done through the inclusion of examples that are culturally relevant, rather than altering any of the key components of the intervention. Similarly, Zayas et al. [43] state that, when conducting cross-cultural adaptations, it is critical to maintain the active ingredients of the intervention that contribute to the mechanism of change. This study's focus on culturally relevant content in a manner that preserves the active treatment components has led to an adapted intervention that is believed to be well-suited for examining its efficacy in future trials to promote hope

among US Veterans with a history of TBI. Despite that further changes were made to the manual during Stage 3 (after implementation data was collected), these changes do not alter the active components of the treatment and, thus, it is not expected that this would alter the implementation data.

The current study is not without limitations. Despite the inclusion of multiple stakeholder groups, not all stakeholders attended Stage 3 of the adaptation process. Importantly, the two Veteran stakeholders that attended the initial consensus conference were unable to attend the final meeting and, thus, were unable to provide feedback regarding the intervention modifications and pilot group results. Additionally, two factors may limit the generalizability of the results to the broader Veteran TBI population. First, the sample size of the pilot groups was small. Only 12 out of 32 potential participants met inclusion criteria, however the majority ($n=18$) were excluded because they had no history of moderate or severe TBI. While this excludes potential participants representative of the broader TBI Veteran population, it includes those with moderate-to-severe TBI, whom the intervention was specifically developed for. Furthermore, the demographic composition of those included was similar to that of the general US Veteran population [45]. Second, the structure of the pilot groups with respect to the number and frequency of sessions varied across pilot groups and is different than how the intervention was originally designed to be delivered. The overall dose of treatment (i.e. 20 hours), however, was consistent across the original intervention, for all pilot groups. The Phase II RCT will provide the opportunity to address both of these factors as the sample size will be much larger and the number and frequency of sessions will be more consistent.

The results of this study encourage future research regarding the three-stage mixed methods procedure employed. Further data regarding the effectiveness of the methodology could be obtained by utilizing it in the cross-cultural adaptation of other interventions. Factors such as the type of intervention, the level of cultural proximity and type of implementation data obtained could all be explored. Additionally, the acquisition of data regarding the utility of the various components of the methodology (e.g. Nominal Group Technique, multiple stakeholders, anonymity, etc.) would facilitate further refinement of the methodology.

Having completed the cross-cultural process, the Phase II replication trial has commenced. To the best of the authors' knowledge, this will be the first time that a psychological intervention for a mental health issue after TBI will be replicated in a second trial. Given that the structure of the intervention was confirmed during the cross-cultural adaptation process and the evaluation protocol is almost identical, it provides a unique opportunity to pool the results from both studies once the current trial is completed. In addition to testing the efficacy of the intervention, the research team is continuing to administer implementation measures to gather more data regarding the feasibility, acceptability and fidelity of this revised intervention. These data will provide more evidence regarding this promising intervention aimed at reducing hopelessness in the high risk population of US Veterans with a history of TBI.

Declaration of interest

The views in this paper are those of the authors and do not necessarily represent the official policy or position of the Department of Veterans Affairs or the United States Government. This work was in part supported by the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs under Award No. (W81XWH-10-2-0178). Opinions, interpretations, conclusions and recommendations are those of the authors and are not necessarily endorsed by the MSRC or the Department of Defense.

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The Window to Hope Program Manual



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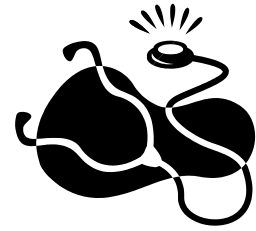
Veterans Integrated Service Network 19 Mental Illness Research, Education and Clinical Center¹; University of Colorado, School of Medicine, Department of Psychiatry²

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'TAKING THE PULSE '



Today, I am feeling (please circle):

1	2	3	4	5	6	7	8	9	10
Extremely Sad			Neither Happy nor Sad				Extremely Happy		

1	2	3	4	5	6	7	8	9	10
No Hope at all			Neither Hopeless nor Hopeful				Extremely Hopeful		

Aims of the program



The program aims to strengthen hope by:

1. Exploring ways of building and maintaining a sense of hopefulness after a brain injury
2. Addressing negative feelings
 - Learning how some thinking styles can trap people into feeling bad
 - Learning how to break out of this trap
3. Learning ways of dealing with life's problems
4. Looking at ways of rebuilding our lives after a traumatic brain injury.

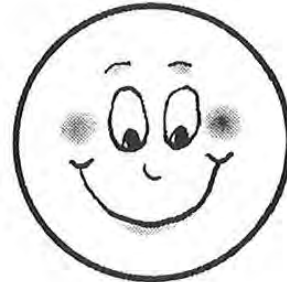
What are feelings?



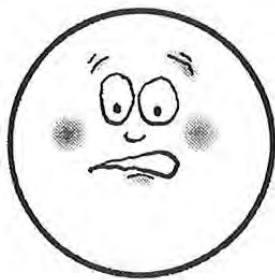
Highlight how you feel about yourself and your future:



Sad



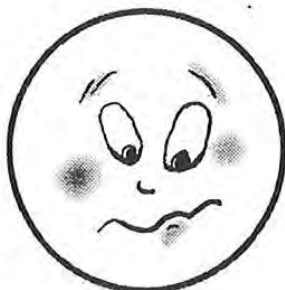
Happy



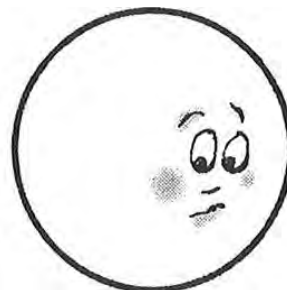
Frightened



Angry



Worried



Lonely

Impact of the Traumatic Brain Injury



What impact is the brain injury having on my life?

Circle the number you choose, and then write a reason why you feel that it has had an impact.

Reason: _____

0 No impact

1 Very slight

2 A little

3 Moderate impact

4 A lot

5 Very much

6 Extreme impact

How is my life going now?



Rate how you feel your life is going now.

0 As bad as life could get

.....

1 Very difficult

.....

2 Life isn't easy

.....

3 Okay, neither too good nor too bad

.....

4 Enjoyable

.....

5 Very enjoyable

.....

6 As good as life could be

.....

Why can it be hard to stay hopeful after a brain injury?



- Difficulties in reaching recovery goals
- Some people become depressed or anxious
- Other people don't always believe in you
- People put you in a 'disabled' basket

Feeling Bad



Up to 40% of people experience periods of depression after a brain injury.

The symptoms of depression can include:

- Feelings of deep sadness or distress
- Loss of enjoyment in activities that is usually pleasurable
- Everything is a huge effort
- Changes to sleep patterns
- Lose hope about the future
- Feel like a failure a lot of the time
- Very critical of self, blaming self for everything bad that happens
- Sometimes even think about ending one's life

Dealing with Feeling Bad

Here are strategies that some people with TBI use to deal with feeling bad. Check ✓ any of these that you use:



Strategies

Try to take my mind off it	☐	Abuse drugs	☐
Watching favorite TV show	☐	Medication	☐
Throw things around	☐	Use computer	☐
Talking to other people	☐	Playing music	☐
Using social media	☐	Abuse alcohol	☐
Try not to think about it	☐	Praying	☐
Seeing a counselor	☐	Playing with a pet	☐
Relaxation	☐	Reading	☐
Using a support group	☐	Tell jokes/ use humor	☐
Call Veteran's Crisis Line	☐	See a doctor	☐
Write things down and think about it	☐	Thinking "there are people worse off than me"	☐
Thinking "things can't get worse, they can only get better"	☐	Acting aggressively	☐
Exercising	☐		

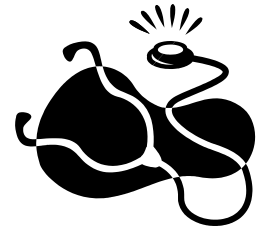


Window of Hope

Building hope and dealing with feeling bad

Positive Lifestyle Eating Activity Sleep Exercise PL-EASE	Take Another Look Stop Drop Roll
Problem-Solving How to be a STAR Spot the problem Think of options Act on best option Review how it went	Building Hope and Self-Esteem Self value Connection Meaning Expect good things

'TAKING THE PULSE '



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
nor Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
nor Hopeful

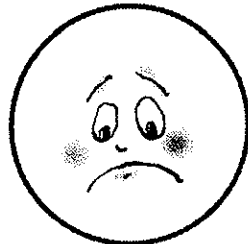
Extremely
Hopeful

Session 1: Evaluation Sheet

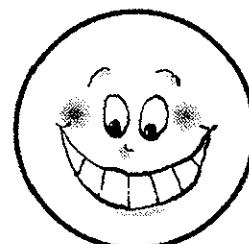
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



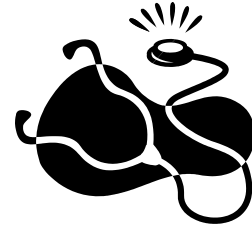
Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

'TAKING THE PULSE '



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
nor Sad

Extremely
Happy

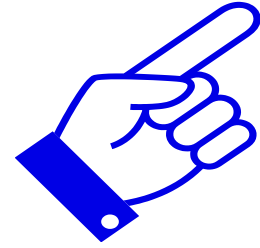
1 2 3 4 5 6 7 8 9 10

No Hope
At all

Neither Hopeless
nor Hopeful

Extremely
Hopeful

Aim and Objectives of Session 2



Aim: To examine the relationship between feeling hopeful and our lifestyle (PL-EASE model)

Objectives:

1. Introduce the EASE model (Eating, Activity, Sleep, and Exercise) as a component of well-being.
2. Evaluate your eating, activity, sleep and exercise patterns.
3. Set a goal in at least one of any identified problem areas.

Positive Lifestyle - EASE



Eating

Eating the right foods in the right portions helps to keep up our energy, control weight and create a sense of balance and well-being.

Activity

Remaining active helps us to enjoy life and achieve personal goals.

Sleep

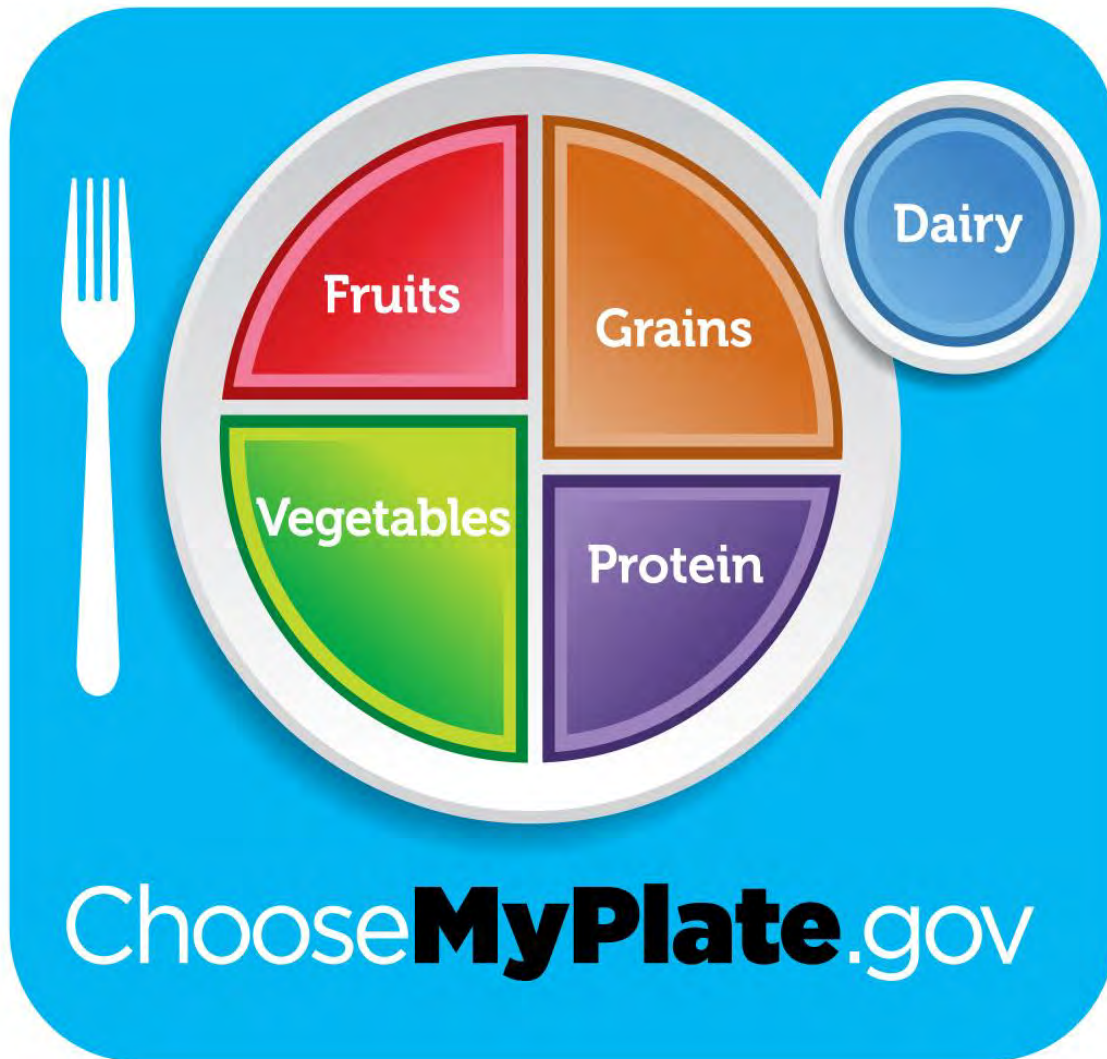
Healthy sleep is important for our body's immune function, metabolism, memory, learning, and other vital functions.

Exercise

Exercise can generate a sense of well-being, reduce boredom, tension and stress

EASE Model – Eating

The “MyPlate” image below illustrates the 5 Food Groups that are the building blocks for a healthy diet.

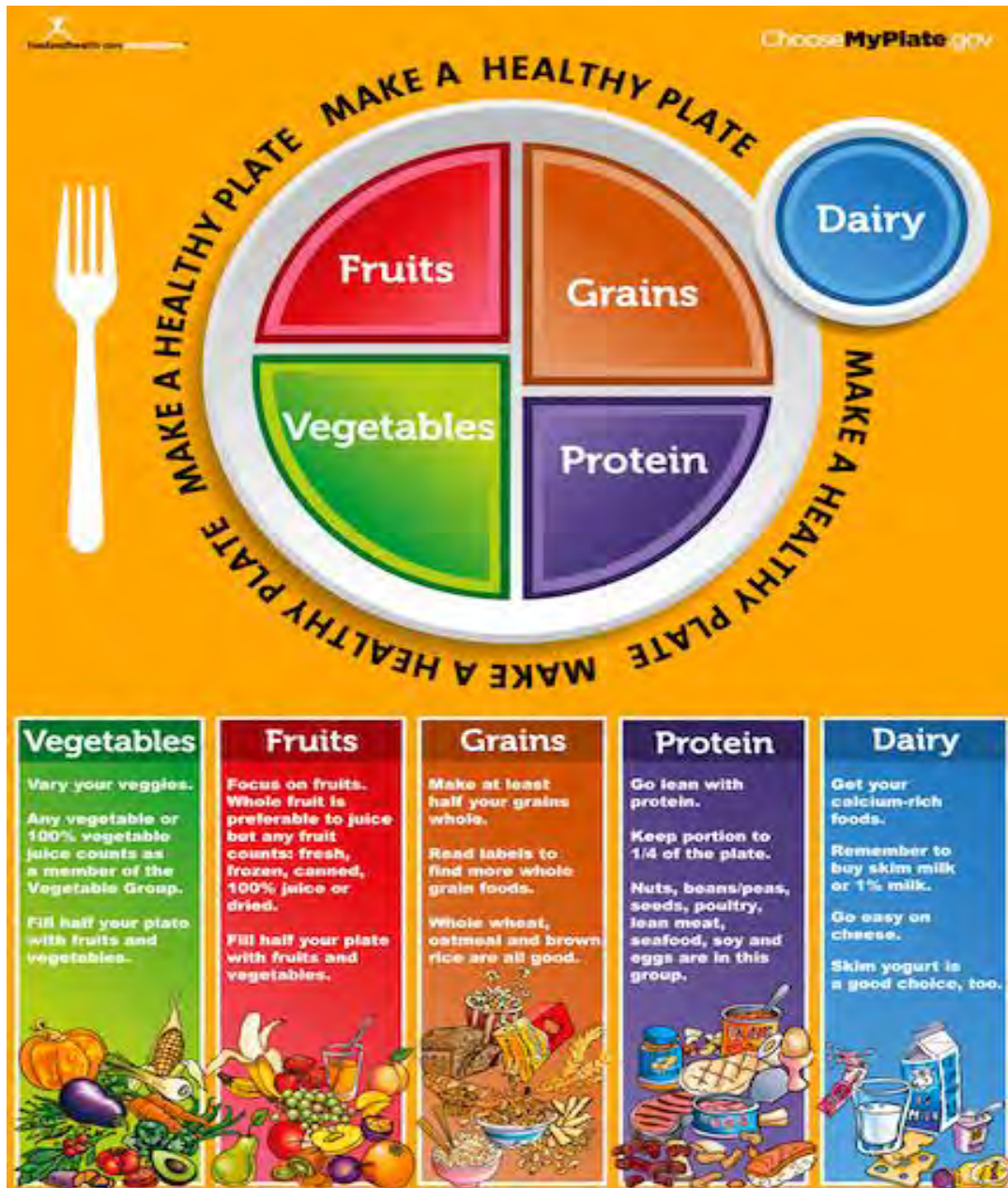


U.S. Department of Agriculture. ChooseMyPlate.gov Website. Washington, DC. MyPlate. www.choosemyplate.gov/tipsresources/ Accessed June 1, 2012.

EASE Model – Eating

5 Food Groups:

Fruits, Vegetables, Grains, Protein, & Dairy



U.S. Department of Agriculture. ChooseMyPlate.gov Website. Washington, DC. USDA Food Icon. www.choosemyplate.gov Accessed June 1, 2012.

PL-EASE Rating

Eating

1	2	3	4	5	6	7	8	9	10
Extremely Unhealthy				Average					Extremely Healthy

Activity

1	2	3	4	5	6	7	8	9	10
Extremely Inactive				Average					Extremely Active

Sleep

1	2	3	4	5	6	7	8	9	10
Extremely Unrefreshed				Average					Extremely Refreshed

Exercise

1	2	3	4	5	6	7	8	9	10
Extremely Unfit				Average					Extremely Fit

Activity Diary



1. Highlight times when you are already active and when you want to be more active.
2. List activities that you want to try in the boxes below.

	MORNING	AFTERNOON	EVENING
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			
SATURDAY			
SUNDAY			

EASE Model – Sleep

- Good sleep is important for a sense of well-being.
- Most people need 7-9 hours of sleep per night.
- Some people need less or more sleep to wake feeling rested.
- Each of us have different sleep-wake cycles

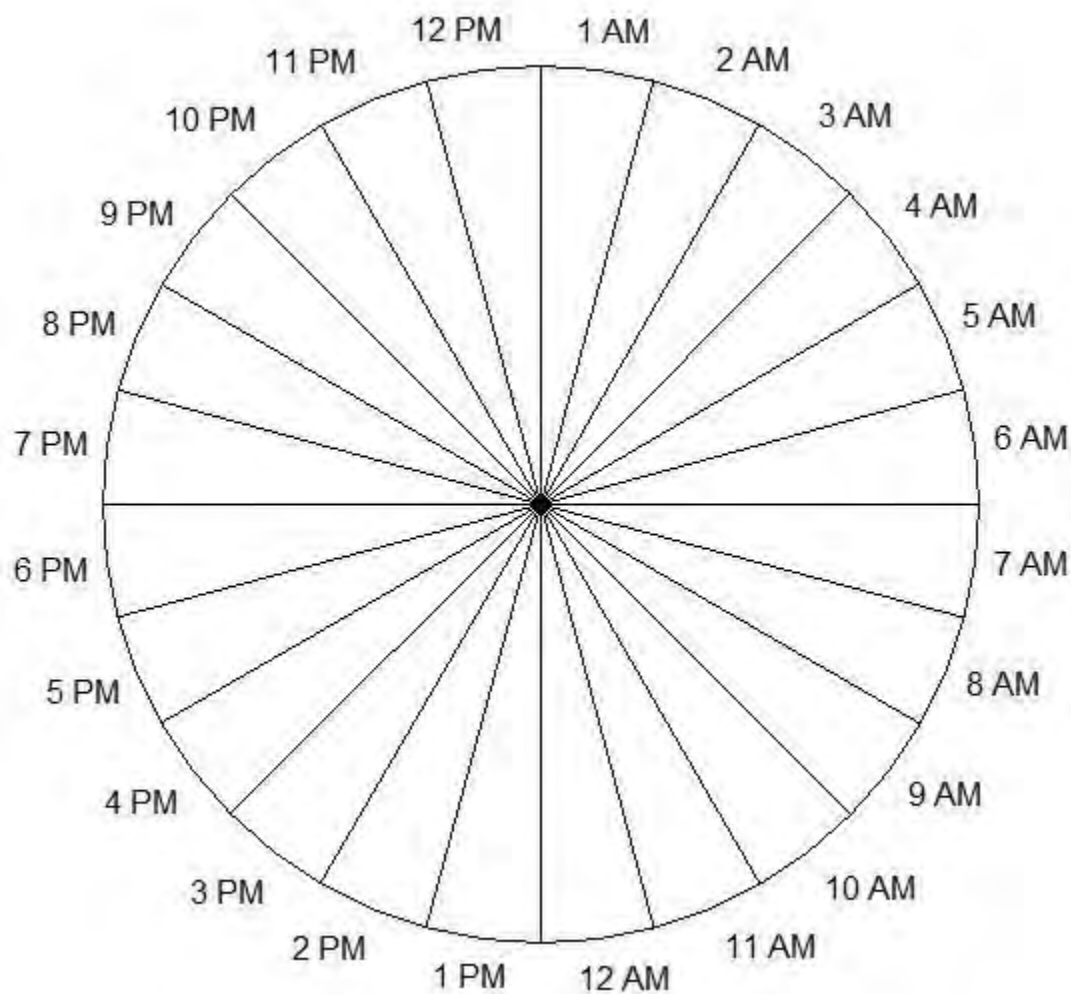
Has your sleep been impacted by TBI?

If yes, how? Write your comments below.

The Sleep Clock



Please mark on the Sleep Clock your usual sleep pattern by highlighting the time you normally go to bed to the time you normally wake up.



EASE Model – Benefits of Exercise



- Improves our health and fitness
- Regular exercise builds our tolerance to stressful situations
- Exercise can be a good way to work off boredom or tension
- Exercise can improve sleep
- Exercise is another way to meet people
- Exercise can improve balance
- It gives us more things to do during the day
- Improves our resting metabolic rate
- Increases our stamina
- It can help us to lose weight

Setting a PL-EASE Goal

My PL-EASE Goal is:

☐ **Eating**

☐ **Activity**

☐ **Sleep**

☐ **Exercise**

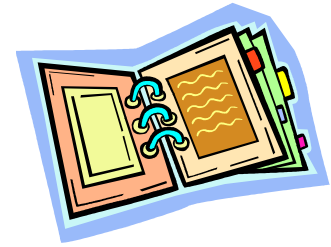
Healthy Eating

Here are some tips for healthy eating:

- Make sure to eat enough fruit and vegetables.
- Drink plenty of fluids, especially water, throughout the day.
- If you are trying to lose weight, do so gradually.
- Try to limit the amount of tea or coffee that you drink.
- Eat regularly and try not to go for long periods without food.

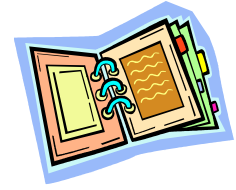
My goal(s) are:

Getting Active



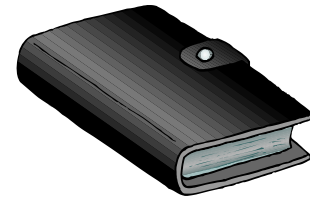
I am interested in these activities:

☐ Aerobics	☐ Concerts
☐ Archery	☐ Cooking
☐ Athletics	☐ Community Organizations
☐ Barbecues	☐ Courses for fun and learning
☐ Baseball/softball	☐ Dancing
☐ Basketball	☐ Darts
☐ Bike riding	☐ Dining out
☐ Billiards/pool	☐ Fishing
☐ Bingo	☐ Folk art/crafts
☐ Board games (e.g., monopoly)	☐ Gardening
☐ Bowling	☐ Golfing
☐ Calligraphy	☐ Horse racing
☐ Camping	☐ Horse riding
☐ Canoeing	☐ Ice skating
☐ Ceramics/pottery	☐ Jigsaw puzzles
☐ Collecting stamps/coins/other	☐ Jogging
	☐ Knitting/crochet



☐ Library	☐ Swimming
☐ Listening to music	☐ Table tennis (ping pong)
☐ Martial arts (e.g., judo, karate)	☐ Tai chi
☐ Model building	☐ Tennis
☐ Movies	☐ Visiting friends
☐ Painting	☐ Walking
☐ Photography	☐ Woodwork
☐ Picnics	☐ Working out/going to the gym
☐ Playing a card game	☐ Writing (e.g., letters, poems, stories)
☐ Playing a musical instrument	☐ Yoga/meditation
☐ Playing with pets	☐ Other (list your ideas)
☐ Reading	_____
☐ Religious organizations	_____
☐ Roller skating/blading	_____
☐ Rowing	_____
☐ Sailing	_____
☐ Sewing	_____
☐ Soccer	
☐ Social clubs	
☐ Spectator sports events	

Sleep Diary



My Weekly Sleep Diary:

Date	Sleep rating [*]	Problem area(s)
<i>Day 1</i>	<i>6</i>	<i>Awakened by noise from outside</i>

^{*}Rate your sleep on a 10-point scale, where ‘0’ means extremely unrefreshed and ‘10’ means very refreshed.

Things I can do when I can't sleep:

After 15 minutes of not being able to sleep, get out of bed, leave your bedroom, and try any of the following:



- › Thought-stopping exercises: 'the stop sign' and 'my calm place'
- › Get up and read (light reading)
- › Go to the bathroom if needed
- › Go for a walk
- › Do a quiet activity or hobby (listen to soothing music)
- › Take a warm bath or shower
- › Drink a warm glass of milk or chamomile tea
- › Listen to a relaxation tape or do relaxation exercises

Tips to help you sleep better:

- › Only go to bed when you are sleepy
- › Use your bedroom for sleep and sex only (no TV, no radio, no eating in the bedroom)
- › Avoid naps during the day.
- › Make sure your bed and room is comfortable- quiet, dark, and at a moderate temperature
- › Avoid caffeine (tea, coffee, chocolate) for 10 hours before you want to go to sleep
- › Avoid heavy meals, high-fat foods (potato chips), raw fruits/ vegetables before your bedtime
- › Eat your dinner before 7pm
- › Avoid alcohol - it won't help you sleep. Avoid nicotine before bedtime.
- › Avoid snacks in the middle of the night
- › Exercise but not for the 2 hours before you want to sleep
- › Do not use sleep medication (unless a doctor has instructed you to do so)
- › Write down what is worrying you during the day (not before bed)

Highlight the sleep tip(s) you want to try over the next week

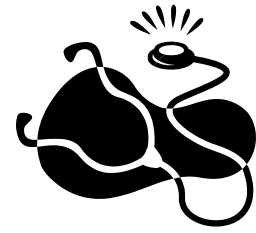
EASE Model – Keeping an Exercise Program



- Choose an exercise you enjoy.
- Ensure you have the right equipment, clothing.
- Start up with light exercise and only later build up to more vigorous ones.
- Try to exercise with a friend or personal trainer.
- Try to exercise every day or every other day.
- Establish a routine so you exercise at the same time every day.
- Reward yourself for exercising during the first 2 weeks.
- Be kind to yourself if you break your routine – get back to it as soon as you can.

My goal(s) are:

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

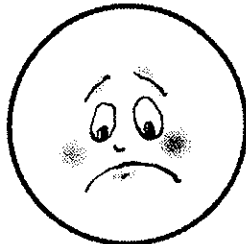
Extremely
Hopeful

Session 2: Evaluation Sheet

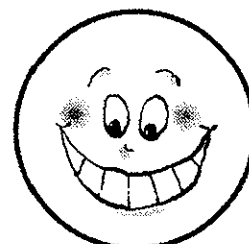
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

Extremely
Hopeful

Aim and Objectives of Session 3



Aim: To examine the relationship between thoughts and feelings

Objectives:

1. Learn how thoughts and feelings are connected.
2. Learn how each person has their own thinking style that shapes the way they see things and therefore, the way they feel about things.
3. Learn that as we change our thinking style, we can start to change the way we feel about situations we come up against.

How are thoughts and feelings connected?



Each person has their own view about the world and things that happen. Our view is often different to the way other people think about the same thing.

This is our thinking style. Because our thoughts keep running over in our mind, it is called self-talk.

Self-talk starts from when we were children. Because we are always using our self-talk it becomes a habit.

Because it is a habit, sometimes we are not even aware of how we use our self-talk.

When faced with any Situation (SIT), our self-talk (THINK) will affect the way we Feel (FEEL).

Our self-talk can be positive or negative - we can think of the good side or bad side of the same situation.

We can cope with a situation better if we use our positive self-talk.

We are in control – we can choose whether we want to use positive or negative self-talk.

It helps to practice our positive self-talk so that it comes more easily when it is needed.



How thinking styles affect feelings

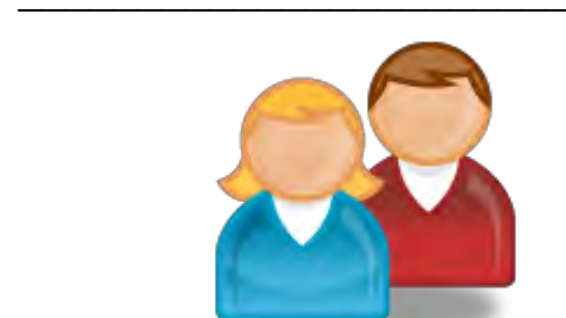
-Draw lines to connect the self-talk to feelings

SIT(uation)	THINK Self-talk	FEEL
Forget to call a friend	I should never forget anything.	A. Stupid, angry at self, embarrassed
	Everyone forgets sometimes.	OR
	I hate having a memory problem.	B. Calm, content, relieved
	Nobody is perfect.	
	What can I do to make sure this doesn't happen again?	

How thinking styles affect feelings

SITUATION

SELF-TALK



How thinking styles affect feelings



SIT(uation)	THINK Self-talk	FEEL
Won't get license back	A _____	A Disappointed, upset, down

	B _____	B Angry, frustrated

	C _____	C Content, calm

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely Neither Happy Extremely
Sad or Sad Happy

1 2 3 4 5 6 7 8 9 10

No Hope Neither Hopeless Extremely
at all or Hopeful Hopeful

Session 3: Evaluation Sheet

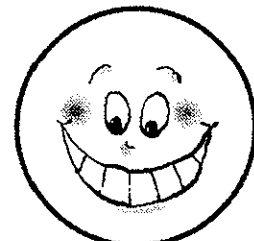
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

Extremely
Hopeful

Aim of Session 4

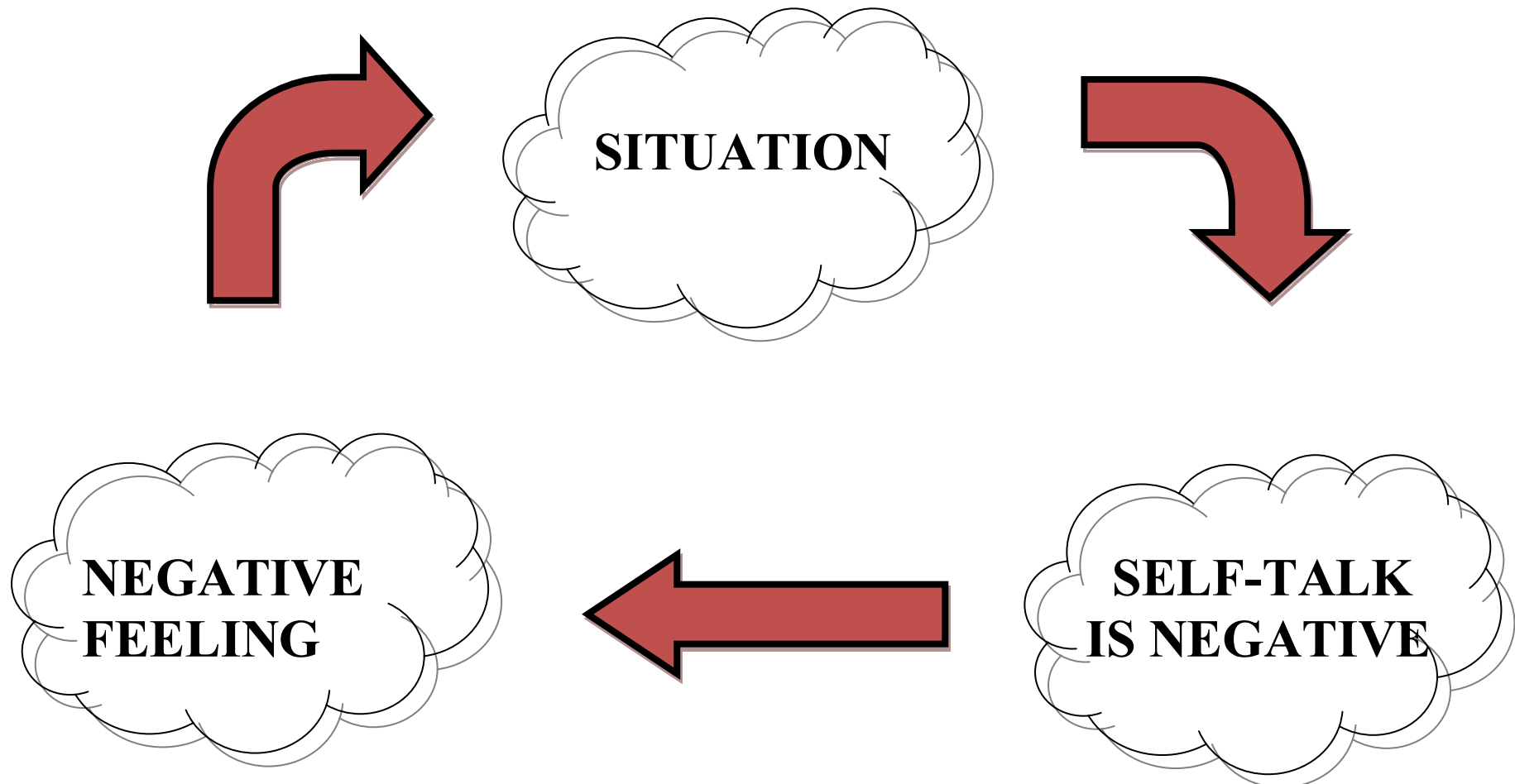


To learn how to increase our positive self-talk by practicing the following skills:

When we realize that we are telling ourselves negative messages, we should:

1. **STOP**  Say it inside our heads, not aloud
2. **DROP**  Your stress by taking 4 deep breaths (or more/less)
3. **ROLL**  On to a positive thought

NEGATIVE SELF-TALK CYCLE



Positive Self-Talk



Examples for when you have forgotten something:

- ✓ My memory isn't terrible. I can remember more if I keep a diary or a list.
- ✓ I'm learning to write things down so that this won't happen as often.
- ✓ It's okay to forget some things.
- ✓ I forgot something but that doesn't make me stupid / useless / unreliable.
- ✓ I can cope with this!
- ✓ I can explain why this has happened so that they can understand.
- ✓ I made a mistake, so what can I learn from it?
- ✓ This can get better one step at a time.
- ✓ I forgot something but I am still worthwhile and deserve respect.

Stopping Negative Self-Talk:

STOP, DROP, & ROLL

Notice negative self-talk then:

STOP



DROP

Take a Deep breath



ROLL

Use Positive Self-talk



Move on

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

Extremely
Hopeful

Session 4: Evaluation Sheet

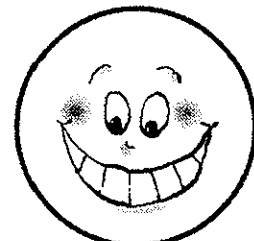
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

Extremely
Hopeful

Aim and Objectives of Session 5



Aim: To examine how certain patterns of thinking or BAD HABITS can lead people to feeling down/ stressed.

Objectives:

1. Practice STOP, DROP, & ROLL
2. Learn how each individual can have particular thinking styles, BAD HABITS, which can lead to them feeling down.
3. Learn how to identify these BAD HABITS.
4. Learn how to come up with alternatives to this thinking to help participants to feel better.

Bad Habits



Negative self-talk:

- ✓ Likes to blend in with the furniture, fly under the radar, and go unnoticed
- ✓ Can be hard to shake
- ✓ Likes to exaggerate, making things seem worse than they actually are
- ✓ Likes being a ‘drama queen’
- ✓ Can be sneaky – likes to put people down
- ✓ Can turn good things into bad. For example you are given an award and you say to yourself, “I don’t really deserve it.”

BUT...

- ✓ You can start to catch negative self-talk
- ✓ Remember it is often the first thought that jumps into your mind when you face a situation

Changing our Thinking Style: Bad Habits Checklist

Do you recognize any of these bad habits in your thinking style? Check the boxes that match your thinking style.

- ☐ 1. Worrying about things that never happen.
“This could go wrong and that could go wrong”
- ☐ 2. Black and White thinking (also called “All or Nothing” thinking)
“If you leave me ... I will never be okay.”
- ☐ 3. Making a mountain out of a mole hill (Making things worse than they really are).
“That person was rude to me so I am never going to talk to them again.”
- ☐ 4. Thinking I should be able to do everything.
“If I can’t drive, than I must be a failure at everything.”
- ☐ 5. Jumping to Conclusions
“If they are talking with each other, than they must be saying something bad about me.”
- ☐ 6. Sticking to one idea
“There is only one way to solve my problem!”
- ☐ 7. Being too hard on myself/critical of myself
“I forgot that person’s name... I am an absolute fool!”
- ☐ 8. Concentrating on my weaknesses and forgetting my strengths.
“I can’t remember anything anymore and I can’t walk in the same way.
I am no good.”

Changing our thinking style: Beating Bad Habits Checklist

Check the boxes below that describe your Bad Habits. Do you have ways to beat these Bad Habits? If so, write it on the line provided. If you can't think of anything, then brainstorm with others and write these ideas on the line provided.

- ☐ 1. Worrying about things that never happen.
If I am, then tell myself: "Don't worry now, I will cross that bridge when I come to it."
- ☐ 2. Black and White thinking ("All or Nothing" thinking)
If I am, then tell myself _____.
- ☐ 3. Making a mountain out of a mole hill
If I am then tell myself _____.
- ☐ 4. Thinking I should be able to do everything
If I am then tell myself _____.
- ☐ 5. Jumping to Conclusions
If I am then tell myself _____.
- ☐ 6. Sticking to one idea
If I am then tell myself _____.
- ☐ 7. Being too hard on myself/critical of myself
If I am then tell myself _____.
- ☐ 8. Concentrating on my weaknesses and forgetting my strengths
If I am then tell myself _____.

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

Extremely
Hopeful

Session 5: Evaluation Sheet

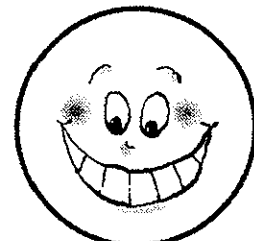
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

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Hopeful

Aim and Objectives of Sessions 6 and 7



Aim: To learn more about solving problems

Objectives:

1. Talking about what it is like having problems after a TBI
2. To learn ‘How to be a STAR’ in solving problems

SPOT  or identify the problem

THINK  of ways to solve the problem

ACT  on the best option

REVIEW  the outcome

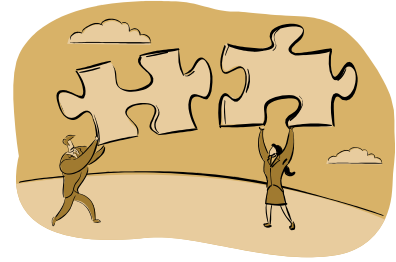
Impact of Problems



1. Everyone has problems in their life.
2. LOTS of small problems are very tiring.
3. BIG problems also affect our life.
4. If we can't solve our problems, it can affect the way we feel and
 - We can start to feel bad
 - We can start to feel helpless about being able to solve the problems
 - We start to feel hopeless about our future
5. Some people have more trouble solving problems after they've had a traumatic brain injury.
6. It is important to look at strategies that we can use to solve problems

Solving Problems

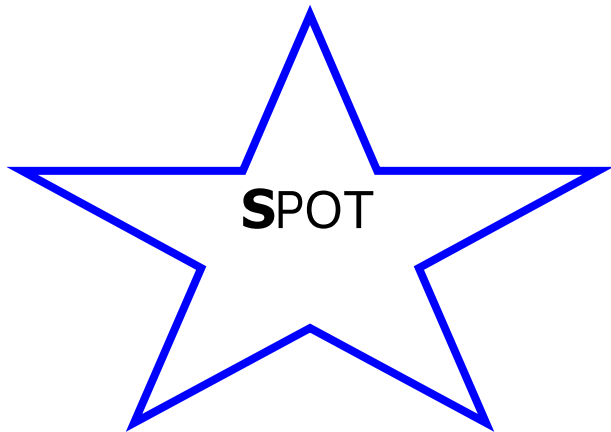
Here are some ways people approach problems:



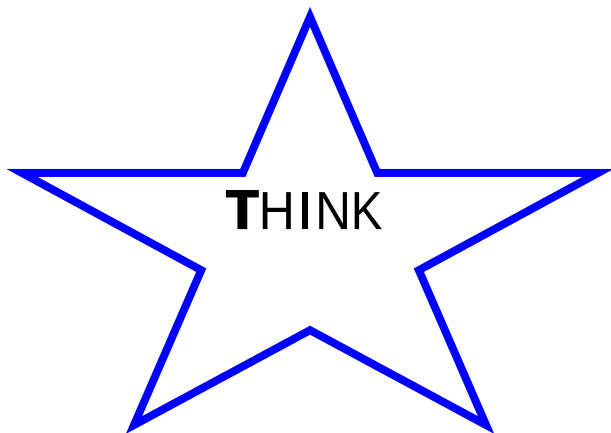
Highlight or circle any ways you solve your problems

- ❖ Pray for guidance
- ❖ Hope for a miracle
- ❖ Let off steam (scream or punch something)
- ❖ Try to ignore or avoid the problem
- ❖ Hand the problem over to someone else
- ❖ Just jump in and do something about it
- ❖ Use a 'Pro' and 'Con' list
- ❖ Break down the problem
- ❖ Think back to a similar problem and how you solved that problem
- ❖ Talk to others
- ❖ Write in any that are not on the list above:

How to be a **STAR**



or identify the problem



of ways to solve the problem



on the best option



the outcome

What is the problem?



Lindsay finds it very hard to live on her income of \$160 per week. She is living alone in a rented unit that is costing \$110 per week. This leaves her with only \$50 to spend on food and everything else.

Lindsay has fallen behind with the rent. The real estate agent has called her to ask when she will pay and hinted to her that she may be evicted.

Lindsay is feeling frustrated with the rehabilitation staff. She feels that the answer to her problem is that they should be doing more to help with her work situation.

Think of ways to solve the problem



Brainstorming:

- ✓ Involves coming up with as many different ways of solving a problem as possible.
- ✓ It doesn't matter how 'crazy' or unrealistic the solution(s) may seem.
- ✓ Just write down all of your ideas and solutions down.
- ✓ Doing this can sometimes help us to find really creative ideas for solving our problems.

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

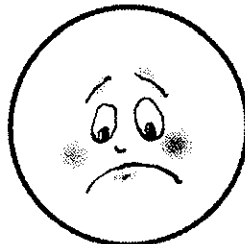
Extremely
Hopeful

Session 6: Evaluation Sheet

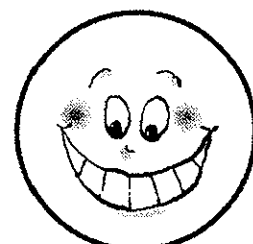
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



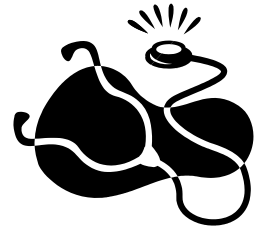
Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

1 2 3 4 5 6 7 8 9 10

Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

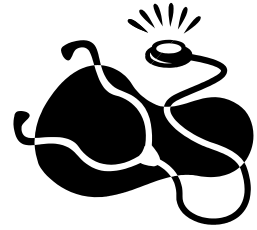
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Hopeful

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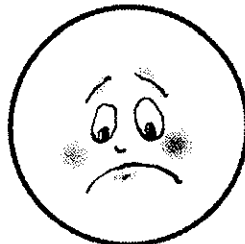
Extremely
Hopeful

Session 7: Evaluation Sheet

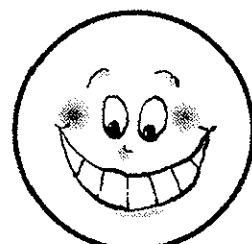
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



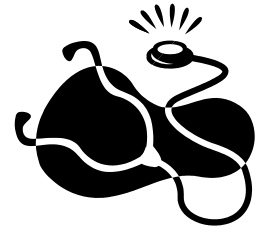
Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

‘TAKING THE PULSE ’



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Aim and Objectives of Session 8



Aim: To develop problem-solving skills with a specific focus on recovery after the brain injury.

Objectives:

To learn to ‘Ask the Coach’ about how to handle problems:

1. during recovery after the traumatic brain injury and
2. while building a new life after TBI.

These problems can be sorted out by...



Asking the Coach

Problems related to recovery after brain injury



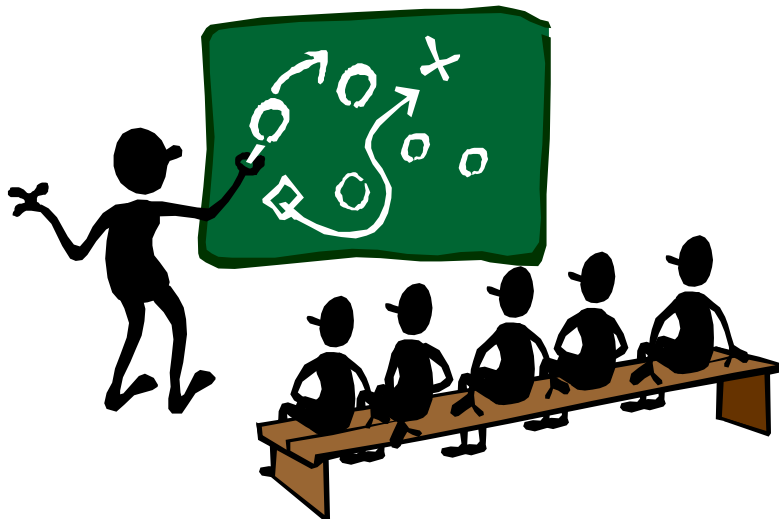
1. Sometimes people have a special set of problems after a brain injury.
2. These problems come up when the person is trying to get their life back to the way things were before the injury.
3. These problems also come up when the person is trying to be like everyone else.
4. Sometimes people experience setbacks when trying to meet new goals.
5. When you experience a setback, sometimes it can result in you feeling down or feeling bad.

Ask the Coach

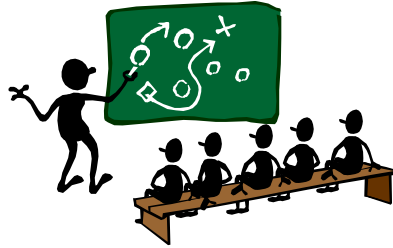
Do you want to keep trying what you are already doing?

If you want to try a different approach, the Coach has four plays:

1. Can you do the same thing in a different way?
2. Can you do something else that meets the same need?
3. Can you break your larger goal down into smaller steps?
4. Is your goal out of reach for now? Is there something else you can start on?



First Play



Can you do the same thing in a different way?

Examples:

Peter had a knob put on the steering wheel of his car. As a result, he is still able to drive.

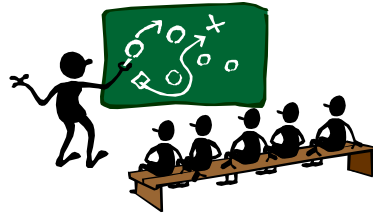
Jan wants to keep track of her medication. Before the injury she could do this in her head. Now she sets an alarm on her watch. The alarm rings when she needs to take her medication.

Will this play help with your goal?

Yes ☐

No ☐

Second Play



Can you do something else that meets the same need?

Examples:

Tony can't drive but loves to go out on the track driving go-carts.

Maria can't get back to her old job but is able to work 3 days a week as a volunteer.

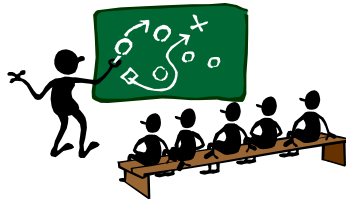
Lindsay can no longer sail but she has joined a disabled sailing club. She's still sailing, but no longer takes such an active role.

Will this play help with your goal?

Yes ☐

No ☐

Third Play



Can you break your large goal down into smaller steps?

Examples:

Sarah wanted to go back to university. She has decided to start with one class at a time and see how it goes first before adding more classes.

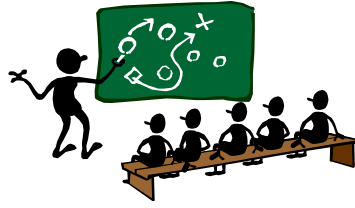
Michael wanted a girlfriend, but decided that he would start just trying to talk to girls first. Then, he would have a better chance of meeting someone who he would like as a girlfriend in the future.

Will this play help with your goal?

Yes ☐

No ☐

Fourth Play



Is your goal out of reach for now? Is there something else you can start on?

Examples:

Pablo wanted to get back to his job as a painter. After trying painting again he found that he was making too many mistakes and would be fired from the job. Although he still wants to work, at this time Pablo decided to focus on his hobby of painting to build up his artistic skills.

Will this play help with your goal?

Yes ☐

No ☐

‘TAKING THE PULSE ’



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Extremely
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Neither Happy
or Sad

Extremely
Happy

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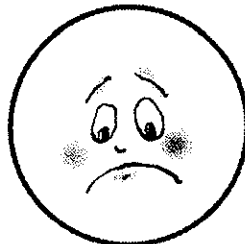
Extremely
Hopeful

Session 8: Evaluation Sheet

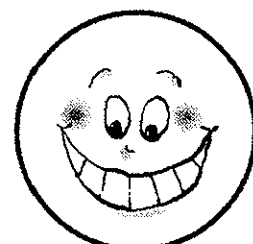
After today's session I feel:
(highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

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Aim and Objectives of Session 9



Aim: To identify the means of building a sense of hope after traumatic brain injury

Objectives:

1. To learn an approach to developing a sense of connection with others and the world
2. To identify a sense of purpose for our lives
3. To learn to work towards good things happening in our lives

Building hope after traumatic brain injury



Feeling a connection

People can feel a connection with:

Spiritual world

Parent

Partner

Child(ren)

Spiritual being

Pet or animal

Nature

Friends

Other: _____

To what extent to you feel a connection with any or some of these?

0 1 2 3 4 5 6 7 8 9 10

Don't feel any
connection

Feel some
connection

Feel strong
connection



Fostering a connection



People can foster a sense of connection by:

Getting out more.

How can you do this? (Write below)

Getting in touch.

How can you do this? (Write below)

Getting involved.

How can you do this? (Write below)

What I want to get out of life



Here are some things that people with traumatic brain injury have said they want to get out of life:

Happiness

Plenty of laughter

Have a partner /children/ family

Home or apartment

Make good friends

A good pay check

Get back to more like my old self

What do you want to get out of your life?

Expect good things to happen



Do you expect good things to happen?

0	1	2	3	4	5	6	7	8	9	10
Don't					Sometimes					Strongly
Expect					Expect					Expect

This is my plan to do something I will enjoy:

What can I do for someone else?

‘TAKING THE PULSE ’



Today, I am feeling (please circle):

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Extremely
Sad

Neither Happy
or Sad

Extremely
Happy

1 2 3 4 5 6 7 8 9 10

No Hope
at all

Neither Hopeless
or Hopeful

Extremely
Hopeful

Session 9: Evaluation Sheet

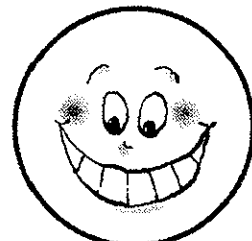
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

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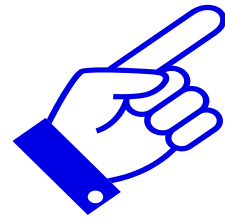
1 2 3 4 5 6 7 8 9 10

No Hope
at all

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or Hopeful

Extremely
Hopeful

Aim and Objectives of Session 10



Aim: To identify the means of building a sense of hope after traumatic brain injury

Objectives:

1. To learn about a model of hope
2. To learn a means of building self-esteem





Your Story. Your Connection.

MakeTheConnection.net helps Veterans and their families recognize that they are not alone—there are people out there like them who are going through similar experiences, overcoming challenges, reaching positive outcomes for treatment and recovery, and finding paths to fulfilling lives. These messages are conveyed by the most credible sources of all—the voices of other Veterans.

Many of our Nation's Veterans—from those who served in World War II to those who served more recently—can benefit from hearing the stories of others and gaining greater awareness of the resources that are available to help them move forward with their lives.

Join the **Make the Connection** online conversation:



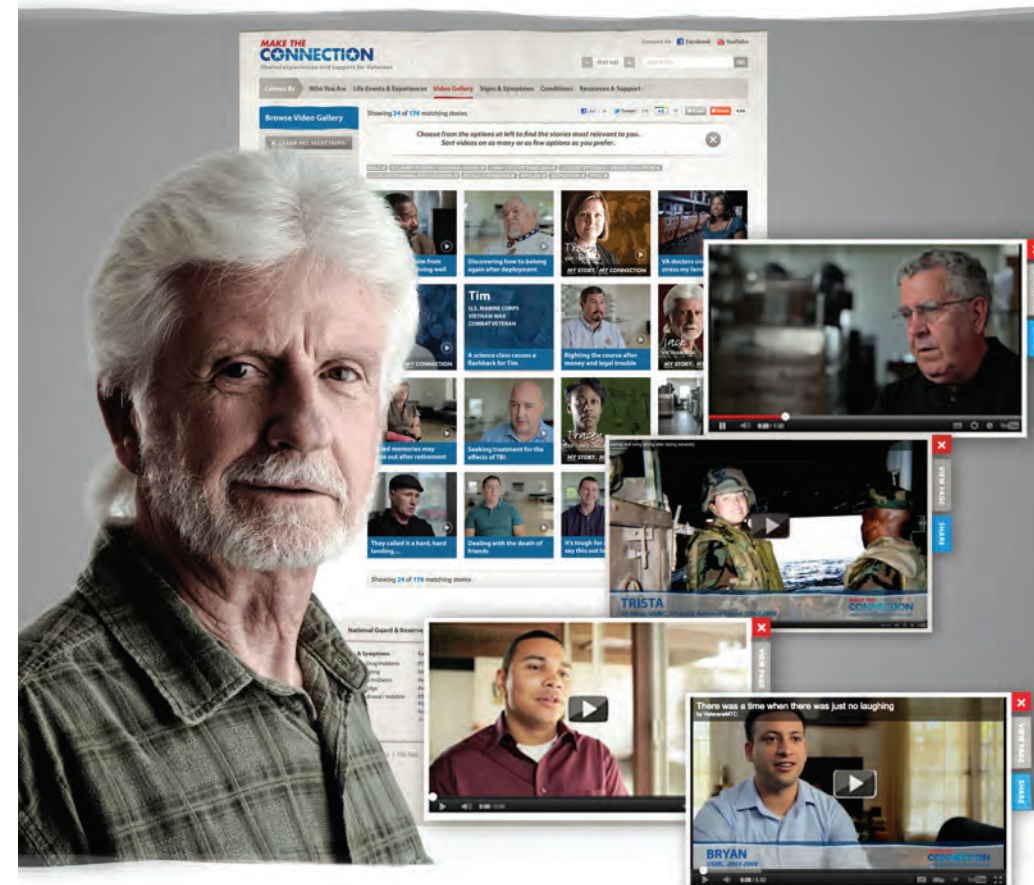
www.facebook.com/VeteransMTC



www.youtube.com/VeteransMTC

A NEW, INTERACTIVE RESOURCE FOR VETERANS

PI: Lisa Brenner, PhD, ABPP



U.S. Department
of Veterans Affairs

www.MakeTheConnection.net

What I see in you:



Highlight the qualities that you see in _____.

Friendly	Well-dressed	Efficient
Outgoing	Shy	Humorous
Adventurous	Sensitive	Studious
Cautious	Creative	Talented
Compassionate	Kind	Loving
Caring	Self-confident	Gracious
Intelligent	Family oriented	Athletic
Happy	Smiling	Cheerful
Talkative	Organized	Considerate
Helpful	Professional	Fun loving
Willing to take risks	Good listener	Optimistic
Able to make decisions		



What I see in **myself**:

Highlight the qualities that you see in **yourself**.

Friendly	Well-dressed	Efficient
Outgoing	Shy	Humorous
Adventurous	Sensitive	Studious
Cautious	Creative	Talented
Compassionate	Kind	Loving
Caring	Self-confident	Gracious
Intelligent	Family oriented	Athletic
Happy	Smiling	Cheerful
Talkative	Organized	Considerate
Helpful	Professional	Fun loving
Willing to take risks	Good listener	Optimistic
Able to make decisions		

‘TAKING THE PULSE ’



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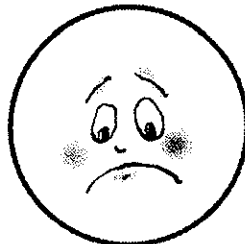
Extremely
Hopeful

Session 10: Evaluation Sheet

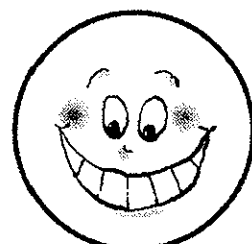
After today's session I feel: (Highlight as many faces as you want)



Bored



Sad



Happy

The thing I liked best about the session was:

The session could have been made better by:

Something I learned today was:

MSRC 1.0 D&I Readiness Working Group Final Report**MSRC 1.0 Intervention:** Window to Hope (WtoH)**MSRC 1.0 Funded Study:** Window to Hope: Evaluating a Psychological Treatment for Hopelessness among Veterans with Traumatic Brain Injury (TBI) and Pilot Study of an Active Control Problem Solving Therapy for Suicide Prevention (PST-SP) Among Veterans with Moderate to Severe TBI**PI:** Lisa Brenner, PhD, ABPP**Review Date:** 14 DEC 2017**Summary of Intervention**

Window to Hope (WtoH) is a psychological intervention for the treatment of hopelessness among Veterans with moderate to Severe traumatic brain injury (TBI). The WtoH program was developed from principles and therapeutic techniques drawn from cognitive behavioral therapy, as adapted for TBI. It is structured around 4 core therapeutic strategies: behavioral activation, cognitive restructuring, problem-solving, and relapse prevention. The central metaphor is a Window of Hope, with the core therapeutic strategies represented by each of 4 window panes. In addition, a therapeutic rationale is provided for each section, making explicit ways in which the various strategies could contribute to alleviating hopelessness. For the final component, therapeutic strategies from the field of posttraumatic growth were substituted for the more standard techniques used to address relapse prevention.

This intervention is not intended for those during the acute recovery stage. WtoH is aimed at those who are at least 1 year post moderate to severe TBI.

Executive Summary of Working Group Feedback

The study PI provided an intervention summary report that was made available to the MSRC Readiness Working Group (WG) prior to the scheduled review. The following summary presents WG feedback derived from pre and post meeting surveys as annotated in the tables below integrated with WG review meeting discussion of 13 WG members. Ratings are based on most recent rating (pre or post review survey).

Reviewers returned 8 ratings for an average rating of 4.5 on an 8-point enthusiasm scale,* which fell slightly above ambivalent/neutral for enthusiasm for implementation within military personnel. The majority of reviewers (5 out of 8) rated the clinical evidence for suicidality outcome** as minimal, while two of the eight indicated they saw moderate research evidence. One reviewer gave a rating of moderately strong. Clinical evidence ratings for other target outcomes (e.g. anxiety, coping, marital satisfaction) were evenly distributed between moderate (3 out of 8) and moderately strong (3 out of 8), then diverged with one rating for minimal and one rating for strong clinical evidence. The majority of reviews (6 out of 7) indicated that further research is needed to support dissemination and implementation (D&I) of this intervention for military personnel. Three of these seven indicated the research needs to be conducted prior to D&I to military personnel, and three suggested it could be done during or as part of the D&I. One reviewer thought further research would be helpful, but is not needed for D&I to military personnel.

The WG review meeting included discussion about intervention applications, the target population, and future research and development. The WG noted limitations for applying results to a military population; the intervention was designed for a moderate TBI population whereas military TBI is predominately mild. Study participants were all veterans with no active duty represented, and the criterion for 12 months pre-intervention stability means most active duty would have processed through a Warrior Transition Unit for medical separation prior to receiving the intervention. The study team acknowledged there are no data yet with a mild TBI population. Since hopelessness was a cornerstone intervention target, the WG noted appeal of organizing training for skills that induced hope, but also questioned the expected intervention impact if hopelessness was not

salient for a given patient. Other advantages included ease of learning the intervention by both providers and patients. Program Manuals (Clinician and Client versions) have been developed by the study team that include detailed instructions to clinicians for the delivery of the intervention, as well as handouts, worksheets, and pre- and post-evaluations for each session. (training and materials would be adapted for active duty personnel with TBI). Potential treatment adaptations were discussed with regard to group size, possibility for individual administration, option for fewer treatment sessions, feasibility for online delivery, use of virtual / tele-behavioral health treatment, and potential as an adjunctive intervention to other therapies. Future research options included study with mild TBI populations and alternatives for online and virtual delivery of the intervention.

Primary DoD Applications Suggested by the MSRC D&I Working Group

None suggested

Potential Targets for Dissemination of the Intervention within the Military

None suggested

Recommendations to Facilitate Dissemination and Implementation within the Military

None suggested

Potential Funding Sources for Future Research for this Intervention

- MOMRP
- VA
- NIH

*Overall enthusiasm for implementation of intervention for military personnel rated as 0=No Enthusiasm 2=Little Enthusiasm 4= Ambivalent/Neutral, 6=Enthusiastic, 8=Extremely Enthusiastic

****Quality of Evidence for Clinical Intervention categories**

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

Verbatim Summary of Working Group Feedback Survey Responses

The feedback below was received via online survey from WG members and is provided for situational awareness. The MSRC D&I Core will follow up with the study PI to determine possible next steps based on this information.

Suggestions for Further Study Prior to D&I
• Larger studies with more heterogeneous samples, to include military personnel with a recent TBI. • Additional research with larger sample sizes and military personnel. The WtoH workbook seems geared toward young individuals and may not be acceptable to military personnel - acceptability testing and even cognitive debriefing on the workbook is recommended prior to running a trial with military personnel. Additionally, given the reading/comprehension level of the workbook, it is advised that researchers obtain a basic baseline level of cognitive functioning for their participants. A sharper focus on the number, severity, time since injury, etc. of the TBIs would provide more information about generalizability. A measure more specific than the OSU TBI ID is likely needed for this purpose. Also need samples of individuals with suicidal ideation and /or recent attempt in order to test effects on suicidality outcomes. • Larger RCT with appropriate sample size to get a better sense of the reliability and magnitude of the findings. Additionally, inclusion criteria should be relaxed to make this a more ecologically valid, implementation type study. • Additional, adequately-powered research again exploring changes in suicidal ideation and behaviors as outcomes. • Interventions need to be structured to fit into operational requirements of military personnel. Could this be delivered in a compressed format or in fewer sessions or through primary care or online?
Opportunity for D&I in our office/agency
• Collaboration on training modules/materials with the ability to disseminate them broadly. • CDP could offer workshops in this treatment. CDP could host online support materials. • Submit to annual PBI call for proposals
Opportunity for D&I for military personnel
• Center for Deployment Psychology (CDP) training programs • Could pursue implementation of this intervention at Military Treatment Facilities. • NICOE at WRNMMC DVBIC
Opportunity for D&I for other groups (e.g. Veterans, families, civilians)
• This intervention does not appear to be constrained only to the military or to veterans, and should be examined for civilian dissemination as well, especially among those at high risk for TBI. • Not entirely clear how effective this would be with non-TBI patients. • More with VA, maybe Vet Centers
Suggestions for next steps for this intervention
• Suicide is a rare event. TBI is also a rare event. Suicide among those with TBI is especially rare. Why limit this to only those with TBI. Is there a protocol adaptation that could be made that would allow this intervention to be applicable to suicide cases generally, and then have specific additional modules/content for those with TBI? • Recommend conducting a second RCT, ideally with a larger sample. • documenting impact on suicide behavior. • Recommend identifying percent of active duty with moderate/severe TBI Recommend sample referred from provider rather than volunteers from a flyer (volunteers might be more hopeful) Recommend instead of comparing to waitlist, compare to alternate intervention.

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MSRC 1.0 Intervention Summary for the D&I Readiness Working Group

Intervention	Crisis Response Plan (CRP)
Intervention Description	A brief (<30 mins), collaboratively-developed intervention that outlines several concrete steps and procedures to use during acute crises: identifying personal warning signs, self-management strategies, sources of social support, reasons for living, accessing professional support services, and using crisis/emergency services. The plan is typically handwritten on an index card.
PI	Craig Bryan, PsyD, ABPP
POCⁱ	Craig Bryan, PsyD, ABPP
POC contact	craig.bryan@utah.edu
Grant Summary	Randomized controlled trial of CRP as compared to treatment as usual.
Recruitment Site(s)ⁱⁱ	Fort Carson, Colorado
Suicidality Outcomeⁱⁱⁱ	Suicide attempts and suicide ideation
Other Target Outcome^{iv}	Psychiatric hospitalization
Participants Included (check all that apply)	☒ Active Duty ☐ Reserve ☐ National Guard ☐ OEF/OIF/OND ☐ Veteran Previous ☐ Civilians Veterans Conflicts
D&I Materials Please describe D&I materials including manuals, toolkits, apps, websites, forms, handouts, PowerPoint presentations, web-based trainings, demonstration videos, posters, messaging information, SharePoint, etc.	
The CRP is designed for use and implementation by mental health clinicians, other health care providers, and nonclinicians (e.g., family members, peer specialists). Curricula for two training workshops have been developed and implemented. The first training workshop targets mental health clinicians and is one full day in duration. The second training workshop targets nonclinicians and other health care providers (e.g., primary care) and is one half-day in duration. Training workshops include didactic knowledge, clinical demonstrations, and skills practice via role play. Participants receive a pocket-sized guide that serves as a “manual.” Summary of existing D&I materials: • Full-day CRP training workshop for mental health professionals • Half-day CRP training workshop for non-mental health professionals • Two-day BCBT training workshop for mental health professionals • CRP pocket guide • CRP website (www.crpforsuicide.com) • Post-training consultation phone calls • 3 qualified CRP trainers Forthcoming/planned D&I materials: • CRP training videos and case vignettes • CRP certification program • Training of additional trainers • Development of train-the-trainer curriculum	
Readiness for Implementation using a combination of RE-AIM and Implementation Outcome Frameworks	
INSTRUCTIONS: Below you will find a list of implementation domains to report your data to date. It is not expected that your project will have data for all of these domains. If none, check “no evidence”, but feel free to comment within the description box. If you do have data, please also check all sources including a clinical ^v or implementation ^{vi} study or from leadership ^{vii} or other stakeholder input ^{viii} . Please specify if from Department of Defense or Veteran vs. civilian settings.	

MSRC 1.0 D&I Readiness Working Group Final Report

MSRC 1.0 Intervention: Crisis Response Planning (CRP)

MSRC 1.0 Funded Study: Brief interventions for short-term suicide risk reduction in military populations

PI: Craig Bryan, PhD

Materials Included:

- MSRC 1.0 Intervention Summary for the D&I Readiness Working Group
- MSRC 1.0 Intervention Summary Supplemental Materials
- MSRC 1.0 Working Group Final Report

Reach Participation rate among clients approached and representativeness of those who participate compared to those for whom this intervention is targeted. Alternatively, the penetration or integration of this intervention within a service setting and its subsystems defined by # clients receiving service/# clients eligible or # providers offering service/# providers trained	
Evidence from: ☒ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	RCT data: Participation rate was 60% (97 consented out of 165 approached). Stakeholder input: Trained clinicians have reported very high rates of CRP integration into service settings.

Evidence for this Clinical Intervention ^{ix}	
Suicidality Outcome Category	☒ Strong ☐ Moderately Strong ☐ Moderate ☐ Minimal ☐ None
Other Target Outcome Category	☒ Strong ☐ Moderately Strong ☐ Moderate ☐ Minimal ☐ None
Direct evidence of CRP effect in <u>military</u> sample. Bryan, C.J., Mintz, J., Clemans, T.A., Leeson, B., Burch, T.S., Williams, S.R., Maney, E., & Rudd, M.D. (2017). Effect of crisis response planning vs. contracts for safety on suicide risk in U.S. Army Soldiers: a randomized clinical trial. <i>Journal of Affective Disorders</i>, 212, 64-72. This RCT tested the CRP as a stand-alone intervention as compared to treatment as usual (i.e., contract for safety), and yielded the following results among active duty Soldiers: • Significant reduction in suicide attempts among participants receiving a CRP as compared to TAU (5% vs. 19%; HR=0.24, p=.028) • Significant reduction in suicide ideation among participants receiving a CRP as compared to TAU (F(3,195)=18.64, p<.001) • Significant reduction in inpatient psychiatric hospitalization days among participants receiving a CRP as compared to TAU (F(1,82)=7.41, p<.001) Direct evidence of similar intervention effect in <u>non-military</u> sample: Miller, I.W., Camargo, C.A., Arias, S.A., Sullivan, A.F., Allen, M.H., Goldstein, A.B., ..., & Boudreaux, E.D., for the ED-SAFE Investigators. (2017). Suicide prevention in an emergency department population: the ED-SAFE study. <i>JAMA Psychiatry</i>. Published online April 29, 2017. This RCT tested an intervention similar to the CRP in an emergency-department setting as compared to TAU and TAU plus enhanced suicide prevention screening: a self-guided safety planning intervention with follow-up phone calls. • Significant reduction in suicide attempts among participants receiving the intervention as compared to TAU (18% vs. 23%; IRR=0.72, p=.05) • The effect on psychiatric inpatient hospitalization was not examined	
Evidence in Support of Intervention Adoption	
Percentage and representativeness of the organizations or settings that will conduct this intervention	
Acceptability	Perception among leadership, clinicians, Service Member/Veteran, family or other stakeholders that this intervention is agreeable, palatable, or satisfactory
Evidence from: ☒ Clinical study ☒ Implementation study ☒ Leadership ☒ Other stakeholder input ☐ No evidence	<u>Military personnel</u> enrolled in our RCT were asked to rate the usefulness of the CRP on a scale ranging from 0 (not at all useful) to 10 (extremely useful). Then mean usefulness rating during follow-up was 7.3. Over 90% reported remembering the plan during the 6-month follow-up, and 85% reported they had kept the plan, although only 20% reported having the plan in their physical possession at the time of the follow-up assessments. Over 50% of patients reported they had used the CRP at least once during each follow-up assessment period. Patients reported they had

	used the CRP a mean of 2.4 times during each follow-up assessment. Nearly half (49%) of patients were able to recall at least one self-management strategy and 78% were able to recall a source of social support during follow-up. The most frequently-used components of the CRP were accessing social support (35%) and self-management strategies (22%). Results of data analyses that are currently being written up for publication indicate that more frequent use of the CRP is associated with significantly less severe suicide ideation during follow-up. Patients who can recall warning signs, self-management strategies, and sources of social support report significantly less severe suicide ideation. Evidence suggests that patients are more likely to use the CRP during the early stages of an emerging suicidal crisis, and access professional sources of support and crisis services during more severe suicidal crises. Anecdotal feedback from <u>clinicians</u> who have implemented the CRP has been very positive, with most clinicians describing the technique as simple, useful, and highly acceptable to patients. Agency administrators have also provided positive feedback and reported favorable impressions of the CRP due to its efficacy and simplicity. In addition to this anecdotal feedback, we have started to collect systematic feedback from trained clinicians. To date, data are available only from one clinic that has implemented the CRP: the UT Health San Antonio Transitional Care Clinic. Seven mental health clinicians from this clinic who participated in CRP training provided the following feedback one month post-implementation: • 100% reported using a CRP at least once with a patient or client • Each clinician reported using the CRP a total of 3 to 10 times • Five of the 7 (83%) rated the CRP as “extremely useful” and 2 of the 7 (17) rated the CRP as “moderately useful” • Two of the 6 clinicians (33%) reported their patients responded “extremely positive” to the CRP, and the remaining 4 of 6 (66%) reported their patients responded “moderately positive” to the CRP • Favored aspects of the CRP included its collaborative, brief, and client-centered approach • Clinicians reported their patients most liked its brevity, transportability, pragmatism, and personalization We are currently collecting acceptability data from Air Force clinicians.
Adoption	Intention, initial decision, or action to try or employ this intervention
Evidence from: ☐ Clinical study ☒ Implementation study ☒ Leadership ☒ Other stakeholder input ☐ No evidence	The following organizations/agencies have already initiated CRP training and started implementation within its systems of care: • State of Utah • State of Texas • Federal Bureau of Prisons • Correct Care Solutions • STRONG STAR Research Consortium • UT Health San Antonio Transitional Care Clinic The following organizations/agencies have hosted CRP trainings and have implemented the procedure to varying degrees: • Salt Lake City VA

	• Madigan Army Medical Center • U.S. Army Recruiting Command The following organizations/agencies have expressed an intention to schedule CRP trainings: • Fort Belvoir • Rutgers University Counseling, ADAP, and Psychiatry Services The following organizations/agencies have instituted the safety planning intervention, a procedure very similar to the CRP: • Veterans Health Administration
Appropriateness	Perceived fit, relevance, or compatibility of this intervention for a given practice setting, perceived fit of this intervention to an established need to address a particular issue, and access to Service Members/Veterans who need it
Evidence from: ☒ Clinical study ☒ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	The RCT enrolled participants from two care settings: emergency department and outpatient behavioral health. The intervention was positively regarded by providers and other staff members in both settings. The CRP has been described by trained clinicians as a good fit in most medical settings including emergency departments, outpatient behavioral health, inpatient psychiatry, crisis hotline call centers, and mobile crisis teams. Positive feedback has also been provided by peer specialists and other non-health care providers who provide support to at-risk military personnel.
Implementation	
Intervention integrity or the quality and consistency of delivery	
Fidelity	Degree to which this intervention has been implemented as it was prescribed in the original study or as it was intended by the intervention developers
Evidence from: ☒ Clinical study ☒ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	Fidelity ratings from the CRP and BCBT trials were above 90% for trained clinicians. Integrity, quality, and consistency of delivery is currently being assessed in a pilot AF implementation project and a State of Utah implementation project. In both of these projects, trained clinicians are participating in weekly or biweekly consultation calls to facilitate integrity, quality, and consistency. These projects will provide better information regarding the amount of consultation required to ensure integrity, quality, and consistency. Feedback from trained clinicians indicates that ongoing consultation is helpful to achieve these ends. Secondary analyses of our RCT data, currently under second review at the <i>Journal of Consulting and Clinical Psychology</i>, indicate that the CRP facilitates affective synchrony and affective co-regulation among military personnel and clinicians. Affective synchrony refers to the degree of “match” in emotional expressivity, whereas affective co-regulation refers to the degree that a clinician influences the patient’s emotional state. These processes are correlated with patient-rated emotional bonding, indicating that the CRP may facilitate perceptions of empathy, understanding, and connectedness among suicidal military personnel. In a VA study (Gamarra et al., 2015), 90% of patients identified as high risk for suicide had a documented safety plan. Safety plans were rated as “mostly complete” and of “moderate quality,” which suggests the content of the safety plan was largely consistent with its original design although there was evidence of

	insufficient personalization and inconsistency in follow-up with the patient. Approximately 25% had generic and/or copied and pasted statements. The authors concluded that implementation quality was poor due to insufficient training. A subsequent VA study (Green et al., 2016) similarly found considerable variability in quality of safety planning, and further found that the quality of a safety plan was correlated with later suicidal behaviors. The authors attributed variability in safety planning quality to a general lack of training and follow-up consultation. The above results suggest that successful implementation likely entails both content/procedural fidelity as well as effective interpersonal process. From a training perspective, we have learned that content (i.e., the specific procedures and components to follow) tends to be relatively easy and straightforward for clinicians to learn. In contrast, process (i.e., how to effectively create a useful CRP) is much more challenging for clinicians to learn. CRP training curriculum therefore emphasizes process (e.g., what to say and how to say it) via demonstrations for the purposes of modeling and role playing for the purposes of skills training and acquisition. To increase clinicians' capacity to focus on process, the CRP pocket guide was developed. The pocket guide provides process-oriented "tips" and an outline of the CRP's components, which clinicians can use as a checklist during clinical encounters. Post-training feedback from clinicians suggests that the CRP pocket guide is a helpful tool for maintaining procedural fidelity. In addition, clinicians have reported that the sample CRP located on the back side of the pocket guide allows them to focus more on process by reducing their anxiety about forgetting content. Anecdotal and accumulating empirical evidence appear to be converging on the importance of both training <i>and</i> consultation for maintaining fidelity and maximizing the success of implementation.
Feasibility	Extent to which this intervention can be successfully used or carried out within a given agency or setting such as the ability to take on the demands of this intervention and resources to do so
Evidence from: ☐ Clinical study ☒ Implementation study ☒ Leadership ☒ Other stakeholder input ☐ No evidence	The intervention is generally perceived as relatively low-cost and low-demand, and resources required for the intervention are inexpensive and generally available in most systems of care (i.e., index cards and pens). The greatest expense involves up-front costs for training and consultation, but there are little to no ongoing material costs. In addition, the CRP can be learned and implemented by professionals and paraprofessionals with master's or even bachelor's degrees, thereby enhancing its feasibility. The primary feasibility barrier we have encountered is agency and clinician support for ongoing consultation after the training. Specifically, many clinicians initially believe that they do not need additional consultation, and agencies are sometimes reluctant to set aside time for this. When clinicians and agencies do engage in this activity, however, they generally provide very positive feedback and report that it was worthwhile.
Maintenance and Cost How well does the adoption or use of this intervention hold up in the long term and the extent to which it becomes institutionalized	

Sustainability	Extent to which this intervention has been maintained or institutionalized within a service setting's ongoing, stable operations (presuming it was implemented)
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	The following agencies/organizations have indicated sustained use of the CRP subsequent to initial training and implementation: • Salt Lake City VA • Federal Bureau of Prisons • Lackland Air Force Base • Randolph Air Force Base • STRONG STAR Research Consortium • Correct Care Solutions Agencies and organizations appear to be more willing to institutionalize the CRP over the long term when they have committed to ongoing consultation and/or multiple training workshops. Agencies and organizations that schedule a single training with no follow-up appear to be less likely to institutionalize the procedure.
Cost	Cost impact of the implementation effort including: costs of this intervention itself, the implementation of the intervention and the location of service delivery
Evidence from: ☒ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	Cost of the intervention The estimated cost of the CRP is 2 cents per administration. This entails the approximate cost of an index card. Costs of implementation The estimated cost of CRP implementation ranges from approximately \$11,000 to \$13,000 per workshop of 50 individuals. This includes travel, a copy of the CRP pocket guide for each participant, and follow-up consultation calls. Costs of the location of service delivery There are no anticipated costs associated with the location of service delivery.

ⁱ POC is the person DoD or other military partners should contact for more information about the intervention and its dissemination and implementation.

ⁱⁱ Recruitment site is where study participants were identified and recruited (e.g. Fort Carson or Portland VA). If online, please provide recruitment strategy or sites where the study was advertised.

ⁱⁱⁱ Suicidity Outcome must be suicidal ideation or behavior. Other risk factors such as hopelessness and depression are considered other target outcomes.

^{iv} Other Target Outcome is either the outcome or the mechanism of your study.

^v Clinical study would be any study where the focus was outcomes for the clients – efficacy or effectiveness RCT, pilot study, adaptation to a new setting where the focus was client outcomes.

^{vi} Implementation study would be a formal study where the focus was not client outcomes from the intervention but its uptake, acceptability, feasibility, reach, sustainability, etc.

vii Leadership feedback ranges from a clinical guideline or other mandate to more informal input such as focus groups, response to briefings on the intervention, etc.

viii Other stakeholder input would include input from clinicians, other staff such as chaplains, Service Members and their families, Veterans, information technology or other relevant administrative staff, etc.

ix Quality of Evidence for Clinical Intervention categories

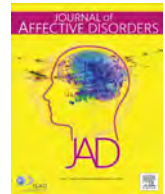
- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.



Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad



Research paper

Effect of crisis response planning vs. contracts for safety on suicide risk in U.S. Army Soldiers: A randomized clinical trial[☆]



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ARTICLE INFO

Keywords:

Military
Suicide
Psychotherapy
Crisis response plan
Safety plan
Contract for safety

ABSTRACT

Objective: To evaluate the effectiveness of crisis response planning for the prevention of suicide attempts.

Method: Randomized clinical trial of active duty Army Soldiers (N=97) at Fort Carson, Colorado, presenting for an emergency behavioral health appointment. Participants were randomly assigned to receive a contract for safety, a standard crisis response plan, or an enhanced crisis response plan. Incidence of suicide attempts during follow-up was assessed with the Suicide Attempt Self-Injury Interview. Inclusion criteria were the presence of suicidal ideation during the past week and/or a lifetime history of suicide attempt. Exclusion criteria were the presence of a medical condition that precluded informed consent (e.g., active psychosis, mania). Survival curve analyses were used to determine efficacy on time to first suicide attempt. Longitudinal mixed effects models were used to determine efficacy on severity of suicide ideation and follow-up mental health care utilization.

Results: From baseline to the 6-month follow-up, 3 participants receiving a crisis response plan (estimated proportion: 5%) and 5 participants receiving a contract for safety (estimated proportion: 19%) attempted suicide (log-rank $\chi^2(1)=4.85$, $p=0.028$; hazard ratio=0.24, 95% CI=0.06–0.96), suggesting a 76% reduction in suicide attempts. Crisis response planning was associated with significantly faster decline in suicide ideation ($F(3,195)=18.64$, $p<0.001$) and fewer inpatient hospitalization days ($F(1,82)=7.41$, $p<0.001$). There were no differences between the enhanced and standard crisis response plan conditions.

Conclusion: Crisis response planning was more effective than a contract for safety in preventing suicide attempts, resolving suicide ideation, and reducing inpatient hospitalization among high-risk active duty Soldiers.

1. Introduction

Due to the rapid rise in U.S. Army suicides (Schoenbaum et al., 2014), interest in developing effective strategies to prevent suicidal behavior in the military has increased. Recent findings indicate that brief cognitive behavioral therapy (CBT), a 12-session outpatient psychotherapy, reduced suicide attempts by 60% in a sample of active duty Soldiers (Rudd et al., 2015). Unfortunately, during the month preceding their deaths, Soldiers who die by suicide are much less likely to visit a mental health clinic as they are to visit nonpsychiatric clinical settings (e.g., primary care, family medicine, emergency medicine) (Trofimovich et al., 2012), suggesting the majority of at-risk Soldiers

are unlikely to receive such treatments. Suicide rates in the U.S. general population have also risen during the past decade, prompting the Joint Commission to release an updated Sentinel Event Alert focused on the assessment and treatment of suicidal patients across all health care settings (The Joint Commission, 2016). Effective, highly transportable risk management strategies that can be easily implemented are therefore needed.

One widely-used strategy is the contract for safety, also known as the no-suicide contract, which entails eliciting a commitment from the suicidal patient to avoid engaging in suicidal behavior (Simon, 1999; Weiss, 2001; Range et al., 2002; Assey, 1985; Callahan, 1996; Kelly and Knudson, 2000; Kroll, 2000). Despite widespread use across

[☆] ClinicalTrials.gov Identifier: NCT02042131

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<http://dx.doi.org/10.1016/j.jad.2017.01.028>

Received 20 October 2016; Received in revised form 4 January 2017; Accepted 22 January 2017

Available online 23 January 2017

0165-0327/ © 2017 Published by Elsevier B.V.

medical disciplines, accumulating consensus is that contracting for safety may be ineffective (Kelly and Knudson, 2000; Reid, 1998; Shaffer and Pfeffer, 2001; Stanford et al., 1994) or potentially even harmful (Shaffer and Pfeffer, 2001; Rudd et al., 2006). The Joint Commission has therefore recommended (The Joint Commission, 2016) alternative strategies such as crisis response planning (Rudd et al., 2006; Bryan, 2010) and the related safety planning intervention (Stanley and Brown, 2012). Written on a small card, crisis response planning outlines steps for identifying one's personal warning signs, using coping strategies, activating social support, and accessing professional services (Rudd et al., 2006; Bryan, 2010; Stanley and Brown, 2012). The crisis response plan therefore outlines what to do during a crisis (i.e., use a range of coping strategies), an approach that sharply contrasts with the contract for safety, which outlines what *not* to do during a crisis (i.e., engage in suicidal behavior). Like the contract for safety, however, use of crisis response plans is largely based on clinicians' beliefs about effectiveness rather than actual empirical data (Kelly and Knudson, 2000; Hogan, 2016). Its adoption across psychiatric and nonpsychiatric health care settings (e.g., emergency departments, primary care clinics, inpatient psychiatric units, outpatient psychotherapy) has therefore occurred in the absence of explicit empirical testing.

The primary aim of the current study was to compare the effectiveness of crisis response planning on suicidal thoughts and behaviors during a 6-month follow-up period among active duty Soldiers as compared to supportive counseling with a verbal contract for safety. To this end, our first hypothesis was that crisis response planning would be significantly better than the contract for safety in reducing suicide attempts and suicide ideation. Recent evidence suggests that one mechanism of action contributing to reductions in suicide attempts in brief CBT is the strengthening of the patient's desire to live (Bryan et al., 2016). As such, we additionally sought to determine if the crisis response plan's effects could be enhanced by adding a component designed to clarify the patient's reasons for living. Our second hypothesis was that the enhanced crisis response plan would be significantly better than the standard crisis response plan and the contract for safety.

2. Methods

2.1. Participants and procedures

Participants were 97 active duty U.S. Army personnel (78% male) aged 19–53 years ($M=26.1$, $SD=6.4$) with active suicide ideation and/or a lifetime history of suicide attempt who voluntarily presented to a military medical clinic for an emergency behavioral health evaluation at Fort Carson, Colorado, from January to December 2013 and January 2015 to February 2016. There was a one-year gap in enrollment from January to December 2014 due to a temporary administrative closure of the study by the Madigan Army Medical Center's Institutional Review Board following staffing changes among collaborating Army personnel. The impact of this one-year delay on study outcomes is discussed below in the Data Analysis section.

Participants were recruited from the emergency department ($n=8$, 8.2%), the outpatient behavioral health clinic ($n=55$, 56.7%), and embedded behavioral health clinics ($n=34$, 35.1%) located at Fort Carson, Colorado. To maximize generalizability, the only exclusion criterion was an inability to provide informed consent due to impaired mental status (e.g., acute intoxication, psychosis, mania). Baseline characteristics of the sample are reported in Table 1. Inclusion criteria were the presence of suicide ideation during the past week and/or a lifetime history of suicide attempt; active duty military status; age 18 years or older; ability to speak English; and ability to understand and complete informed consent procedures. Soldiers were excluded if they had a medical or psychiatric condition that would preclude informed consent (e.g., active psychosis or mania).

Table 1

Baseline demographic and diagnostic characteristics.

Variable	All (n=97)	Treatment Condition		
		TAU (n=32)	CRP (n=32)	E-CRP (n=33)
Age, M (SD), y	26.1 (6.4)	25.4 (5.3)	27.0 (6.9)	26.0 (6.8)
Deployments, M (SD)	1.2 (1.2)	1.2 (1.1)	1.2 (1.2)	1.2 (1.4)
Military service, M (SD), y	5.4 (5.2)	5.3 (4.1)	5.9 (6.4)	4.9 (4.9)
Male gender, n (%)	76 (78)	24 (75)	24 (73)	28 (88)
Rank, n (%)				
E1–E4	73 (75)	22 (69)	24 (75)	27 (82)
E5–E6	15 (16)	5 (16)	4 (13)	6 (18)
E7–E9	4 (4)	2 (6)	2 (6)	0 (0)
Officer	5 (5)	3 (9)	2 (6)	0 (0)
Race, n (%)				
White	71 (74)	25 (78)	20 (65)	26 (79)
Black	17 (18)	6 (19)	7 (23)	4 (12)
Asian	4 (4)	1 (3)	1 (3)	2 (6)
Pacific Island	3 (3)	1 (3)	2 (7)	0 (0)
Native Amer.	8 (8)	2 (6)	1 (3)	5 (15)
Other	2 (2)	0 (0)	1 (3)	1 (3)
Hispanic ethnicity, n (%)	7 (7)	2 (6)	2 (7)	3 (9)
Psychiatric diagnosis, n (%)				
Any adjustment disorder	43 (44)	13 (41)	15 (47)	15 (46)
Any depressive disorder	38 (39)	16 (50)	9 (28)	13 (39)
Any bipolar disorder	15 (16)	6 (19)	5 (15)	4 (13)
Any anxiety disorder	19 (20)	6 (19)	7 (22)	6 (18)
Any stressor disorder	12 (12)	4 (13)	5 (16)	3 (9)
Any personality disorder	8 (8)	4 (13)	3 (9)	1 (3)
Any psychotic disorder	2 (2)	0 (0)	1 (3)	1 (3)
Suicide attempt history, n (%)				
0	43 (44)	11 (34)	15 (47)	17 (52)
1	24 (25)	8 (25)	8 (25)	8 (24)
2+	30 (31)	13 (41)	9 (28)	8 (24)
Referral location, n (%)				
Emergency department	7 (7)	2 (6)	2 (6)	3 (9)
Specialty behavioral health clinic	56 (58)	16 (50)	20 (63)	20 (61)
Embedded behavioral health team	34 (35)	14 (44)	10 (31)	10 (30)

Soldiers who presented to the emergency department or a behavioral health clinic for a voluntary emergency behavioral health appointment were referred to a research therapist if they reported recent suicide ideation and/or a lifetime history of suicide attempt on clinic paperwork. Research therapists conducted a suicide risk assessment using the Beck Scale for Suicide Ideation (described below) to determine eligibility. Soldiers meeting eligibility criteria were then informed about study procedures. To preserve participant blinding, Soldiers were informed that they would be assigned to “one of three interventions that are commonly used by health care providers.” The three interventions were referred to by number only (i.e., crisis response plan 1, 2, or 3). Soldiers were informed that all three interventions included some combination of supportive counseling, strategies to manage emotional distress, education about crisis services, and referrals to treatment services, and differed only with respect to how much of each element was included. After signing the informed consent document, research therapists administered a structured clinical interview focused on suicide attempt history. Upon completion, the participant completed self-report measures via laptop computer, after which the research therapist executed a computerized simple randomization procedure. Intervention group was designated by color (red, green, or blue) to prevent inadvertent breaking of blinding. The therapist selected the appropriate color-coded manual and administered the assigned intervention, which was audio recorded for fidelity.

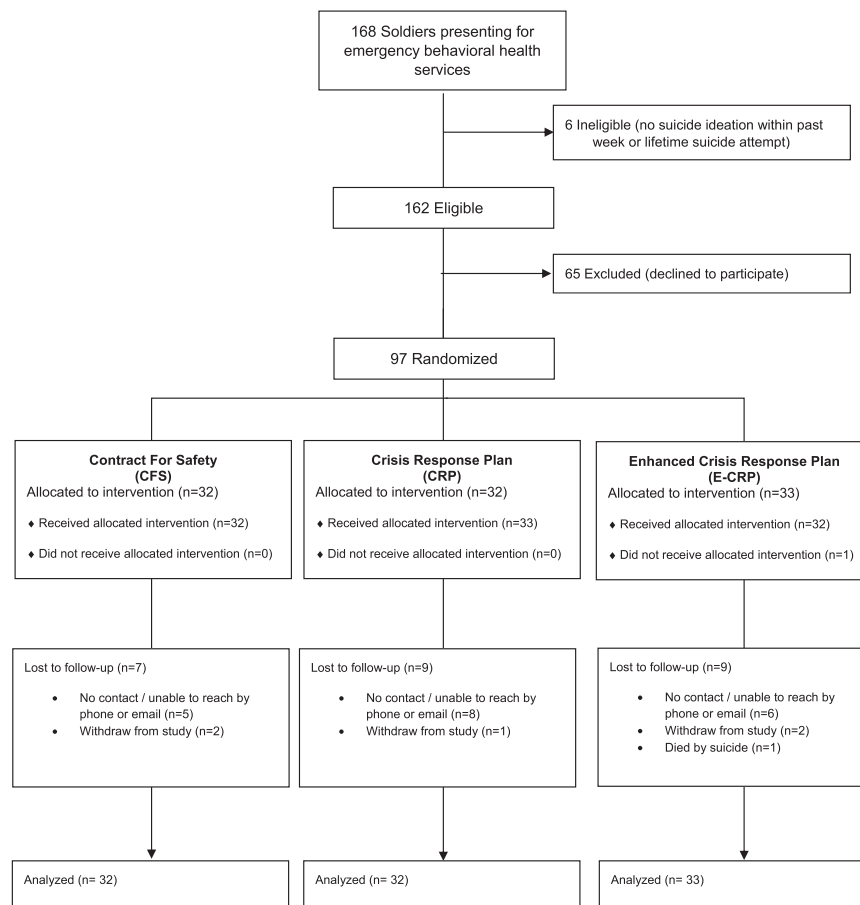


Fig. 1. Participant flow through a randomized clinical trial to prevent suicidal behavior in a sample of active duty U.S. Army Soldiers reporting recent suicide ideation or a history of suicide attempts.

monitoring. After the intervention was complete, participants completed several more self-report measures via laptop while the case was staffed with an on-call licensed Army mental health clinician in a separate room. Treatment assignment was not revealed to the on-call clinician, who made a disposition determination regarding psychiatric hospitalization.

2.2. Randomization

Participants were randomized to either the contract for safety (n=32), standard crisis response plan (n=32), or enhanced crisis response plan (n=33) group using a computerized randomization program created based on the RANUNI function available in the SAS software, constrained to produce equal numbers across groups. The flow of subjects through the study is shown in Fig. 1. Participants were allowed to continue all other forms of mental health and substance abuse treatment during the follow-up period across all three treatment groups. Treatment groups did not significantly differ with respect to any baseline variable.

2.3. Assessments

Research therapists were trained to conduct structured assessments by members of the investigative team who were clinical psychologists and had several years' experience administering and supervising the assessment interviews within the context of clinical trials (CJB and TAC). All interviews were recorded and reviewed by one of the trainers to ensure reliability and fidelity. Posttreatment assessments were conducted 1, 3, and 6 months after enrollment by a blinded independent evaluator who completed the assessments via phone interview

from a location separate from the treatment administration site. The evaluator's assessments were recorded and monitored for fidelity.

2.3.1. Outcome measures

The primary outcome was the occurrence of suicide attempts during the follow-up period. Suicide attempts were defined as behavior that is self-directed and deliberately results in injury or the potential for injury to oneself for which there is evidence, whether implicit or explicit, of suicidal intent (Crosby et al., 2011), and was assessed with the Suicide Attempt Self-Injury Interview (SASII) (Linehan et al., 2006a). The SASII is a structured clinical interview designed to assess the factors involved in nonfatal suicide attempts and nonsuicidal self-injury (e.g., method, lethality, impulsivity, subjective versus objective intent, reasons for the attempt, and consequences of the attempt). The SASII has high interrater reliability across the assessor-related items (median=0.96), and high consistency between retrospective report of suicide attempts as compared to weekly reports (ICC=0.91). Comparison of reports on the SASII relative to medical record verification has additionally supported the instrument's validity in assessing medical lethality and outcome.

The secondary outcomes were severity of suicide ideation and use of mental health services. Severity of suicide ideation was assessed with the Beck Scale for Suicide Ideation (BSSI) (Beck and Steer, 1991), a 19-item interviewer-administered scale that assesses the intensity of respondents' attitudes, behaviors, and plans to make a suicide attempt. Each item is scored on a 3-point scale, with higher scores indicating greater suicide risk. Items are summed to provide a metric of suicide risk severity. The BSSI has very good internal consistency (> 0.89) and interrater reliability (0.83) (Beck et al., 1979), and is associated with eventual death by suicide (Brown et al., 2000). Use of mental health

Table 2
Components of the three treatment conditions.

Component	Description	TAU	CRP	E-CRP
Suicide risk assessment	Therapist conducts a semi-structured interview of recent suicide ideation and lifetime history of suicide attempts	✓	✓	✓
Supportive listening	Therapist and patient have unstructured conversation about recent stressors and current complaints; therapist expresses concern and support without discussing coping strategies or tips	✓	✓	✓
Warning signs	Therapist and patient collaboratively identify “clear signs that you’re in a crisis or are really stressed out,” whether behavioral, cognitive, affective, or physical	–	✓	✓
Self-management skills	Therapist and patient collaboratively identify “some things you can do on your own that will help to distract you or to feel less stressed”	–	✓	✓
Reasons for living	Therapist and patient collaboratively identify “positive things in in our lives, or what is worth living for”; therapist directs patient to “tell me a story about these reasons for living”	–	–	✓
Social support	Therapist and patient collaboratively identify friends and family members who have “helped you during times of stress in the past, and who you feel comfortable contacting now when in crisis”	–	✓	✓
Crisis resources	Therapist provides phone numbers of medical providers and other professional sources of help, including the Military Crisis Hotline	✓	✓	✓
Referral to treatment	Therapist staffs case with on-call provider, schedules follow-up appointment with mental health care provider, and makes referrals to other professional resources	✓	✓	✓
Contract for safety	Therapist asks patient, “If you were to go home today, do you think you would be able to keep yourself safe?”	✓	–	–

Abbreviations: TAU, treatment as usual; CRP, crisis response plan; E-CRP, enhanced crisis response plan

services was assessed via medical record review and a modified version of the Cornell Services Index (CSI) (Sirey et al., 2005), an interviewer-administered scale that assesses the type and amount of medical visits accessed by respondents during the assessment period. The CSI has demonstrated good interrater reliability (ICC=0.83), especially for outpatient psychiatric visits (ICC=0.98) and inpatient psychiatric admissions (ICC=1.00).

2.4. Treatment Conditions

Descriptions of each treatment condition are summarized in Table 2. A fidelity monitoring scale (available upon request) was used to rate therapist adherence to the three interventions. The fidelity checklist entailed assessing the presence or absence of each component listed in Table 1. Fidelity was therefore determined by the inclusion of correct components as well as the exclusion of incorrect components. All intervention administrations were reviewed, scored, and discussed during individual weekly supervision with each therapist. A random selection of 15 cases were rated independently by two separate investigators, which yielded high interrater reliability estimates for each component (0.84–1.00). Overall fidelity ratings also correlated strongly with each other ($r=0.95$).

2.4.1. Contract for safety

The contract for safety was selected as the treatment as usual condition based on interviews with clinical providers prior to the start of the study, and was comprised of several commonly-used components when interacting with high-risk patients: suicide risk assessment, supportive listening, provision of crisis resources, referral to a mental health professional, and a verbal contract for safety. Crisis resources were written on an index card by the therapist and handed to the patient. Specific to the verbal contract for safety, therapists asked patients the following question: “If you were to go home today, do you think you would be able to keep yourself safe?”

2.4.2. Standard crisis response plan

The standard crisis response plan was comprised of the same components as the contract for safety, with the exception of the verbal contract for safety. The standard crisis response plan additionally included a collaborative process in which the patient and therapist identified the patient’s personal warning signs for an emotional crisis, self-management coping skills, and sources of social support. These components were written on an index card by the patient.

2.4.3. Enhanced crisis response plan

The enhanced crisis response plan was comprised of the same components as the standard crisis response plan, but additionally included an explicit discussion of the patient’s reasons for living. The patient’s reasons for living were written on the back side of the index card containing the written crisis response plan.

2.5. Therapists

A total of four female clinical social workers delivered the three interventions. Two therapists were licensed, one was unlicensed, and one achieved licensure during the course of the study. Clinical experience ranged from 1 to over 15 years. Therapists were trained and monitored by two of the investigators who were experts in each condition (CJB and TAC). In order to maximize generalizability, research therapists conducted all procedures within the military medical system and followed all military and local requirements for patient care, to include documenting the clinical encounter in the military’s electronic medical record.

3. Statistical analysis

All analyses were conducted using an intent-to-treat approach. Primary analyses focused on the effect of treatment group on suicide attempt rates, severity of suicide ideation, and mental health care utilization during follow-up. Estimated proportions of participants in each treatment group who attempted suicide during follow-up were calculated using the Kaplan-Meier method. The log-rank statistic was used for the test of group differences in suicide attempt rates. Hazard ratios were calculated using the Cox proportional hazards model with censoring for participants who were lost to follow-up or did not attempt suicide. For suicide ideation, longitudinal generalized mixed models for Poisson and negative binomial distributions with a variance components covariance matrix were used. Fixed effects included treatment condition, time, and their interaction, and a random intercept was specified. Post-hoc pairwise contrasts were used to evaluate between-group differences at each time point. For post-intervention mental health utilization, generalized linear models for Poisson distributions was used.

Because the components comprising the two crisis response plans were additive in nature (i.e., the enhanced crisis response plan contained all of the elements as the standard crisis response plan, but added one unique component intended to enhance its effect), the data analytic approach reflected ordered effects (i.e., enhanced crisis response plan > standard crisis response plan > contract for safety).

Table 3

Number and proportion of suicide attempts during follow-up across treatment groups, by study phase, with between-group comparisons.

	E-CRP	CRP	CFS	Log-rank χ^2			
				E-CRP vs. CRP	E-CRP vs. CFS	CRP vs. CFS	CRP _{comb} vs. CVS
Phase 1	1/20 (5%)	0/15 (0%)	3/20 (20%)	0.12	2.45*	4.21**	4.51**
Phase 2	1/13 (8%)	1/17 (6%)	2/12 (18%)	0.05	0.58	0.91	1.05
Aggregate	2/33 (5%)	1/32 (3%)	5/32 (19%)	0.14	2.70*	4.22**	4.78**

* $p < 0.10$.

** $p < 0.05$.

To determine the comparative effectiveness of crisis response planning to the contract for safety, we first compared the two crisis response plans, combined together, to the contract for safety. Next, to determine if the additional component in the enhanced crisis response plan provided incremental benefit, we compared each crisis response plan group (i.e., enhanced and standard) to each other and to the contract for safety group.

3.1. Effect of study closure on outcomes

Staffing changes at the research site resulted in a one year suspension of recruitment by the IRB and, ultimately, the inability to meet planned recruitment goals. In all, 97 participants were enrolled (54 and 43 during the first and second phases, respectively), approximately one-quarter the size of the original goal ($N=360$). Participants enrolled during the second phase reported significantly less severe baseline suicide ideation ($t(94)=2.85$, $p=0.005$) but did not differ on any other baseline variable. With regards to outcomes, suicide attempt rates during follow-up did not differ between study phases ($\chi^2(1)=0.11$, $p=0.736$), but trajectories of suicide ideation significantly differed between phases ($F(6184)=4.89$, $p < 0.001$). Analyses were therefore conducted separately for each study phase and then conducted in the aggregate with baseline suicide ideation entered as a covariate to

determine if different patterns existed.

3.2. Power analysis

Our initial power analysis was based on previously published suicide attempt rates among treatment-seeking active duty Soldiers with similar inclusion criteria (Rudd et al., 2015). We assumed a 50% difference in suicide attempts between crisis response planning and the contract for safety (i.e., hypothesis 1). Assuming 20% attrition and a 2:1 allocation ratio (due to the inclusion of two crisis response plan groups), a minimum sample size of 96 (64 in crisis response planning, 32 in contract for safety) was sufficient to provide 80% power. We expected a much smaller difference between the enhanced and standard crisis response plan conditions, however, due to the fact that both were both active and similar treatments. In order to achieve 80% power to detect a 50% difference in suicide attempt rates between these two conditions (i.e., hypothesis 2), a minimum sample size of 360 participants (120 per arm) was required. Following the one-year study closure, this recruitment goal was determined to be unachievable, but the recruitment of 96 participants was achievable. As such, we focused on reaching this recruitment goal instead of altering our study design or power assumptions.

3.3. Treatment dropout and missing data

There were no differences between groups with respect to dropout rates from follow-up assessments ($\chi^2(2)=0.26$, $p=0.880$): enhanced crisis response plan, $n=9$ (27%); standard crisis response plan, $n=9$ (28%); contract for safety, $n=7$ (22%). The combined dropout rate for crisis response planning was $n=18$, (28%). Results of pattern mixture model analyses indicated that findings were not biased by dropouts or missing data.

4. Results

4.1. Suicide attempts

A total of 8 suicide attempts occurred across all treatment groups during the 6-month follow-up, to include one death by suicide in enhanced crisis response plan: enhanced crisis response plan, $n=2$

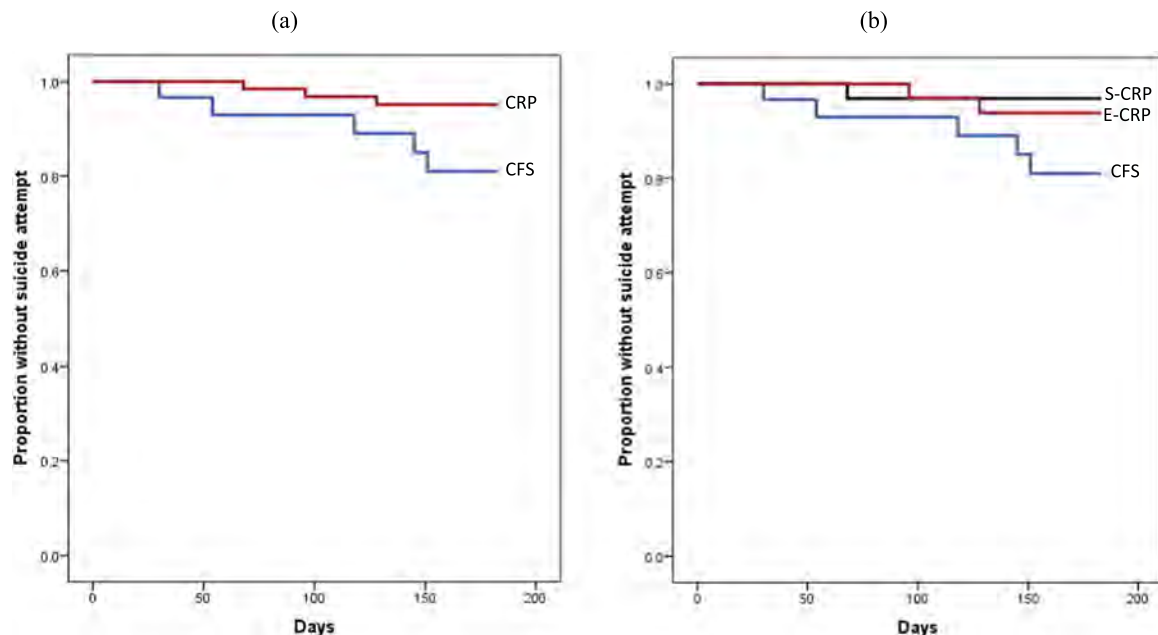


Fig. 2. Survival curves for time to first suicide attempt or end of study among suicidal active duty Soldiers receiving (a) the contract for safety (CFS) or a crisis response plan (CRP); and (b) the contract for safety (CFS), standard crisis response plan (s-CRP), or enhanced crisis response plan (E-CRP).

(estimated proportion: 6.2%); standard crisis response plan $n=1$ (estimated proportion: 3.1%); and contract for safety, $n=5$ (estimated proportion: 19.0%). The number and proportion of follow-up suicide attempts by treatment group and study phase were similar across both phases of treatment (see Table 3). Survival curves are plotted in Fig. 2a. Results indicated there was a statistically significant difference between crisis response planning and the contract for safety (estimated proportions: 4.9% vs. 19.0%; log-rank $\chi^2(1)=4.85$, $p=0.028$). The hazard ratio from this analysis was 0.24 (95% CI=0.06–0.96), indicating that participants with a crisis response plan were approximately 76% less likely to attempt suicide during follow-up than participants with a contract for safety. When controlling for baseline suicide ideation severity, the adjusted hazard ratio fell shy of statistical significance (hazard ratio=0.29, 95% confidence interval [CI]=0.06–1.18, $p=0.068$), but was only 5% smaller in magnitude than the unadjusted hazard ratio.

We next examined the effects of each crisis response plan separately (see Fig. 2b). Results indicate there was no difference between the enhanced and the standard crisis response plan (log-rank $\chi^2(1)=0.158$, $p=0.691$) or the enhanced crisis response plan and the contract for safety (log-rank $\chi^2(1)=2.70$, $p=0.100$). There was a statistically significant difference between the standard crisis response plan and the contract for safety (log-rank $\chi^2(1)=4.31$, $p=0.038$), however. The hazard ratio for this latter analysis was 0.15 (95% confidence interval [CI]=0.02–1.29), indicating that participants in the standard crisis response plan were approximately 85% less likely to attempt suicide than participants in the contract for safety. The 95% confidence interval for this analysis included the value of 1, however, suggesting this risk reduction fell short of statistical significance.

4.2. Suicide ideation

When comparing crisis response planning to the contract for safety, the treatment-by-time interaction was statistically significant for both the first ($F(3,111)=19.69$, $p<0.001$) and second ($F(3,78)=4.20$, $p=0.008$) phases of the study. Patterns of change in suicide ideation

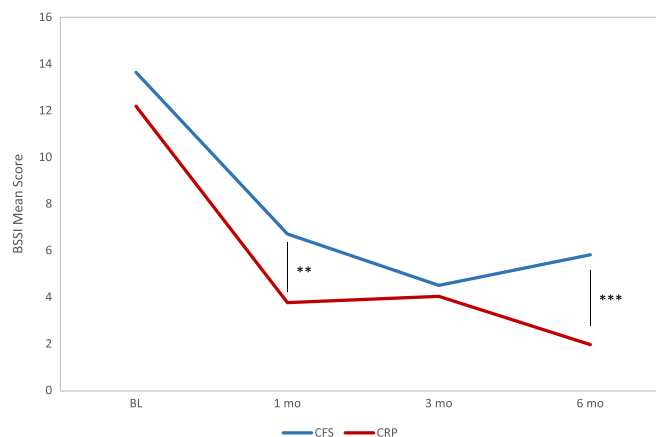


Fig. 3. Mean Beck Scale for Suicide Ideation (BSSI) scores over time among suicidal active duty Soldiers receiving a crisis response plan (CRP) versus the contract for safety (CFS). ** $p<0.01$, *** $p<0.001$.

both within and between groups were similar across both phases (see Table 4). Both phases were therefore combined together and study phase was entered as a covariate. The treatment-by-time interaction remained statistically significant ($F(3,195)=18.64$, $p<0.001$), indicating that suicide ideation declined at different rates across the three treatment groups. Post-hoc comparison of slopes indicated that suicide ideation declined significantly faster for crisis response planning than for contract for safety ($t(195)=4.46$, $p<0.001$; see Fig. 3).

When examining the effects of each crisis response plan separately, results yielded a statistically significant treatment-by-time interaction for both the first ($F(6,108)=13.12$, $p<0.001$) and second ($F(6,75)=2.37$, $p=0.038$) phases of the study, with similar patterns in both within- and between-group change. The rate of decline in suicide ideation was significantly faster in the enhanced ($t(192)=4.31$, $p<0.001$) and standard crisis response plan ($t(192)=2.96$, $p<0.001$) as compared to the contract for safety. There was no difference between the enhanced and the standard crisis response plan ($t(192)=1.41$,

Table 4

Change in suicide ideation mean scores and within- and between- group effect sizes over time, by treatment group and study phase.

	M (SD)			Test _{between}		d _{within} (95% CI) ^d			d _{between} (95% CI) ^e		
	CFS	S-CRP	E-CRP	F	p	CFS	S-CRP	E-CRP	CFS vs. S-CRP	CFS vs. E-CRP	S-CRP vs. E-CRP
Phase I											
BL	18.5 (6.6)	16.1 (5.0)	15.8 (6.9)	0.04	0.965	–	–	–	–0.4	–0.4	–0.1
1 mo	8.0 (10.7) ^{a,b}	4.9 (6.6) ^{a,c}	2.6 (5.2) ^{b,c}	10.36	< 0.001	–1.2	–1.9	–2.1	–0.3	–0.6	–0.4
3 mos	3.6 (6.8) ^a	3.7 (6.4) ^c	0.9 (3.2) ^{a,c}	7.36	0.001	–2.2	–2.2	–2.5	0.0	–0.5	–0.5
6 mos	5.1 (7.9) ^{a,b}	1.0 (2.5) ^a	0.7 (1.9) ^b	18.53	< 0.001	–1.9	–3.6	–2.7	–0.7	–0.7	–0.1
Phase II											
BL	14.6 (7.2)	13.3 (8.4)	11.2 (4.7)	0.10	0.907	–	–	–	–0.2	–0.6	–0.3
1 mo	8.0 (10.2)	5.7 (7.2)	5.1 (6.3)	0.49	0.612	–0.7	–0.9	–1.1	–0.3	–0.3	–0.1
3 mos	7.6 (8.1)	9.9 (9.8)	6.7 (7.9)	0.03	0.970	–0.9	–0.4	–0.7	0.3	–0.1	–0.4
6 mos	9.2 (9.3) ^b	6.7 (9.2)	3.8 (7.6) ^b	2.52	0.087	–0.6	–0.7	–1.2	–0.3	–0.6	–0.3
Combined Phases											
BL	17.0 (7.0)	14.7 (6.9)	13.9 (6.5)	0.18	0.834	–	–	–	–0.3	–0.5	–0.1
1 mo	8.0 (10.3) ^{a,b}	5.3 (6.8) ^a	3.6 (5.7) ^b	5.36	0.006	–1.0	–1.4	–1.7	–0.3	–0.5	–0.3
3 mos	5.3 (7.5)	6.8 (8.7) ^c	3.4 (6.2) ^c	4.82	0.009	–1.6	–1.0	–1.6	0.2	–0.3	–0.5
6 mos	6.7 (8.5) ^{a,b}	2.9 (6.0) ^a	2.0 (5.1) ^b	17.37	< 0.001	–1.3	–1.8	–2.0	–0.5	–0.7	–0.2

CFS=Contract For Safety; S-CRP=Standard Crisis Response Plan; E-CRP=Enhanced Crisis Response Plan.

^a CFS and CRP values significantly differ at unadjusted $p<0.05$.

^b CFS and E-CRP values significantly differ at unadjusted $p<0.05$.

^c CRP and E-CRP values significantly differ at unadjusted $p<0.05$.

^d For within-group effect sizes, positive coefficients indicate an increase in suicide ideation severity whereas negative coefficients indicate a decrease in suicide ideation severity relative to baseline.

^e For between-group effect sizes, positive coefficients indicate the first listed group has a higher mean score whereas negative coefficients indicate the second listed group has a higher mean score.

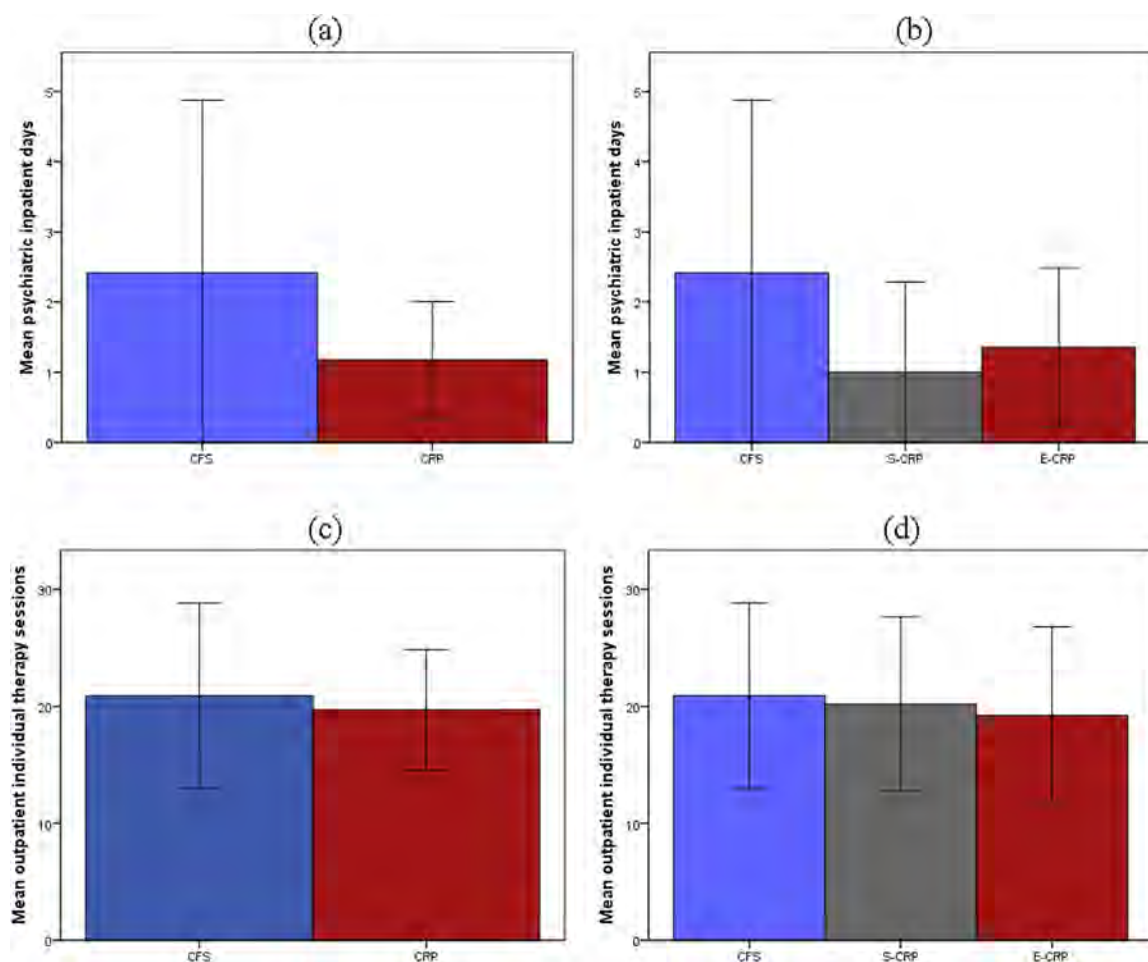


Fig. 4. Mental health care utilization during follow-up by treatment group: (a) mean psychiatric inpatient hospitalization days among contract for safety (CFS) and crisis response plan (CRP) participants; (b) mean psychiatric inpatient hospitalization days among CFS, standard CRP, and enhanced CRP participants; (c) mean outpatient individual therapy sessions among CFS and CRP participants; and (d) mean outpatient individual therapy sessions among CFS, standard CRP, and enhanced CRP participants.

$p=0.161$; (see Table 4).

4.3. Mental health service utilization

In terms of inpatient psychiatric hospitalization, crisis response planning was associated with significantly fewer inpatient days than the contract for safety ($F(1,82)=7.41$, $p < 0.001$; see Fig. 4a). The enhanced ($t(81)=3.58$, $p < 0.001$) and standard crisis response plans ($t(81)=2.74$, $p < 0.001$) each had significantly fewer inpatient days than the contract for safety, but the two crisis response plans did not differ from each other ($t(81)=1.01$, $p=0.313$; see Fig. 4b). There was no difference in mean number of outpatient individual therapy sessions between crisis response planning and the contract for safety ($F(1,82)=0.52$, $p=0.472$; see Fig. 4c). The enhanced crisis response plan, standard crisis response plan, and contract for safety similarly did not differ from each other ($F(2,81)=0.27$, $p=0.767$; see Fig. 4d).

5. Discussion

The focus of this randomized clinical trial was to compare the effectiveness of crisis response planning on the risk for follow-up suicide attempt and suicide ideation among active duty Soldiers presenting to military medical clinics for an emergency behavioral health appointment. Though commonly used across medical settings, the crisis response plan (and the related safety planning intervention) had not yet been definitely tested until now (Hogan, 2016). Consistent with our expectations, Soldiers who received a crisis response plan

were significantly less likely to make a suicide attempt during follow-up than Soldiers who received the contract for safety. Soldiers receiving a crisis response plan also experienced significantly faster reductions in suicide ideation. Contrary to our second prediction, however, there were no differences between the enhanced and the standard crisis response plans, suggesting that asking Soldiers about their reasons for living during a crisis response plan does not improve outcomes relative to a standard crisis response plan. This latter conclusion is made cautiously, however, in light of limited statistical power resulting from the IRB's temporary closure of the study, which hindered our ability to achieve our planned recruitment goal. As a result, there was insufficient power to detect differences between the two crisis response plan conditions. Additional studies with larger samples are needed to further test the effects of the crisis response plan's various components and to determine if enhancements can increase the intervention's magnitude of effect.

From a clinical perspective, these findings suggest that a Soldier's risk for suicidal behavior can be reduced for up to six months with a relatively simple intervention that emphasizes concrete steps to follow during an emotional crises. Because of its brevity and simplicity, the enhanced or standard crisis response plan could be feasibly implemented in a wide range of medical settings by a diverse range of health care professionals (e.g., physicians, nurses, mental health professionals). The observed effect in the present study (i.e., 75% decrease in suicide attempts) suggests that crisis response planning may be an especially potent component of treatments such as dialectical behavior therapy and CBT, each of which have been shown to reduce follow-up

suicide attempts by 50% or more (Rudd et al., 2015; Linehan et al., 2006a, 2015; Brown et al., 2005). Large reductions in suicide attempts have also been reported subsequent to a three-session outpatient psychotherapy that emphasizes crisis response planning (Gysin-Maillart et al., 2016). A recent component analysis of dialectical behavior therapy further suggests that skills training in self-monitoring of warning signs, self-management, and effective use of social support accounts for a larger portion of the treatment's overall effect than the individual therapy component (Linehan et al., 2015). The reductions in suicide attempts and ideation associated with crisis response planning in the present study were achieved concurrent with a reduction in inpatient hospitalization days, a pattern that also mirrors findings from dialectical behavior therapy and CBT (Rudd et al., 2015; Linehan et al., 2006b; Brown et al., 2005).

As noted previously, the crisis response plan shares many components with the safety planning intervention (i.e., identification of warning signs, self-management skills, social support, and crisis resources), although the safety planning intervention also includes a mean restriction counseling component (Stanley and Brown, 2012). To that end, the safety planning intervention is, in many respects, akin to an (alternative) enhanced crisis response plan. As noted by Hogan (Hogan, 2016), safety planning has not yet been definitely tested. However, preliminary data from an unrandomized cohort comparison study conducted in Department of Veterans Affairs (VA) emergency departments indicate the safety planning intervention is associated with reductions in suicide behavior reports, an administrative tool used by the VA to document known instances of suicide ideation, attempt, or death. In that study, the safety planning intervention was combined with weekly follow-up phone calls that continued until the patient initiated outpatient mental health care (mean=3.7 phone calls), resulting in a much higher “dose” of intervention than the single-session crisis response plan tested in the present study. In light of the present findings supporting the crisis response plan's efficacy, additional research is warranted to further clarify which components of the crisis response plan (and the safety planning intervention) contribute most directly to reductions in risk for suicidal thoughts and behaviors.

In addition to the aforementioned limitations related to statistical power, conclusions may have limited generalizability beyond active duty Army personnel. Due to the present study's small sample size, we were also unable to shed light on how clinical context might influence outcomes. Because the contextual demands of emergency departments differ from those of outpatient behavioral health clinics and primary care clinics, for example, future studies aimed at determining if the effects of crisis response planning are moderated by clinical context would be of benefit. Relatedly, additional research is needed to determine if the crisis response plan can be reliably implemented as a suicide prevention strategy outside of the health care system (e.g., schools, families, military units). Despite these limitations, the present study provides the first empirical evidence supporting the value of crisis response planning as a brief intervention to mitigate short-term risk of suicidal behavior among Soldiers presenting to emergency settings with acute suicidal crises.

Previous Presentations

European Symposium for Suicide and Suicidal Behavior, Oviedo, Spain, Sep 8–10, 2016.

Disclosures and acknowledgements

Drs. Bryan, Mintz, and Rudd report grant funding from the Department of Defense. Drs. Bryan and Rudd receive compensation for providing training and consultation specific to suicide risk management and the use of crisis response plans. No other disclosures were reported.

Funding/support

This study was supported in part by the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs under award #W81XWH-10-2-0181. Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the U.S. Government, the Department of Defense, the Department of the Army, or the MSRC.

Role of the Funder/Sponsor

The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

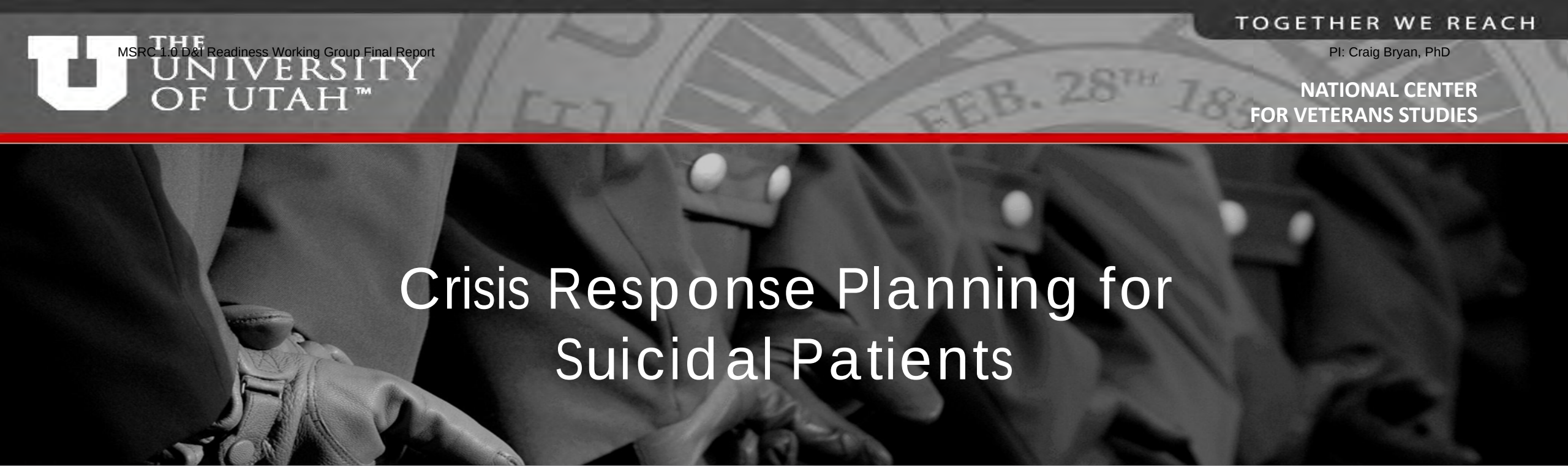
Acknowledgement

The authors would like to express their gratitude to AnnaBelle O. Bryan, MS, who assisted with regulatory compliance, records maintenance, and administrative support, and Brian Butler, PhD, who served as the study's medical monitor.

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Crisis Response Planning for Suicidal Patients

Craig J. Bryan, PsyD, ABPP
National Center for Veterans Studies
The University of Utah

What a Crisis Response Plan Is

a memory aid to
facilitate early
identification of
emotional crises

a checklist of
personalized strategies
to follow during
emotional crises

a problem solving tool

a collaboratively-
developed strategy for
managing acute
periods of risk

What a Crisis Response Plan Is Not

a no-suicide contract

a no-harm contract

a contract for safety

Essential Ingredients of Effective Interventions

1. Based on a simple, empirically-supported model
2. High fidelity by the clinician
3. Adherence by the patient
4. Emphasis on skills training
5. Prioritization of self-management
6. Easy access to crisis services

Crisis Response Planning: Effectiveness

CRP As Stand-Alone Intervention

Study	Design	Tx	Comparison Condition	Setting	Sample	Follow-Up	Attempt Rates
Bryan et al. (2017) N=97	RCT	Standard CRP & Enhanced CRP	TAU	ED, Outpt MH	Military, 78% male, 26 y	6 months	5% CRP vs. 19% TAU (76% rel. reduction)
Miller et al. (2017) N=1376	Quasi	Self-guided Safety Plan + f/u phone calls	TAU	ED	ED patients, 55% male, 56 y	12 months	18% SP vs. 23% TAU (20% rel. reduction)

Treatments With Embedded CRP

Study	Design	Tx	# of Sessions	Comparison Condition	Setting	Sample	Follow-Up	Findings
Brown et al. (2005) N=120	RCT	CT-SP	10	TAU	Outpt MH	Attempters, 40% male, 35 y	18 months	24% CT-SP vs. 42% TAU (50% rel. reduction)
Rudd et al. (2015) N=152	RCT	Brief CBT	12	TAU	Outpt MH	Military, 87% male, 27 y	24 months	14% BCBT vs. 40% TAU (60% rel. reduction)
Gysin-Maillart et al. (2016) N=120	RCT	ASSIP	3	TAU	Outpt MH	Attempters, 45% male, 38 y	24 months	5% ASSIP vs. 27% TAU (80% rel. reduction)

Understanding Suicidal Behaviors

Functional Model of Suicide

Reinforcement

Positive

Negative

Automatic
(Internal)

Adding something desirable
("To feel something")

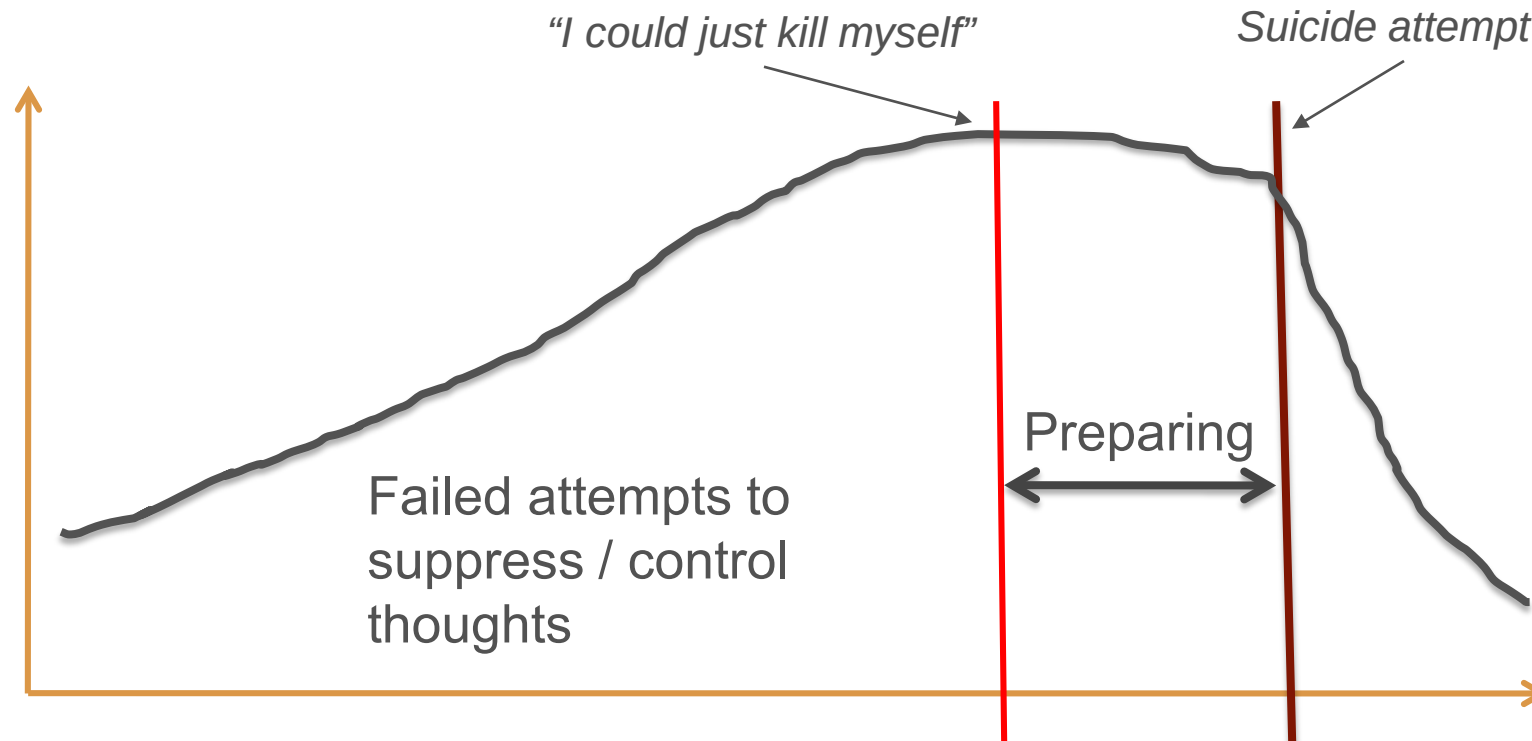
Reducing tension or negative affect
("To stop bad feelings")

Social
(External)

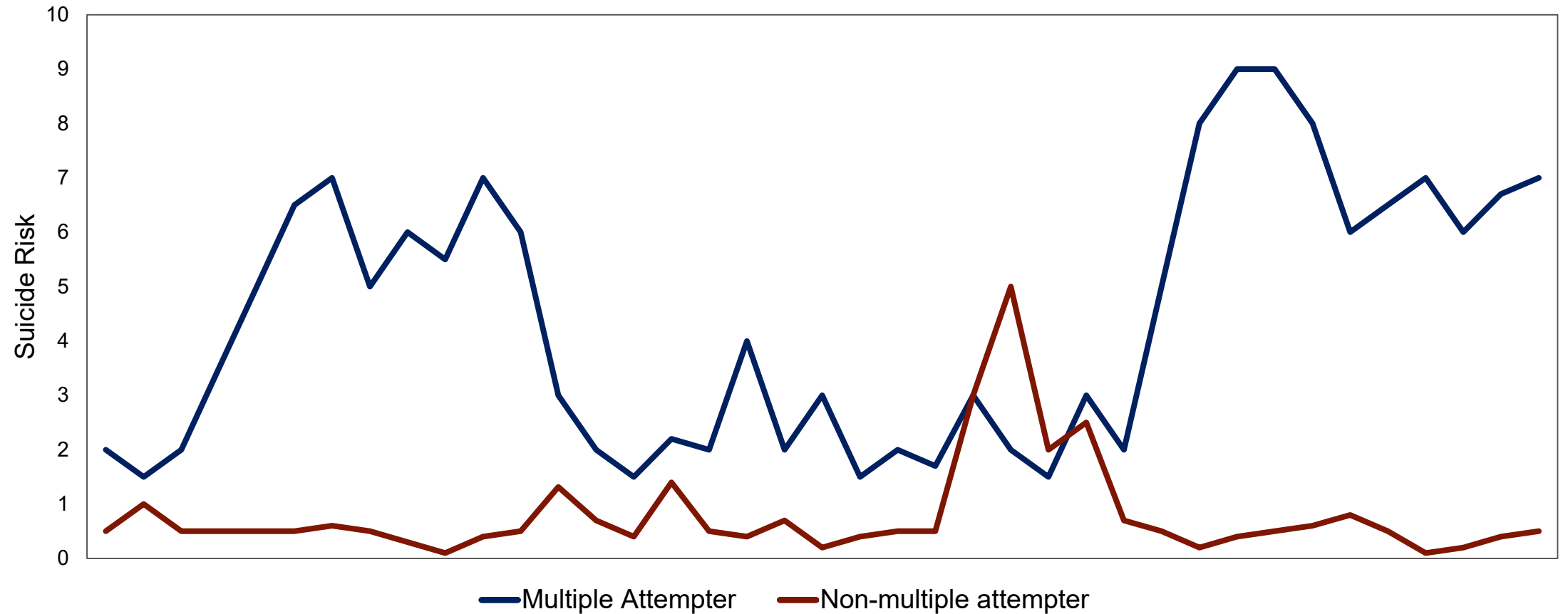
Gaining something from others
("To get attention or let others
know how I feel")

Escape interpersonal task demands
("To avoid punishment or doing
something undesirable")

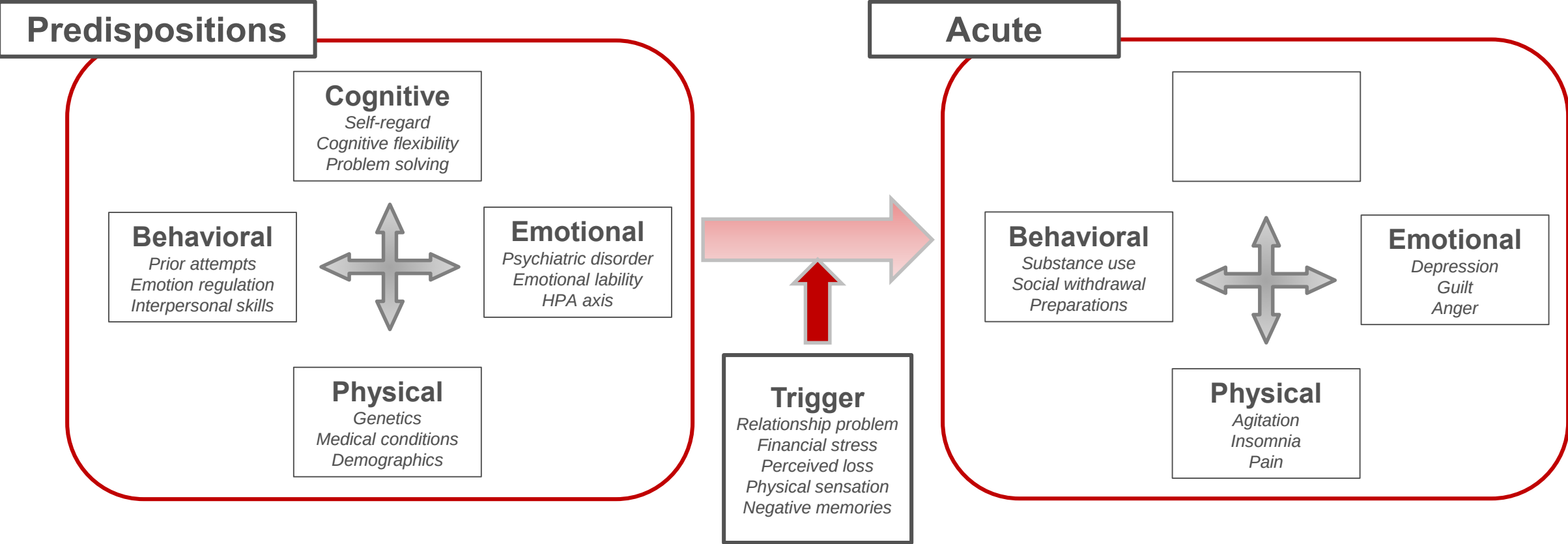
Negative Reinforcement



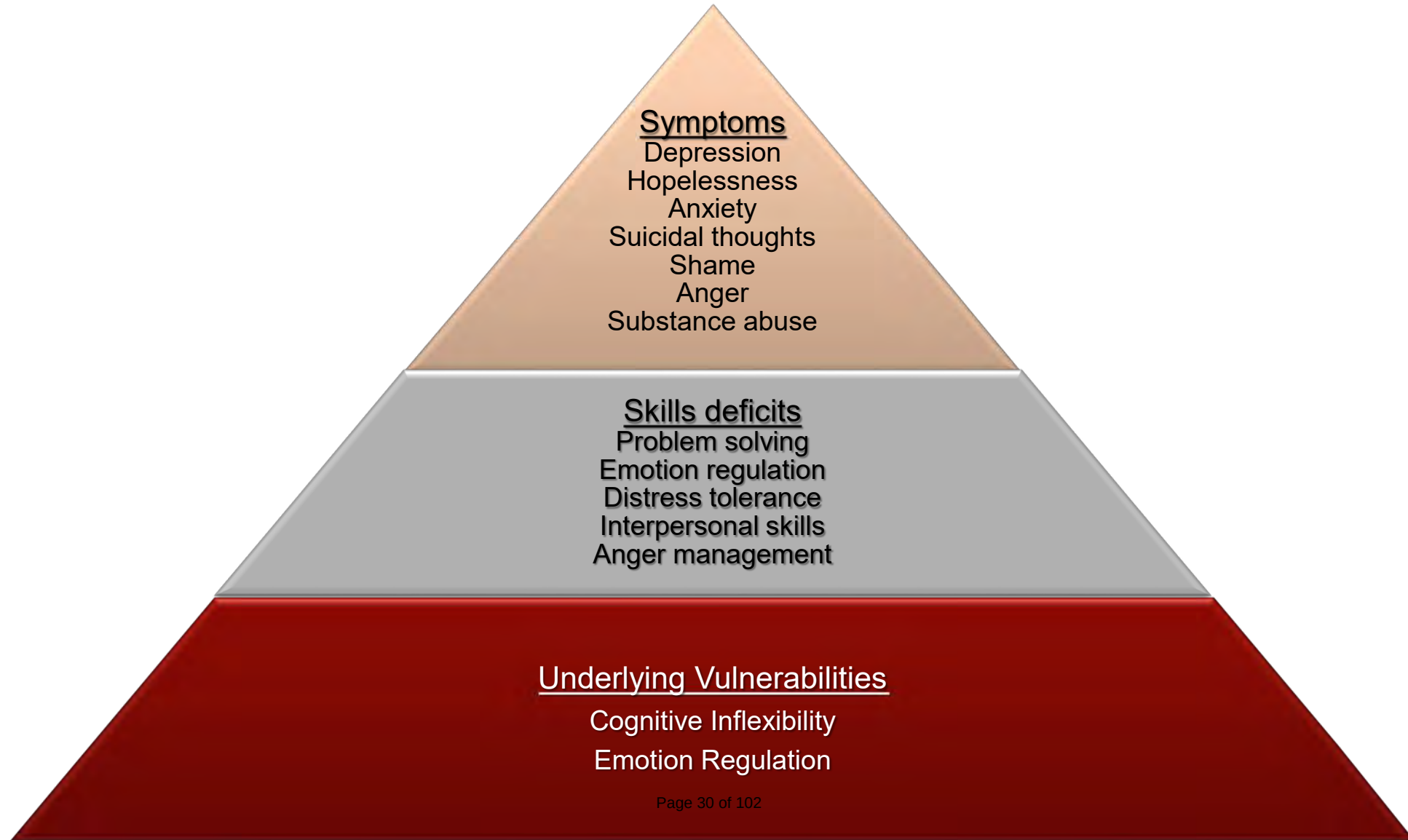
Stable and Dynamic Aspects of Suicide Risk



The Suicidal Mode



Multiple Levels of Suicide Risk



Common Reactions to Suicidal Individuals



Clinician vs. Suicidal Individual Goals

Clinician

prevent death
don't get sued

Suicidal Individual

alleviate suffering
solve the problem

Narrative Assessment: Mechanics

Narrative Assessment vs. Traditional Interview

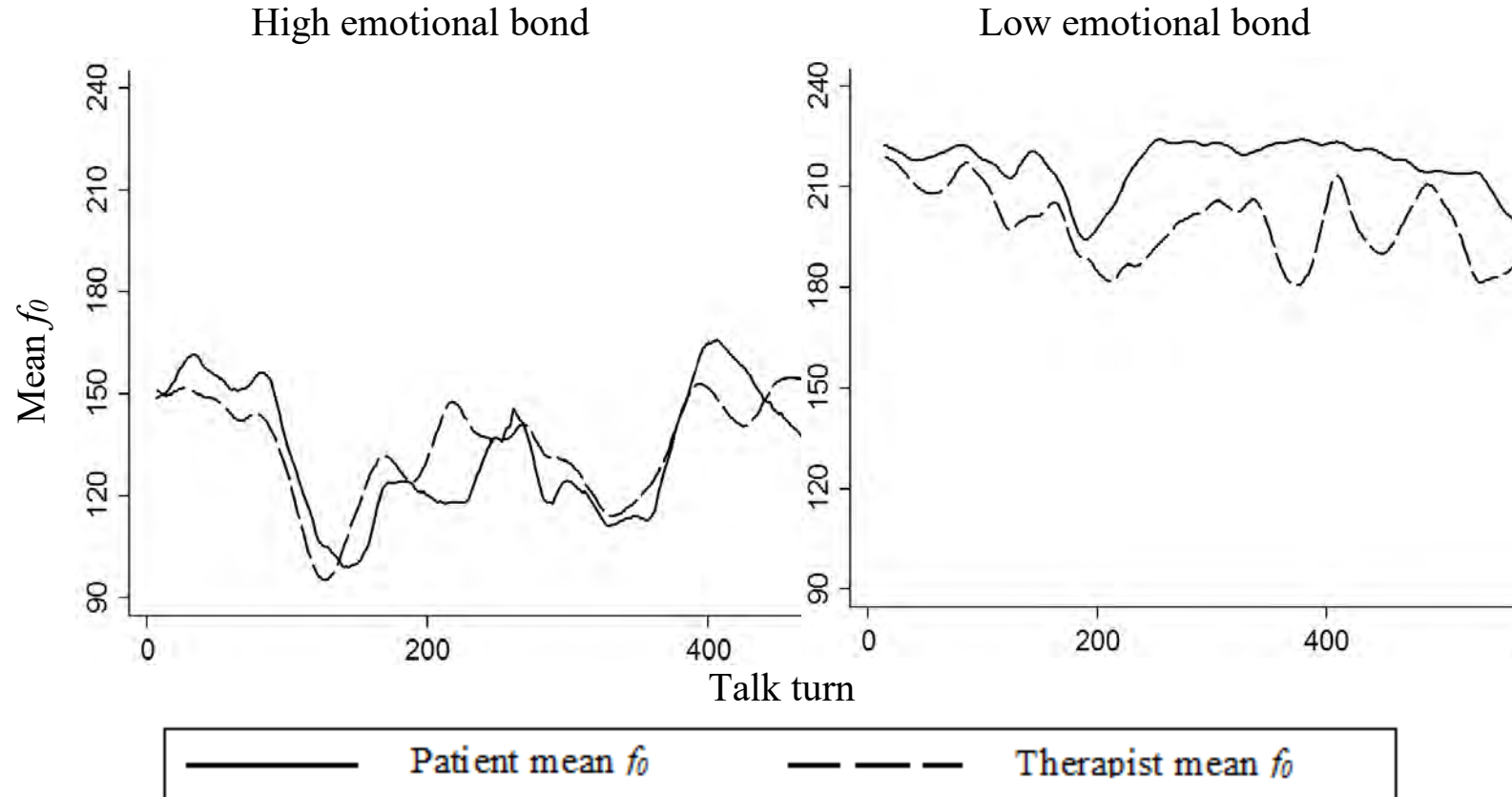
Narrative Assessment

- Higher empathy ratings
- Higher affective synchrony
- Emotional co-regulation
- Lower speech complexity

Traditional Interview

- Lower empathy ratings
- Lower affective synchrony
- Emotional co-dysregulation
- Greater speech complexity

Moment-to-Moment Synchrony & Empathy



Lowess smoothed plots of two example cases demonstrating variability and synchrony in patient and clinician mean f_0 over time during the intervention phase of emergency behavioral health encounters rated as high (left panel) and low (right panel) in emotional bond. (Note: bandwidth = .1).

Narrative Assessment

Ask patient to describe the chronology of events for the suicidal episode that led up to the crisis

- “Let’s talk about your suicide attempt/what’s been going on lately.”
- “Can you tell me the story of what happened?”

Assess events, thoughts, emotions, physical sensations, and behaviors

- “What happened next?”
- “And then what happened?”
- “What were you saying to yourself at that point?”
- “Did you notice any sensations in your body at that point?”

Narrative Assessment: Practice

Narrative Assessment

Ask patient to describe the chronology of events for the suicidal episode that led up to the crisis

- “Let’s talk about your suicide attempt/what’s been going on lately.”
- “Can you tell me the story of what happened?”

Assess events, thoughts, emotions, physical sensations, and behaviors

- “What happened next?”
- “And then what happened?”
- “What were you saying to yourself at that point?”
- “Did you notice any sensations in your body at that point?”

Crisis Response Planning: Mechanics

Crisis Response Plan

1. Explain rationale for CRP
2. Provide card for patient to record CRP
3. Identify personal warning signs
4. Identify self-management strategies
5. Identify reasons for living
6. Identify social supports
7. Provide crisis / emergency steps
8. Verbally review and rate likelihood of use

Introducing the Crisis Response Plan

- It sounds like things haven't been going really well for you lately. Of all those issues and problems you described, which ones would you say you want to change the most?
- I can see how you got to that point. If you could change one thing about what's happening to you right now, what would that be?
- What would you like to be different about what's going on right now?

CRP Tips

- Use an index card or a business card.
- Avoid large paper or pre-printed forms.
- Ask individuals to handwrite their plan.

Warning Signs

- What are some of the things you notice inside of yourself during these situations?
- What are some of your indicators that things aren't going so well and are getting out of control?
- If we wanted to prevent this from happening in the future, how might we know when you're heading down this road?

CRP Tips

- Ask clarifying questions to obtain specific warning signs.
- Ensure the warning signs occur far enough in advance to be helpful.

Self-Management

- When feeling upset or stressed, what are some things that help you to calm down or feel less stressed?
- What are some things you used to find helpful when stressed, even if you don't do them anymore?

CRP Tips

- If unable to identify self-management strategies, ask about strategies that have worked in the past.
- If a strategy works in only one setting, ask about other strategies that can work in other settings.

Reasons for Living

- What are your reasons for living?
- What gives you a sense of purpose and meaning in life?
- What stands in the way of you killing yourself?

CRP Tips

- Ask the individual to describe their reasons for living in detail to increase their emotional vividness.
- If an individual says they have no reasons for living, reward by asking about what gets in the way of a suicide attempt.

Social Support

- When feeling stressed or upset, who helps to take your mind off of things or cheer you up?
- Who do you know who provides you with support during tough times?
- People often have a family member, friend, or coworker who supports them in times of need. Who would that person be in your life?

CRP Tips

- If an individual cannot identify a social support, provide some general suggestions.
- If an individual still cannot identify a social support, normalize the situation and move to the next step.

Emergency Support Services

- National Suicide Prevention Hotline: 1-800-273-TALK
- If you don't answer your phone, make sure the patient knows that in advance
- Include "go to the hospital or call 911" as the final step.

CRP Tips

- If an individual is reluctant to include a particular emergency service, invite them to explain why.
- Ask individuals if they would include emergency services even if unmotivated to use them.

Sample Crisis Response Plans

Warning Signs: pacing
feeling irritable
thinking "it'll never
get better"

- go for a walk 10 mins
- watch Friends episodes
- play with my dog
- think about my kids
 - vacation to beach in Florida
 - Christmas Day 2012
- call/text my Mom
or Jennifer
- call Dr. Brown: 555-555-5555
 - leave msg w/ name, time,
phone #
- 1-800-273-TALK
- go to hospital
- call 911

- ① crying ③ wanting to hit things
② getting angry ④ argument w/ wife
 ① ~~play videogames~~ ③ photography
 ② woodwork in garage ⑥ writing
 ③ go for walk ⑦ games on phone
④ breathing 10 mins ⑧ listen to ^{uplifting} music
 ⑤ talk to Bill
 ⑥ Dr. Smith: 555-555-5555 (voicemail)
 ⑦ Hotline: 1-800-273-2755
 ⑧ Hospital or 911

Reasons to live:

Mom	photography
wife	motorcycle rides
kids (Matt, Katie)	

Other Tips for Effective Crisis Response Planning

- Laminate the card
- Take a picture of the card to keep in their smart phone
- Complement with the “Virtual Hope Box” app

Crisis Response Planning: Practice

Crisis Response Plan

1. Explain rationale for CRP
2. Provide card for patient to record CRP
3. Identify personal warning signs
4. Identify self-management strategies
5. Identify reasons for living
6. Identify social supports
7. Provide crisis / emergency steps
8. Verbally review and rate likelihood of use

Questions?

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CRISIS RESPONSE PLAN

HELPING OTHERS HOLD ON

In this pocket reference, we provide example language that you can use to help encourage and guide an individual experiencing a suicidal or other intense emotional crisis. This sample language was based on recorded interviews and sessions with actual patients that were conducted by clinicians trained in crisis response planning. These sample scripts are provided to address one of the most commonly asked questions posed by individuals learning this approach: "What do I actually say when I'm talking with someone in crisis?"

The crisis response plan was initially developed in mental health care settings with licensed professionals (e.g., psychologists, psychiatrists, social workers), and was subsequently expanded to medical and health care professionals more broadly (e.g., physicians, nurses). We have since trained non-health care providers to use these techniques as well, based on the recognition that individuals in crisis are much more likely to be identified by a family member, friend, teacher, or first responder than a health care provider. The crisis response plan is therefore, in many respects, a form of "CPR for mental health." In that spirit, it often serves as the first step to helping someone in need and connecting them to higher levels of care. What we say (and how we say it) during a crisis can help someone choose life.

The Conceptual Foundation of Crisis Response Planning

The suicidal state is characterized by intense emotions, self-criticism, and a pessimistic outlook. During these periods of crisis, research has found that individuals vulnerable to making suicide attempts struggle to solve problems, especially when the strategies and solutions that worked for them in the past do not seem to work for the present situation. If an individual cannot think of other options, they may continue to use the old strategies even though they do not work. As a result, the person “gets stuck” in a vicious cycle. Over time, their emotions become more and more intense and they start to feel trapped and hopeless. As tunnel vision sets in, they lose the ability to take a step back and see their situation from a different perspective, and their risk for making a suicide attempt increases. The crisis response plan was designed to short-circuit this process.

The crisis response plan was first developed and articulated as an acute crisis management intervention within the context of outpatient cognitive behavioral therapy (CBT) for suicidal patients. Rudd, Joiner, and Rajab (2001) initially outlined three critical components of the crisis response plan:

1. Helping the individual clarify what triggered the crisis and improving his or her understanding of the thoughts, feelings, behaviors, and physical sensations that surround the crisis.
2. Identifying skills and strategies that are effective for reducing the suicidal crisis.
3. Providing easy access to emergency care and assistance in the event that the identified skills and strategies do not work or do not sufficiently resolve the crisis.

Rudd et al. emphasized that the crisis response plan should be constructed in a manner that facilitates self-management. In other words, suicidal individuals should be helped to identify solutions and strategies that are practical and easy to employ on their own, rather than emphasizing external sources of support (e.g., hospitalization, calling their mental health clinician). The emphasis on self-management is a core philosophy of the crisis response plan, as this approach helps the individual to develop a stronger sense of self-worth and to find personal meaning in his or her life. Consistent with this philosophical orientation, Rudd et al. stressed that when emergency care is accessed, it should be done in a manner that facilitates skill development and minimizes dependency.

expanded on these early foundational concepts and hypothesized that the crisis response plan accomplished the following, all of which have since been confirmed scientifically:

1. The crisis response plan helps to establish and maintain a collaborative relationship by engaging the individual as a partner in decision-making.
2. The crisis response plan reduces emotional distress by providing a specific and detailed plan that enhances the individual's understanding of the problem and a general sense of control over their situation.
3. The crisis response plan increases the individual's commitment to living and, by extension, enhances their commitment to treatment.
4. The crisis response plan facilitates appropriate use of crisis services.
5. The crisis response plan reduces suicidal behavior.

It is critical to note that the crisis response plan is not a contract for safety, no-suicide contract, or no-harm contract. Although these latter strategies are widely used across medical settings and the

health care system more broadly, they have never been shown to be effective for reducing suicide risk or preventing suicidal behavior. The crisis response plan differs from these other strategies in a number of ways.

CRISIS RESPONSE PLAN	CONTRACT FOR SAFETY
Outlines what to do during a crisis.	Outlines what not to do during a crisis.
Supports skills development, self-worth, and personal growth.	Reinforces dependency on others.
Strengthens the desire to live.	Does not impact suicidal desire or ambivalence.

New evidence from our recently completed treatment study indicates that the crisis response plan is significantly better than a contract for safety in two key ways: the crisis response plan reduces suicide attempts by 76 percent and leads to significantly faster resolution of suicidal thinking. These benefits of crisis response planning were gained while also decreasing inpatient psychiatric hospitalization, which indicates the technique reduces risk while promoting self-management.

Key Components of Crisis Response Planning

The crisis response plan seems to work best when it is handwritten on an index card or a business card, which are compact enough to fit in a pocket, purse, backpack, or bag. When written on larger sheets of paper (e.g., printer paper), individuals typically have to fold the plan up multiple times for safekeeping. We have found that folded pieces of paper are more likely to be misplaced or lost by suicidal individuals. Feedback from the suicidal individuals we have worked with indicates that index cards and business cards are preferred because they are more convenient and discreet.

We have also found that pre-printed crisis response plans (e.g., fill-in-the-blank style) are less effective because they are perceived as less personal. Pre-printed crisis response plans also run the risk of exposing deficits in the suicidal person's life, which can facilitate hopelessness and despair. If, for example, a suicidal individual is unable to identify sources of social support, this empty section of their pre-printed crisis response plan can become a glaring reminder of their loneliness and isolation. When using a blank index card, by contrast, this

missing section does not. Dr. Craig Bryan, PhD's response plan therefore serves as a reminder of the individual's available resources, which facilitates hope.

CRISIS RESPONSE PLANNING TIPS:

- Use a blank index card or business card.
- Avoid large pieces of paper or pre-printed templates.
- Ask individuals to **handwrite their plan on the card.**

Developing a Crisis Response Plan

Creating an effective crisis response plan entails several key steps:

1. Introducing the crisis response plan
2. Identifying personal warning signs
3. Identifying self-management strategies
4. Identifying reasons for living
5. Identifying social supports
6. Outlining steps to access emergency services
7. Reviewing the plan and obtaining buy-in

Understanding the Crisis

MSRC 1.0 D&I Readiness Working Group Final Report

Before creating a crisis response plan, we should first seek to understand the suicidal individual's situation, from their perspective. To do this, we can use an approach known as the narrative assessment. In the narrative assessment approach, we invite the individual in crisis to "tell us the story" of their situation, which could include a recent suicide attempt. For example, we might open the conversation by asking one of the following questions:

Would you mind sharing with me the story of what happened today?

Would you be willing to tell me the story of your suicide attempt?

Could you tell me what was going on at that time that led up to your suicidal thoughts?

The individual's narrative account of the crisis (or suicide attempt) helps us to understand the context of his or her situation. This helps us to see how the suicidal crisis fits into the bigger picture of his or her life. Suicidal crises do not appear out of blue, although sometimes this may seem to be the case. The narrative assessment allows us to identify the trajectory of emotions, thoughts, behaviors, and stressors leading up to the crisis. If we can map out the many links of the chain leading up to the

crisis, it becomes easier to see where the chain could possibly be broken in the future. To map out this chain of events, we can ask questions like the following:

What happened next?

And then what happened?

When that happened, what did you say to yourself?

What emotion did you feel at that point?

The narrative assessment approach therefore differs from the typical interview-based approach that has traditionally been used by health care providers to conduct a suicide risk assessment. Because the narrative assessment approach is less directive than an interview, many people (especially health care providers) worry that it will be too long to gather needed information from the suicidal person (e.g., "I don't have enough time for this."). In our experience, however, clinicians who adopt the narrative approach find that it does not take longer than a typical interview. In addition, clinicians often find that they obtain better information from the suicidal individual. This may be due to the fact that suicidal individuals are more likely to report that they feel understood and cared about during a narrative assessment as compared to an interview, which increases their willingness to talk about what they are thinking and feeling. The narrative assessment therefore seems to be a "win-win" strategy for both parties.

Transition from the narrative assessment by introducing the concept of the crisis response plan by briefly explaining its purpose. An effective strategy for transitioning to the crisis response plan is to ask the individual what they would like to change or how they would like for things to be different. Asking this question will enable you to identify priorities and goals that are personally meaningful and relevant, and will help you to connect the crisis response plan to these goals.

It sounds like things haven't been going really well for you lately. Of all those issues and problems you described, which ones would you say you want to change the most?

I can see now how you got to that point. Let me ask this: if you could change one thing about what's happening to you right now, what would you change?

What would you like to be different about what's going on right now?

Note that, in some cases, a suicidal person may not care much about suicide prevention. In this case, make sure to emphasize that the crisis response plan is aimed at helping to accomplish his or her change goals.

Ask the individual to list any thoughts, images, emotions, behaviors, physical sensations, or any symptoms or signs that would serve as a useful signal that a crisis is emerging. In many cases, the individual will have described these personal warning signs during the narrative assessment.

What are some of the things you notice inside of yourself during these situations?

What are some of your indicators that things aren't going so well and are getting out of control?

If we wanted to prevent this from happening in the future, how might we know when you're heading down this road?

Identify self-management strategies Working Group Final Report Identify reasons for living Bryan, PhD

Ask the individual to think of any activities or strategies that they have found helpful for reducing their stress or distracting them when upset, even if only for a short period of time. In order to foster the ability to self-manage crises and develop mastery of coping skills, these initial strategies should include activities that do not require the involvement or assistance of others, such as engaging in a hobby, practicing breathing exercises, going for a walk, playing with a pet, watching a movie, etc.

When feeling upset or stressed, what are some things that help you to calm down or feel less stressed?

What are some things you used to find helpful when stressed, even if you don't do them anymore?

CRISIS RESPONSE PLANNING TIPS:

- If an individual is unable to identify self-management strategies, ask about strategies that have worked in the past, even if the individual no longer uses them.
- If a strategy works in only one setting, ask about additional strategies that can work in other settings.

Ask the individual to think of their reasons for living by asking what prevents them from making a suicide attempt.

What are your reasons for living?

What gives you a sense of purpose and meaning in life?

What stands in the way of you killing yourself?

As the individual identifies their reasons for living, engage them in a brief, informal discussion about their reasons for living. For example, ask them to recount a story about their reasons for living, ask them to explain why they selected those reasons for living, or ask for details about the reasons for living (e.g., names of family members, breed of pets, specific location of a trip).

CRISIS RESPONSE PLANNING TIPS:

- Ask for details about reasons for living to increase their emotional vividness.
- If an individual says they have no reasons for living, reword the question by asking about what gets in the way of a suicide attempt.

Identify social support & Readiness Working Group Final Report

Ask the individual to identify one or two individuals who provide support or help him or her to feel better when emotional upset. Note that the individual does not necessarily have to tell these sources of support that he or she is contemplating suicide or is currently in crises; it is perfectly acceptable to talk about something else, to make plans for the weekend, or to reminisce about a shared memory.

When feeling stressed or upset, who helps to take your mind off of things or cheer you up?

Who do you know who provides you with support during tough times?

People often have a family member, friend, or coworker who supports them in times of need. Who would that person be in your life?

If the individual is unable to identify a supportive person, provide some possible suggestions. If the individual is still unable to think of a supportive person, normalize this situation and suggest that as a goal for future work.

That's okay; it's actually pretty common for people to have limited sources of support. It sounds like that might be something for us to work on together.

CRISIS RESPONSE PLANNING TIPS:

- If an individual says they have no sources of social support, provide some general suggestions (e.g., family, friends, coworkers).
- If an individual cannot identify a source of support after prompting, normalize the situation and move to the next step.

CRISIS RESPONSE PLANNING TIPS:

Provide the individual with information for accessing support from health care providers and other emergency crisis services (e.g., crisis hotlines, 911, emergency departments). If the individual is hesitant to include one or more of these steps, invite them to share their concerns. Validate these concerns and ask the individual if they would be willing to include emergency support services on the index card, even if they were skeptical or doubtful about its use. Another strategy is to ask if them to select the emergency support service that they feel most comfortable (or least uncomfortable) about, and ask if they would be willing to include only that option.

If you are a health care provider and will be including your phone number in this step, be sure provide an overview of what the individual can expect when calling. For example, if you do not answer your calls or have calls redirected to voicemail, explain this upfront. Similarly, if the process of leaving a voicemail requires several steps (e.g., pressing a button to get your mailbox), make sure to explain this. Add these additional steps to the crisis response plan so the individual does not forget about them during a crisis.

- If an individual is reluctant to include a particular emergency support service, invite them to explain why.
- Ask individuals if they would be willing to include an emergency support service on the plan even if they are not interested in using that option.
- If you include your number as an emergency service, be sure to include details about additional steps that may be required (e.g., mailbox numbers, leaving a voicemail).

CRISIS RESPONSE PLANNING TIPS:**Crisis Response Planning Tips:**

- Keep items brief and easy to understand.
- Avoid long, wordy sentences.

Review the plan and obtain buy-in

Ask the individual what they think about the plan and identify any problems. Ask them to rate the likelihood of using the plan when they experience their warning signs on a scale of 0 (not at all likely) to 10 (very likely). If the individual provides a rating lower than 7, ask them if what could be changed about the plan to increase their likelihood of using it.

Warning Signs: pacing
 PI: Craig Bryan, PhD
 feeling irritable
 thinking "it'll never
 get better"

-
- go for a walk 10 mins
 - watch Friends episodes
 - play with my dog
 - think about my kids
 - vacation to beach in Florida
 - Christmas Day 2012
 - call/text my Mom
 or Jennifer
 - call Dr. Brown: 555-555-5555
 - leave msg w/ name, time,
 phone #
 - 1-800-273-TALK
 - go to hospital
 - call 911

- ① crying
- ② wanting to hit things
- ③ getting angry
- ④ argument w/ wife
- ⑤ ~~play videogames~~ ⑤ photography
- ⑥ noob work in garage
- ⑦ writing
- ⑧ go for walk
- ⑨ games on phone
- ⑩ breathing 10 mins
- ⑪ listen to music ^{withing}
- ⑫ talk to Bill
- ⑬ Dr. Smith: 555-555-5555 (voicemail)
- ⑭ Hotline: 1-800-273-2755
- ⑮ Hospital or 911

Reasons to live:

Mom
wife
kids (Matt, Katie)

photography
motorcycle rides

Frequently Asked Questions

QUESTION: What if a suicidal person says they want to die and have no reasons for living?

ANSWER: Remember that the suicidal state is characterized by ambivalence, meaning that they both want to die and want to live at the same time. If someone is talking to you, it is safe to assume that a part of them wants to live, even if only a little bit. Validate the person's perspective and ask them to explain what gets in the way of their suicide (or what keeps them alive) despite their desire to die. For example:

Based on what you've told me, I can see why you wouldn't have much reason to live. Given you have such a strong desire to die, I wonder what it is that has kept you alive so far? What's getting in the way of your death?

QUESTION: I'm afraid that if I'm this direct and blunt about suicide, I might give someone ideas about how to kill themselves. Is it safe to ask so much about suicide?

ANSWER: This is a common misconception about helping suicidal individuals. Suicidal individuals are already thinking about suicide. On

the contrary, suicide risk typically decreases. Specific to the crisis response plan, research indicates that suicidal individuals calm down and feel less emotionally distressed when creating a crisis response plan with someone who expresses empathy and is nonjudgmental.

QUESTION: What if a suicidal person says they don't have any supportive people in their lives?

ANSWER: This is a relatively common situation. Indeed, the lack of social support is a factor that can contribute to suicide risk. If a suicidal person is unable to identify a supportive person, gently provide some suggestions to help jog their memory. In some cases, that is enough to identify someone. If the person is still unable to identify someone, don't dwell on the issue: normalize the experience, suggest the issue as a potential goal, and move on to the next session. For example:

It's okay if you can't think of anyone right now; that's actually fairly common. Maybe that's something we can talk about some more later and work on together. Let's go ahead and move to the next section.

QUESTION: I am not a mental health professional. What number should I give to someone in crisis?

ANSWER: Provide the number for a suicide crisis hotline. If your local community does not have a hotline, provide the National Suicide Lifeline number, which is available 24/7: 1-800-273-TALK (8255).

QUESTION: What if the person doesn't want to go to the hospital or call 911? What if they don't want to call a suicide hotline?

ANSWER: Ask the individual to explain their concerns. This may reveal negative assumptions about treatment or negative experiences they have had in the past. Ask if they would be willing to include the step on their plan, even if they don't think currently intend to use it. If they are reluctant to include multiple emergency services, ask them to rank order them in terms of disagreeableness or ask them which one would be more tolerable to include. These strategies ensure that the information is available to them in the event it needed in a crisis, but validates their concerns and respects their autonomy.

One method for rating the quality of a crisis response plan is providing an overall score using a self-assessment checklist. Higher scores indicate higher quality crisis response plans. A minimum score of 75% is required for a crisis response plan to be minimally acceptable.

Did you...

- ☐ Provide an index card?
- ☐ Explain what a crisis response plan is?
- ☐ Identify personal warning signs?
- ☐ Identify self-management strategies?
- ☐ Identify reasons for living?
- ☐ Identify sources of social support?
- ☐ List emergency support services?
- ☐ Assess the individual's buy-in and understanding?

Sample Crisis Response Plan

MSRC 21007 & 21008 Working Group Final

Warning signs

Pacing
Feeling angry
“I can’t take this anymore”

Things I will do on my own:

Go for a walk
Listen to some music
Play games on my phone

Reasons for living:

My kids (Tim and Lisa)
My wife (Susan)

Social support:

Call Susan (wife): 555-555-5555
Call John (friend): 555-555-5555

Crisis/professional assistance:

Call my doctor and
leave a message: 555-555-5555
Call hotline: 1-800-273-TALK
Crisis text line: 838255
Go to hospital
Call 911

Crisis Response Planning for Suicidal Patients Training Workshop Outline

This full-day workshop is designed to enhance professionals' knowledge about crisis response planning for managing acute suicide risk, and to increase their ability to confidently and competently administer this intervention with at-risk individuals. The first half of the workshop provides didactic knowledge about suicide, the development of the crisis response plan intervention, and its empirical support, all of which are designed to increase clinician knowledge. The second half of the workshop includes clinical demonstrations by the instructor and skills practice by attendees, which are designed for clinicians to acquire skill competency.

Outline of the training curriculum:

- I. Introduction
 - a. What a crisis response plan is and is not
 - b. Essential elements for suicide prevention interventions
 - c. Empirical evidence supporting the crisis response plan
- II. Understanding suicidal behaviors
 - a. The functional model of suicide
 - b. Stable and dynamic properties of suicide risk
 - c. Common reactions to suicidal patients
- III. The narrative assessment
 - a. Mechanics and general approach
 - b. Clinical demonstration
 - c. Role play
- IV. The crisis response plan
 - a. Mechanics and general approach
 - b. Clinical demonstration
 - c. Role play

Objectives:

1. To describe the primary motives for suicidal behavior
2. To effectively conduct a narrative assessment of the patient's index suicidal crisis
3. To identify the core components of a crisis response plan
4. To help a suicidal patient identify and implement strategies that can reduce their suicide risk

Chapter 7:

Narrative Assessment

After providing an overview of BCBT and describing the treatment's structure, the clinician conducts a narrative assessment of the index suicidal crisis. The index suicidal crisis refers to the most recent suicidal episode (which may or may not include a suicide attempt) that was most directly related to the patient seeking out or initiating the current course of treatment. For example, if the patient is initiating outpatient treatment following a discharge from inpatient psychiatric hospitalization subsequent to a suicide attempt, the clinician would focus the narrative assessment on the suicide attempt prompting the hospitalization. Alternatively, if the patient is resuming outpatient treatment due to the recurrence of a major depressive episode marked by severe suicide ideation and planning, the clinician would focus the narrative assessment on a recent suicidal crisis, typically the one identified by the patient as the "worst" crisis (i.e., the time during which he or she most intensely wanted to die by suicide). In the narrative assessment, the clinician seeks to obtain a detailed understanding of the contextual circumstances, thoughts, behaviors, feelings, and physical sensations associated with the index suicidal crisis. The clinician therefore seeks to identify in detail the sequence of events leading up to and following the suicidal crisis. The information gained from this narrative assessment serves as the basis for the suicide risk assessment, the case conceptualization, and the overall treatment plan.

Rationale

As the first major activity within BCBT, the narrative assessment serves several purposes. First, it is an alliance-building strategy. Suicidal individuals often feel that they have never really been "listened to," even by health care providers and mental health professionals.

For many patients, the narrative assessment is the first time they have been asked to tell the story of their suffering in their own words and at their own pace. By actively listening and asking clarifying questions regarding the sequence of events that led up to and surrounded the patient's suicidal episode, the clinician communicates interest and the desire to help. The second purpose of the narrative assessment is to obtain the information needed to form an accurate case conceptualization: the context and circumstances surrounding the suicidal episode, the "major players" involved, the patient's preferred coping strategies and behavioral responses, and the thoughts, feelings, and physiological experiences associated with the active suicidal mode. The third and final purpose of the narrative assessment is to obtain the information needed to assess the patient's risk for suicide and to document this risk assessment accordingly.

The narrative assessment approach differs markedly from the traditional suicide risk assessment interview format used by many clinicians. In a traditional suicide risk assessment interview, the clinician typically asks a series of questions regarding the presence (or absence) and nature of the patient's suicide risk and protective factors. Underlying this approach is an assumption that the patient is willing to disclose the requested information and is doing so with a high degree of accuracy. The process is largely, if not entirely, driven by the clinician, whereas the patient plays a relatively passive role. Depending on the work setting, the structure and flow of the suicide risk assessment interview is dictated by agency checklists and/or forms, which are required to be filled out by the clinician afterwards. Because these forms and checklists must be completed to meet agency procedural requirements, clinicians often fill in the forms during the interview. In these cases, agency forms often determine the specific sequence of interview questions because clinicians start at the top of the form and work their way down.

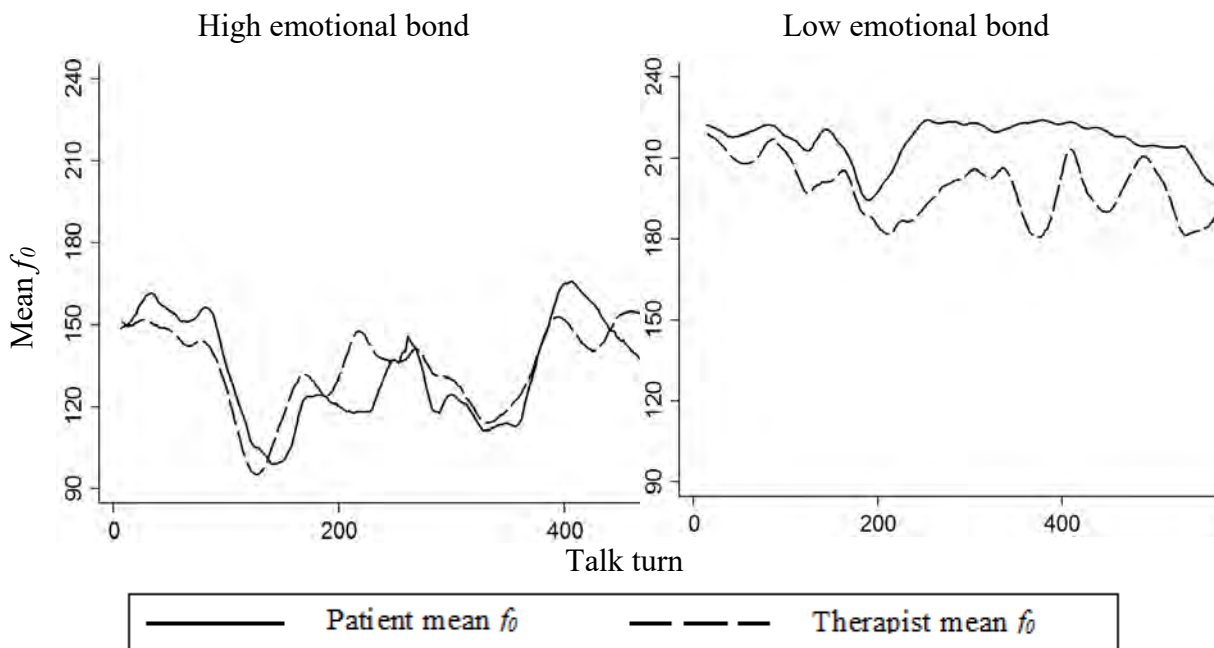
In contrast to the interview-based approach to suicide risk assessment, the narrative assessment approach invites the suicidal patient to “tell the story” of his or her suicide attempt or suicidal crisis. To conduct a narrative assessment, the clinician asks the patient to recount the chain of events leading up to the index suicidal crisis, which might also include a suicide attempt. The clinician initiates this process by asking the patient to tell the story of his or her suicidal crisis, “wherever the story begins.” The clinician then assists the patient in eliciting details about the internal experiences (e.g., thoughts, emotions, physical sensations) and external cues (e.g., sights, sounds, contextual circumstances) associated with the crisis, and concludes by validating the patient’s experience.

As compared to the traditional interview format, the narrative assessment facilitates the emergence of unique interpersonal processes that are conducive to treatment. First, the narrative assessment is associated with greater synchrony in emotional states between the clinician and the patient as compared to the traditional interview. Affective synchrony represents the degree to which the suicidal patient and the clinician match each other with respect to level of affective arousal and expression, which can be measured via a variety of methods, of which voice pitch is an especially practical and noninvasive method. Recent research indicates that synchronization of voice pitch between an acutely suicidal patient and his or her clinician serves as an objective marker of patient-rated empathy and emotional bonding (Bryan et al., 2017). The concept of affective synchrony is depicted in Figure 7-1. In this figure, the fundamental frequencies of two separate, acutely suicidal patients (represented by the dashed lines) and their clinicians (represented by the solid lines) are plotted on a moment-to-moment basis during an initial clinical encounter. Note that on the left-hand side, the patient and clinician show very similar levels of affective arousal and tend to track each other over the course of the session, which

signals emotional synchronization. On the righthand side, the patient and clinician initially show some signs of synchronization, but this does not endure for very long. This signals a lack of synchronization. Narrative assessments are more likely to be characterized by emotional synchrony, akin to the figure on the left, whereas interview assessments are more likely to be characterized by a lack of synchrony, akin to the figure on the right (Bryan et al., 2017).

Figure 7-1.

Two example cases demonstrating synchrony of emotional states among acutely suicidal patients and their clinicians. The figure on the left depicts high synchrony, and is characteristic of the narrative assessment process, whereas the figure on the right depicts low synchrony, which is characteristic of the traditional suicide risk interview.



A second way in which the narrative assessment positively impacts the treatment process is affective co-regulation. Affective regulation refers to the process by which an individual influences his or her own emotional state over time, specifically by calming him- or herself down. Affective *co*-regulation is similar, but entails an interpersonal process by which an individual influences the emotional state of another individual over time, specifically by calming

the other person down. The narrative assessment is characterized by two interdependent affective co-regulation processes: the clinician influencing the suicidal patient's emotional state and, in return, the suicidal patient influencing the clinician's emotional state (Bryan et al., 2017). The narrative assessment therefore entails an interpersonal process by which the patient and clinician effectively calm each other down during the encounter. The traditional interview approach, by contrast, is not characterized by this process to the same degree.

Finally, the narrative assessment is characterized by less complex speech than the traditional suicide risk assessment interview (Nasir, Baucom, Bryan, Narayanan, & Georgiou, 2017), which suggests that patients and clinicians use simpler and more accessible language during the narrative assessment. Because speech complexity is correlated with empathy, this pattern aligns with previously-noted findings regarding affective synchrony.

How to Do It

Step 1: Invite the patient to tell his or her story of the index suicidal episode

The clinician begins the narrative assessment by asking the patient to tell the story of his or her most recent suicidal crisis.

Sample Clinician Script

I'd like to learn more about the details of what happened to you when you last experienced that intense desire to kill yourself [or made a suicide attempt]. Could you tell me the story of your suicidal crisis [or suicide attempt]?

If the patient asks where he or she should begin:

Wherever the story begins.

Step 2: Assist the patient in identifying and describing the sequence of events

The clinician ensures that the patient identifies those thoughts, emotions, physical experiences, and behaviors associated with the index suicidal episode, and encourages the patient to continue moving through the narrative account by encouraging the patient to elaborate further or to provide more details. If the patient does not provide this information on his or her own, the clinician prompts the patient accordingly to obtain a clear moment-by-moment account of the steps that led up to the suicidal episode.

Sample Clinician Script

Sample prompts to elicit the patient's narrative account of the suicidal crisis:

And then what happened?

What happened next?

Did anything happen right before that?

How did you get to be in that place?

What, specifically, was going through your mind at that moment?

What was the emotion you felt at that moment?

Where did you feel that sensation in your body?

Describe what the room that you were in looked like

What did you see?

What did that person specifically say to you? What were his/her exact words?

At what point did you decide to make the suicide attempt?

Step 3: Provide emotional validation

Upon concluding the narrative assessment, the clinician acknowledges that telling the story may have been emotionally difficult and thanks the patient for sharing the story. The clinician concludes by allowing the patient one more chance to share any additional information or details about their story.

Sample Clinician Script

Thank you for being willing to share your story with me; I'm sure it wasn't easy. Is there any other part of the story that needs to be told, or any other information that you think I may need to know?

Tips and Advice for the Narrative Assessment

- 1. Leave some stones unturned.** The narrative assessment is *not* a general biopsychosocial interview, which is typically completed during an initial intake appointment before the start of BCBT. As such, the clinician should avoid probing or asking about life events or experiences that are not directly or proximally related to the index suicidal episode. If, for example, the patient mentions child abuse or other traumatic experiences, take note of this but do not interrupt the flow of the patient's story to pursue more details about these experiences. The primary objective of the narrative assessment is to understand the contextual factors that surround the patient's suicidal thoughts and behaviors, not to obtain a detailed history of the patient's life.
- 2. Help patients to stay on track.** If the patient gets "off track" by talking about other life events, problems, or situations that do not appear to be proximally related to the index suicidal episodes,

the clinician can redirect the patient by asking the patient to explain how the current topic is related to the index suicidal episode. For example, during the narrative assessment the patient may begin to talk about memories of child abuse which might be related to the index suicidal episode (e.g., the patient's memories or flashbacks of the abuse trigger suicidal thoughts) but also might not be (e.g., the patient's recounting of child abuse was a tangential distraction). In this situation, the clinician might ask, "Just so I'm clear, when you made the suicide attempt last week were you thinking about being abused as a child? Or were these memories of child abuse involved in your suicide attempt in another way?" If the patient indicates that the child abuse was not directly involved the index suicidal episode, the clinician can then ask the patient to resume the story from where he or she left off: "Oh that makes sense. So you were saying that on the day of your suicide attempt..." This strategy can help to redirect patients in a gentle and respectful way that minimizes the likelihood that they will feel interrupted or invalidated.

3. **Distinguish between proximal and distal variables.** Related to the previous point, when conducting the narrative assessment, the clinician should be cautious about assuming that certain events or topics are directly or proximally related to the index suicidal crisis. Trauma exposure, for instance, is an important risk factor for suicide, but this does not mean that the patient's most recent suicide attempt was directly related to a particular trauma. For example, although combat exposure (especially exposure to killing) is associated with increased risk for suicide ideation, suicide attempts, and death by suicide among military personnel and veterans (Bryan, Griffith et al., 2015), very few military personnel report thinking about combat-related memories on the day of their suicide attempts (Bryan & Rudd, 2012). Combat exposure may therefore serve as a predisposing vulnerability for suicide, but it may not be a trigger.

- 4. Conceptualize as you go.** In addition to its utility as a rapport-building strategy and suicide risk assessment process, the narrative assessment enables the clinician to gather the information needed to “fill in” the various domains of the suicidal mode so that an accurate case conceptualization can be formulated. As the patient relays their story, the clinician can organize the patient’s risk and protective factors into the various domains of the suicidal mode. This will not only set up the clinician for the next step of the first session—the case conceptualization—it will also help the clinician to start thinking about potential strategies for the crisis response plan.
- 5. Take your time.** Because of elevated anxiety and/or situational pressures, clinicians initially push through the narrative assessment process at a faster than ideal pace. Clinicians who work in fast-paced settings characterized by rapid triage and decision-making (e.g., emergency departments, primary care clinics, mobile crisis response teams) are especially vulnerable to this tendency. Most clinicians are able to complete the narrative assessment in 10 to 15 minutes on average. Although this may be longer than the traditional suicide risk assessment interview approach, clinicians who slow down and take their time during the narrative assessment often report that they obtain better, more nuanced information from their patients. Several additional minutes often pays large dividends.

Chapter 9: Crisis Response Plan

The crisis response plan is the final required component of the first session of BCBT. The crisis response plan is a collaboratively-developed written plan that the patient can follow during suicidal crises or periods of emotional distress that precede the onset of an acute suicidal crisis. In essence, the crisis response plan entails a written checklist of “what to do” when in crisis, and is comprised of behavioral alternatives to making a suicide attempt. The crisis response plan includes five components: (1) identifying personal warning signs indicating the possible onset of a suicidal crisis; (2) identifying self-management skills or strategies that can distract the patient from or effectively cope with the situation; (3) identifying reasons for living; (4) identifying supportive friends or family members who can be contacted to obtain social support and/or assistance; and (5) identifying professional sources of support and help such as mental health providers, crisis hotlines, and emergency services (i.e., 911).

Rationale

The primary purpose of the crisis response plan is to aid the patient’s decision-making process during acute periods of emotional distress and impaired problem-solving. Relative to individuals who have not been suicidal, even those with major depression, suicidal individuals experience considerable difficulty in generating potential solutions to their problems (Williams, Barnhofer, Crane, & Beck, 2005). This deficit in problem-solving is likely related to the attentional bias that suicidal individuals have towards death- and suicide-related information, which includes negative emotional states and negative expectations for the future. During a crisis, the patient’s cognitive predispositions are activated, such that suicidal individuals tend to overestimate the likelihood of negative events occurring to them in the future (MacLeod, Rose,

& Williams, 1993). The crisis response plan serves as a decisional aid that outlines a sequence of steps to take during a crisis, thereby counteracting the collapse in problem solving that occurs during acute crises. In essence, the crisis response plan outlines alternatives to making a suicide attempt when the patient most wants to make a suicide attempt.

As a suicide prevention procedure, various iterations of the crisis response plan have been used in a wide range of treatments with established efficacy for reducing suicidal behavior: dialectical behavior therapy, cognitive therapy for suicide prevention, the attempted suicide short intervention program, and BCBT. Because of its simplicity, the crisis response plan has been extracted from BCBT for use in a wide range of settings including emergency departments, primary care clinics, inpatient psychiatric units, and outpatient mental health settings. Results of a recently-completed randomized clinical trial support the effectiveness of the crisis response plan for the prevention of suicide attempts when used as a stand-alone risk management procedure (Bryan et al., 2017). In this study, two versions of the crisis response plan were examined and compared to treatment as usual, which entailed supportive listening, provision of professional crisis resources, and a verbal contract for safety. Both versions of the crisis response plan included the following four components: (1) identifying personal warning signs; (2) identifying self-management skills; (3) identifying supportive friends or family members; and (4) identifying professional crisis services. One version of the crisis response plan also included a fifth element: identifying personal reasons for living. Although the two versions of the crisis response plan did not differ from each other with respect to suicide attempt rates or suicide ideation during follow-up, they significantly outperformed treatment as usual on both metrics. Specifically, acutely suicidal participants who received a crisis response plan were 76% less likely to make a suicide attempt during and they showed faster and larger declines in suicide

ideation during the 6-month follow-up period. Participants who received a crisis response plan also had significantly fewer days of inpatient psychiatric hospitalization.

Our subsequent research suggests that, in addition to its long-term benefits on suicidal thoughts and behaviors, crisis response planning also shows immediate effects on suicidal individuals' emotional state. When assessed immediately before and after their interventions, which spanned approximately 20-30 minutes, participants who received either of the two crisis response plans showed significant declines in several negative affective states including depression, anxiety, perceived burdensomeness and suicidal desire. In contrast, participants who received a contract for safety showed no change in emotional state afterwards. Furthermore, participants who received the version of the crisis response plan that included the extra component (i.e., a discussion of their reasons for living) also showed a significant increase in hope and calmness, and a significantly larger decline in perceived burdensomeness than participants in the crisis response plan condition without this extra component. Taken together, these findings indicate that crisis response planning (a) reduces suicide attempts, (b) rapidly resolves suicidal crises, (c) immediately reduces negative emotional states, and (d) immediately increases positive emotional states, but only if the patient is asked to talk about their reasons for living. The crisis response plan is therefore an especially potent ingredient of BCBT that serves as the platform for all subsequent interventions.

In a separate study conducted in emergency departments, the safety planning intervention (Stanley & Brown, 2008), a procedure that is similar in design to the crisis response plan, combined with follow-up phone calls was similarly associated with reduced rates of suicidal behavior as compared to treatment as usual (Miller et al., 2017), although the magnitude of effect (20% reduction) was much smaller in size than what has been seen with the crisis response plan

and other interventions that integrate the crisis response plan. In this study, the safety planning intervention was self-administered by the patient rather than being developed collaboratively with a health care provider; was created using pre-printed, fill-in-the-blank forms rather than being handwritten on an index card; and included a section focused on means restriction (Boudreaux et al., 2013). These differences suggest that, aside from its content, the process by which a crisis response plan is developed might influence its efficacy.

How to Do It

When creating a crisis response plan with patients, clinicians should adopt a guiding approach in which they assist patients in identifying their own solutions and strategies. By taking this approach, clinicians can increase the likelihood that patients will use the crisis response plan during periods of intense emotional distress. Because the crisis response plan serves as the platform for all subsequent interventions in BCBT, clinicians and patients should conceptualize the crisis response plan as a “living document” that will be amended and modified over the course of treatment, such that it is continuously improved upon together.

At the beginning of every follow-up session, the clinician should ask the patient if he or she has used the crisis response plan since the previous session. If yes, the clinician then asks the patient to describe the circumstances of the situation(s) that led to the use of the crisis response plan, and how the crisis response plan was used. Successful use of the crisis response plan should be reinforced by the clinician, whereas barriers or obstacles to effective use of the crisis response plan (to include failure to use the crisis response plan) should be collaboratively problem-solved. The clinician should thereby differentiate between those self-management skills that are not practical or helpful and those that simply require refinement and/or more practice. For example, if a patient reports that his or her use of a relaxation skills “didn’t work,” the clinician should

first seek to determine if this is instead due to the patient not fully understanding how to use relaxation effectively and/or did not practice the skill enough for it to be beneficial. Skills that not practical or helpful should be removed from the crisis response plan. Skills that are challenging or confusing should be practiced further before being removed from the crisis response plan, however.

Step 1: Introduce the crisis response plan

The clinician first provides a brief description of the crisis response plan and the rationale for its use.

Sample Clinician Script

Based on what you were telling me before, the pain that you experience when you are suicidal feels unbearable and like it will never end. Under those circumstances, many people find it hard to focus and to make decisions effectively. Would you say that's true for you as well?

Because it's so hard to make decisions when we're that upset, it can be helpful to have a plan laid out in advance to help get us through the crisis, sort of like a contingency plan or an emergency response plan that we have to prepare for disasters or other major, unexpected issues in life. Have you ever made an emergency plan or a contingency plan for your family or work? Could you describe what those plans were like?

As you noted, most emergency plans have very clear checklists of what to do when the problem arises. Basically, a good plan lists out very simple instructions for what to do in response to the situation. We can create a similar crisis response plan for managing our own personal crises in life. Before we wrap up today, I'd like for us to create a crisis response plan for you. Would you be willing to do that? Let's write down the plan on this index card, so that you can keep it in your pocket or purse or somewhere else that's easy to access.

Step 2: Identify personal warning signs

The clinician asks the patient to think about their personal indicators for emotional distress and crises. In most cases, these personal warning signs have already been described by the patient during the narrative assessment of his or her index suicidal crisis. Common warning signs are listed in Figure 11-2 at the end of this chapter. If the patient is struggling to identify his or her personal warning signs, the clinician provides the patient with a list of warning signs to prompt or cue the patient's memory.

Sample Clinician Script

The first step for creating a good crisis response plan is knowing when we need to actually use the plan. If we don't know when to pull out the plan, we probably won't use it very effectively. If we were to pick some warning signs or red flags for an impending crisis in your life, what would those warning signs be? In other words, how do you know when you're getting upset and may need to use this plan? Let's write one or two of those warning signs down on the top of your index card.

Step 3: Self-management strategies

The clinician asks the patient to identify activities or strategies that can either distract the patient from the situation or reduce his or her distress. A useful strategy is to ask the patient what activities helped to relieve stress in the past, even if he or she is no longer using them. If the patient is struggling to identify self-management strategies, the clinician provides the patient with a list of possible strategies similar to Figure 11-3 to prompt or cue the patient's memory. When identifying self-management strategies, the clinician ensures that the patient is able to effectively use the strategy and is specific about how long or under which circumstances he or she will use the self-management strategy.

Sample Clinician Script

Now that we know when to use this plan, let's write down some strategies you can use to manage your stress or distract you from the problem temporarily. What are some things that help you to feel less stressed or more relaxed? What are some things you used to do that helped you to feel less stressed or more relaxed, even if you don't do those things anymore? Let's write one or two of those strategies down underneath your warning signs.

How long do you think you would be able to do each of these things? Let's write down how long you'll do each of those strategies as well.

Step 4: Identify supportive friends or family members

The clinician asks the patient to identify the names and phone numbers of individuals who are supportive and/or who help the patient to feel better when distressed. The clinician directs the patient to write down both the name and phone number for the supportive person even if this information is stored in the patient's cell phone (or in another location). The clinician emphasizes that the patient is not required to tell the supportive other that he or she is in a crisis; rather, the patient can simply call this person as a distraction or to otherwise obtain support without disclosing his or her suicidal thoughts.

Sample Clinician Script

Sometimes we're in situations where using these strategies isn't very realistic, such as when we're at work or when there's bad weather out. Other times we use these skills but we still feel upset. It's therefore good to have an alternative or backup plan, such as reaching out to a friend, family member, or another supportive person who can help us to feel better. We don't necessarily have to tell this person that we're upset or in crisis or thinking about killing ourselves; sometimes just talking with them is enough to calm us down or feel better.

Who is a person in your life who helps you feel better when you're upset or helps take your mind off of things? Let's write his/her name and phone number down next on this list, so that they're listed right there in an easy-to-access place when you need them.

Step 5: List sources of professional help

The clinician lists his or her name and phone number, along with the contact information for any other mental health or medical professionals. The clinician should be very specific regarding reasonable expectations for answering phones and returning calls. For example, if the clinician is unlikely to answer the phone during office hours, the patient should be instructed to leave a voice message along with the expected time to wait for a return phone call (e.g., at lunch time or the end of the business day). The clinician should also provide the phone number for the National Lifeline (1-800-273-TALK). Finally, the patient should include going to the emergency department and calling 911 as the final steps.

Sample Clinician Script

It's also good to make sure you have easy access to professional help when your crises are especially bad or these other strategies aren't working. So let's put my name and phone number next on the list. Now one thing to keep in mind is that I don't always answer my phone because I'm helping other patients or am doing other things. Although I might not answer right away when you call, I will call you back as soon as possible, so you'll have to leave a voicemail for me. Let's add that information here after my name and number: "leave a voice message with my name, phone number, and time."

I check my voicemail at the end of each day, so if you call and leave a message I'll be able to call you back in the afternoon. Sometimes I can call back sooner if a patient doesn't show up or I have an open schedule, but it'll definitely be by the end of the day. Do you have any concerns about that?

Since I might not be able to answer the phone right away when you call, I want to make sure you have someone you can talk to immediately if you need assistance. Here is the phone number for the National Lifeline, which is a toll-free phone number you can call to speak with someone right away about what's bothering you: 1-800-273-TALK. You can call them 24/7 and on holidays, and someone will pick up.

When all else fails, you can always go to the emergency department or call 911 for emergency assistance. Although it's unlikely that you'll need to get to this step, we should write it down anyway because it's better safe than sorry, and it's been a helpful "last step" for a number of my patients. Go ahead and write down "go to emergency department" and "call 911" as the final steps.

Step 6: Review the plan and elicit patient buy-in

Upon completion of the crisis response plan, the clinician asks the patient to verbally review each of the steps. This facilitates mental rehearsal and practice of the crisis response plan, and also provides a means for determining if the patient understands how to use the crisis response plan. If the patient is unclear how to use any portion of the crisis response plan, the clinician reviews this information again. The clinician wraps up this intervention by asking the patient to rate their likelihood of using the crisis response plan on a scale ranging from 0 to 10, with 0 indicating "not at all likely" and 10 indicating "very likely."

Sample Clinician Script

Okay, so let's review these steps together. When will you know when to use this plan?

And when you experience those warning signs, what will you do first? And if those strategies don't work or can't be used, what else could you do? And what if you need to speak with a professional? What are your options there?

Very good. Does this plan make sense, or do you have any questions about what to do and how to do it?

After finishing the plan:

On a scale of 0 to 10, with 0 being "not at all" and 10 being "definitely," what would you say is the likelihood that you will use this crisis response plan when you're upset?

If rating is lower than 7 out of 10:

Is there any part of this plan that reduces your likelihood for using it? What could we change about this plan to make it more likely that you would use it?

Step 7: Review and revise the crisis response plan during each follow-up (all BCBT sessions)

During each follow-up session, new self-management and coping skills (discussed in later chapters) are added to the plan. In the event that a patient loses, misplaces, or throws away his or her crisis response plan, the clinician assists the patient in creating a new plan in-session.

Sample Clinician Script

Did you use your crisis response plan at all since we last met?

If yes:

Tell me what happened and how you used it.

If no:

Tell me what you would've done if you had needed it.

Case Studies

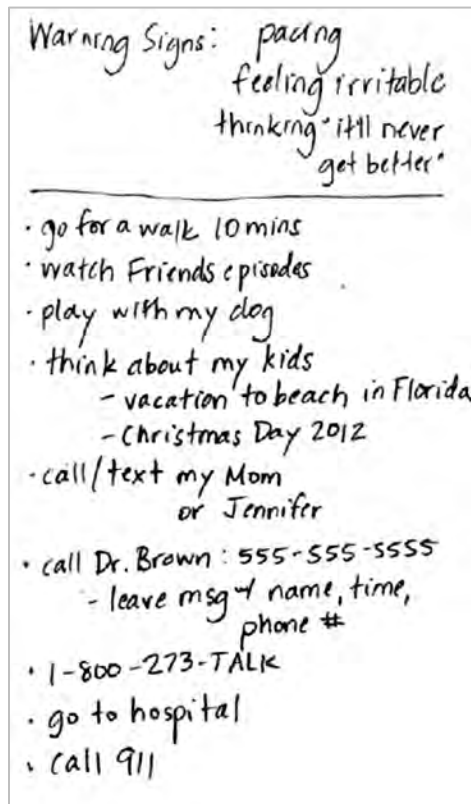
Critical to the development of an effective crisis response plan is the clinician's willingness to meet the patient at his or her current state. To this end, clinicians are encouraged to mirror the patient's language when helping them to create a crisis response plan, and to tie the intervention to their personal motives and goals for treatment. In each of our three case studies, we provide partial transcripts of treatment sessions to demonstrate how the clinicians customized the standardized set of procedures that comprise the crisis response plan to the unique needs of each individual patient.

The case of John

Upon completing the case conceptualization, the clinician asked John what his goals for treatment were. John's immediate response was directly related to preventing suicidal behavior: "To make sure I never do this again. I don't want to put my wife or family through that ever again." The clinician therefore transitioned to the crisis response plan by tying the intervention to this goal: "Well, then how about we make a plan to reduce the likelihood of you getting that close to suicide again?" John agreed that this would be helpful. The clinician provided John with

an index card and they proceeded to develop a crisis response plan together. John's crisis response plan is displayed in Figure 9-1.

Figure 9-1.
John's initial crisis response plan



The case of Mike

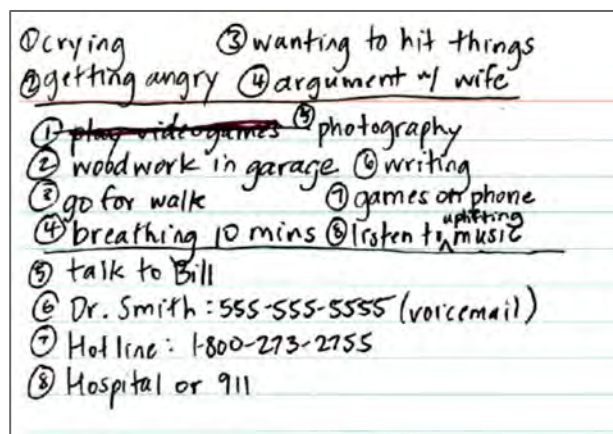
As was initially described in Chapter 2, during Mike's initial consultation appointment he reported numerous symptoms of depression, heavy alcohol use, agitation, and several other risk factors. He denied suicidal thoughts or behaviors, however. Nonetheless, Mike's presentation led his clinician to assess his risk for suicide as high, which prompted the clinician to forego the typical intake interview in order to complete a narrative assessment and a crisis response plan. Because Mike denied suicide ideation and became upset when the issue of suicide was raised, the clinician introduced the crisis response plan as a strategy for helping him to manage his emotions when feeling they were "out of control" rather than introducing the crisis response plan as a

suicide prevention procedure: “Given you feel that your emotions are out of control, I’m wondering if you would be interested in talking about some strategies you could start using right away to feel a bit more in control?” By presenting the crisis response plan in this way, the clinician was able to move into the intervention while avoiding a potential power struggle. When constructing his crisis response plan, Mike was highly engaged in the process and quickly identified self-management strategies, reasons for living, and sources of social support. Over the course of BCBT, this plan was updated and modified several times from the version of the crisis response plan that was developed in this initial consultation session.

Mike’s initial crisis response plan included four warning signs: crying, getting angry, wanting to hit things, and arguments with his wife. When asked what he has found helpful in his life for managing stress or distracting himself during difficult times, Mike quickly identified four self-management strategies: playing video games, doing woodwork in the garage, going for a walk, and practicing a breathing exercise that he had learned during martial arts many years before. With regards to sources of social support, Mike indicated he could call his friend, Bill. The clinician then provided his own office phone number and the National Suicide Prevention Lifeline phone number, and reminded Mike that he could 911 or go to the hospital. At the next session (Session 1 of BCBT), Mike reported that he had another argument with his wife and went to go play videogames, but this only angered his wife more, who felt that Mike was disengaging from the argument. Mike and his clinician therefore agreed that this option should be removed from the list; it was therefore crossed out. Over the course of subsequent sessions, Mike identified additional self-management strategies that were added to the crisis response plan: photography, writing, playing games on his phone (which was an acceptable option to his wife), and listening to music. This latter option was subsequently qualified when Mike came to

session and reported that he had listened to music on one occasion but felt worse. The clinician asked Mike to describe what had happened. During this conversation, Mike explained that he had listened to some “death metal,” which increased his anger. The clinician and Mike therefore clarified on his crisis response plan that he would listen to “uplifting” music. Mike’s crisis response plan, including all of its modifications and changes, is displayed in Figure 9-2.

Figure 9-2.
Mike’s crisis response plan during the final session of BCBT



The case of Janice

When Janice’s clinician introduced the topic of the crisis response plan, Janice noted, “I think I already have one of those. I created a plan like that with my last therapist.” The clinician acknowledged that this was possible, and asked Janice if she had that plan with her. Janice said she did not, but thought that it was at home. The clinician asked Janice to describe what was on her plan, to which Janice replied, “I think it has some things like playing with my dogs and calling some friends, but I don’t really remember.” When asked if this plan was helpful, Janice answered, “Sometimes, I guess.” The clinician engaged Janice in a dialogue to further explore her thoughts and feelings about her previous crisis response plan, and discovered that she had some ambivalence about its utility and potential effectiveness. The clinician therefore offered to

help Janice create a new crisis response plan that might work better for her: “It sounds like there’s something about that other plan that may not work as well as you’d like. What do you think about creating a new plan now that might work better for you?” Janice agreed, and together she and her clinician created a new crisis response plan (see Figure 9-3).

In the final step of the crisis response plan, Janice expressed concern about calling 911 or going to a hospital. “I’ve been hospitalized before and I don’t want to do that ever again,” she explained. “I’m not going to go to a hospital or call the cops, because that’s what’ll end up happening.” The clinician therefore said the following: “I can understand that completely, which is why I usually include these options this as the last steps rather than the first or second steps. In my experience, most people don’t ever get to these steps because all the others steps work so well, but it’s always good to have a safety net just in case. I’m wondering if you would be willing to add this as the final step even if you don’t intend to ever use it?” Janice reasserted that she did not intend to call the police or go to a hospital, but agreed to include it as the final step of her crisis response plan.

Figure 9-3.
Janice’s crisis response plan

avoid others.
 "what's the point?"
 not wanting to get out
 of bed.

get a cup of coffee
 listen to jazz music
 pet my dog
 text michelle
 visit the neighbors
 think about my kids

(801) 999-9119
 call my therapist
 call the Veterans Crisis
 Line: 1-800-273-TALK
 press: 1
 call 911
 go to the hospital

Tips and Advice for the Crisis Response Plan

- 1. Handwrite the crisis response plan.** Asking the patient to handwrite his or her own crisis response plan personalizes the intervention and increases the patient's sense of ownership of the plan. By contrast, pre-fabricated crisis response plans are generally perceived as irrelevant or unhelpful. Crisis response plans that are typed and then printed also tend to receive less favorable feedback than handwritten plans, and may have reduced efficacy.
- 2. Use index cards instead of full sheets of paper.** Although a crisis response plan can be created using almost any type or size of paper, index cards seem to work better than full-size sheets of paper because the compact size of an index card lends itself to convenience (e.g., placement in pockets or purses). When crisis response plans are written on full sheets of

paper, patients usually fold them up several times to place them in a convenient location, which seems to reduce the perceived importance of the plan.

- 3. Avoid fill-in-the-blank templates.** Pre-printed, fill-in-the-blank crisis response plans are generally discouraged for several reasons. First, these plans are generally perceived by patients as less personal or “customized.” Second, patients who are unable to identify several (or any) items to include in each section are left with empty spaces on their crisis response plans. These empty spaces can serve to reinforce these patients’ perceptions about what is lacking or missing in their lives, which can be counterproductive (e.g., *I should have three people to call but only have one; I really am alone.*). Third, preliminary data suggest that this approach may be less effective.
- 4. When patients are unable to identify warning signs or self-management strategies, use visual cues and menus to help.** Some patients will struggle to create the crisis response plan because they lack the ability to effectively identify when they are approaching an acute emotional crisis and/or are unaware of how they can effectively manage these crises. In the former situation, patients are often unable to identify or list their warning signs. The clinician can often get around this barrier by providing a list of possible warning signs from which the patient can choose or select items that apply to him or her. A sample list of warning signs is provided in Figure 9-4. Likewise, when the patient is unable to identify self-management strategies for emotional crises, the clinician can provide a list of possible self-management strategies and ask the patient to identify one or two that have worked for him or her in the past. A sample list of self-management strategies is provided in Figure 9-5.

Figure 9-4.

Possible warning signs that precede suicidal crises

Thoughts	“I’m an idiot.” “Here we go again.” “This will never end.” “It’s my fault.” “Nobody cares about me.” “What’s the point?” “I can’t take this anymore.” “I deserve to be punished.” “I’m a failure.”
Mental Images	Stressful memories Flashbacks about trauma Reliving uncomfortable situations Seeing myself make a suicide attempt
Emotions or Feelings	Sadness or depression Guilt or remorse Worry Anger
Behaviors or Actions	Pacing Being quiet around others Avoiding others Yelling / screaming Crying Shaking / trembling Aggression Self-injury Practicing / rehearsing the suicide attempt Getting ready for a suicide attempt
Physical Sensations	Headaches or other pain Agitation / feeling on edge Racing heart Muscle tension Nausea Breathing difficulties Insomnia

Figure 9-5.
Common self-management strategies

Watching a movie
 Watching a TV show
 Listening to music
 Singing
 Playing with a pet
 Going for a walk

Exercising Taking a warm bath or shower Reading a book Reading spiritual or religious material Meditation Relaxation or breathing exercises Prayer Puzzles (e.g., crossword, Sudoku, computer games) Thinking about a positive upcoming event Thinking about positive memories Looking at pictures of friends Reading letters or emails from family members Eating a favorite food (e.g., ice cream, pizza) Cooking or baking Playing a sport

- 5. Only include skills that are within the patient’s ability level.** When identifying self-management strategies, the clinician should ensure the listed activities are within the patient’s ability level. For instance, “relaxation” should not be listed as a self-management strategy unless the patient can effectively use this skill. The clinician can gauge the patient’s skill level by asking the patient to describe (or demonstrate) how he or she uses the strategy to manage stress. The clinician should be careful not to overestimate the patient’s capabilities, even with respect to relatively “simple” or basic self-management skills.

MSRC 1.0 D&I Readiness Working Group Final Report**MCRS 1.0 Intervention:** Crisis Response Planning (CRP)**MCRS 1.0 Funded Study:** Brief interventions for short-term suicide risk reduction in military populations**PI:** Craig Bryan, PhD**Review Date:** 9-14-17 (And follow up conversation on 10-12-17 by working group members only)**Summary of Intervention**

Randomized controlled trial comparing two versions of the crisis response plan (with and without discussion of reasons for living) vs. treatment as usual to reduce the risk of suicide attempt among active duty Soldiers presenting to clinical facilities for behavioral health emergencies.

Executive Summary of Working Group Feedback

The study PI provided an intervention summary report that was made available to the MSRC Readiness Working Group (WG) prior to the scheduled review. The following summary presents WG feedback derived from pre and post meeting surveys as annotated in the tables below integrated with WG review meeting discussion of 12 WG members. Ratings are based on most recent rating (pre or post review survey).

The surveys contained 10 ratings from reviewers that returned an average rating of 5.4 on an 8-point scale,* which fell above ambivalent/neutral (4) but below enthusiastic (6). Just over half of reviewers (6 out of 10) rated the clinical evidence for suicidality outcome** as moderately strong to strong, while the remaining reviewers (4 out of 10) provided ratings of minimal to moderate. Clinical evidence ratings for other target outcomes (e.g. anxiety, coping, marital satisfaction) were more evenly distributed between minimal to moderate (5 out of 9) and moderately strong to strong (4 out of 9). Five out of 10 reviewers saw opportunity for implementing CRP within their office/agency, and five of the 10 believed there would be an opportunity to implement CRP for military personnel through another service, office, or agency. While curriculum specific to CRP has been developed and trainings have been conducted within DoD and the VA (to peers, Chaplains, juvenile justice staff, and other non-mental health professional), six of the 10 reviewers indicated that additional research is needed to support dissemination and implementation of this intervention for military personnel. Five of these six reviewers agreed that research could be done during or as part of dissemination and implementation (D&I) to military personnel. One reviewer indicated that research needs to be conducted prior to D&I to military personnel. During the Working Group discussion, the reviewers noted that CRP does not include means safety and discussed the importance of integrating it into CRP prior to D&I.

Primary DoD Applications Suggested by the MSRC D&I Readiness Working Group

- Peer counselors
- Behavioral health providers
- Family advocacy providers

Potential Targets for Dissemination of the Intervention within the Military

- DoD Family Advocacy Programs
- Center for Deployment Psychology (CDP)
- Defense Health Agency (DHA) Behavioral Health Office
- VA Mental Health
- Texas Military Veteran Peer Network
- Defense Suicide Prevention Office (DSPO)
- DoD/VA PBI Network**
- DHCC Deployment Health Clinical Center (DHCC) Defense Centers of Excellence (DCOE) ***
- National Center for Telehealth & Technology (T2)***

Recommendations to Facilitate Dissemination and Implementation within the Military

- Further research should be conducted either prior to or in tandem with the dissemination and implementation of the intervention to military personnel.
- Replication in a larger trial and with other services was recommended.
- Compare CRP to Stanley and Brown Safety Planning Intervention to account for differences in addressing means safety.
- Evaluation of adaptations for other settings – including non-clinical settings such as chaplains and leadership.
- Develop methods for assessing implementation fidelity.

Potential Funding Sources for Future Research for this Intervention

- Defense Suicide Prevention Office (DSPO)
- DoD/VA PBI Network
Psychological Health Center of Excellence (PHCoE)

*Overall enthusiasm for implementation of intervention for military personnel rated as 0=No Enthusiasm 2=Little Enthusiasm 4=Ambivalent/Neutral, 6=Enthusiastic, 8=Extremely Enthusiastic

**Quality of Evidence for Clinical Intervention categories

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

***Update from March 2018: DCoE reorganized as PHCoE. PBI Network administered by PHCoE, DHHC no longer a separate program, & T2 reorganized under PHCoE & DHA. None of these agencies/programs fund research at this time.

Verbatim Summary of Working Group Feedback Survey Responses

The feedback below was received via online survey from WG members and is provided for situational awareness. The MSRC D&I Core will follow up with the study PI to determine possible next steps based on this information.

Suggestions for Further Study Prior to D&I
• Adequately powered RCT with Active Duty SMs and comparing safety planning with CRP instead of verbal contract. • Isolate the effect of enhanced provider training from the effect of the actual crisis plan card. • DSPO is interested in a translation study that allows for CRP to be used by trained peers, immediate supervisors, spouses, or chaplains in military environments. Those individuals are more likely to encounter a Service member in crisis than a clinician. DSPO would not expect the translation to be qualified to deliver clinical interventions but the aims of such a study could be (a) develop counseling interventions appropriate to the capabilities and experiences of non-clinicians; and (b) sustain • Examples of needed research: - Replication of this study by different investigators - Larger RCT, conducted at multiple sites, including important demographic groups, females, LGBT service members and veterans, civilians - Effectiveness study • Expand implementation and evaluation; pilot at more than one military installation in all Service branches with larger N, and study barriers/facilitators. • Replication across military settings. Comparison to training in careful suicide assessment and potentially an intervention that simply uses the reminder card with minimal training for the provider.
Opportunity for D&I in our office/agency
• DSPO would open to integrating CRP principles into a variety of non-clinical settings to include peer-to-peer support, outreach literature, and social media forums. • Contacts who are current members with the implementation arm: Dr. Tim Hoyt (T2) Dr. Adam Walsh (DSPO) CAPT Colston (DCoE) Could also be nominated for VA/DoD Practice Based Implementation (PBI) Network by DCoE - MAJ Pittman • Potentially suitable for consideration for implementation in PBI Network. • CDP could support dissemination/implementation efforts by hosting online workshops and/or working with Tx developer to train CDP personnel to deliver workshops. In addition, CDP personnel embedded with military clinical psychology internship programs could facilitate use in those settings
Opportunity for D&I for military personnel
• Although T2 is not an actual clinic providing direct clinical services, there is a small group of credentialed providers at T2 who continue to provide services in outpatient and residential settings who could implement the CRP protocol, when indicated. • I believe each Service branch and the National Guard would be interested in a follow-up implementation study. In addition at the OSD and Service/Guard level, Chaplaincies and family program staff should be engaged in addition to medical commands. • Other options like the Family Advocacy Program might need to be explored. I will coordinate with Dr. Kate Nassauer and get back to you on options and/ or contacts. • Cohen Veteran Network • Potentially brief to Mental Health Work Group (Directors of Psychological Health for all Services, and DHA/Health Affairs leaders), if RCT results accepted for publication. • CDP has worked with Army OTSG to train embedded MH providers in Brief Behavioral Therapy for Insomnia. This provider population would likely be receptive to the CRP intervention as well.

Opportunity for D&I for other groups (e.g. Veterans, families, civilians)

- The military health system and VA need a standardized approach across agencies and across hospitals within those locations. DHA HQ and VA Central Office should be the starting points.
- This intervention could work for all members of the military community as well as those outside of military communities.
- As mentioned earlier FAP might be an option. I will follow up with Dr. Nassauer and get back to you. Dr. Bob O'Brien might be a contact person for VA.
- Community providers have already been targeted by the developer. I would think that other agencies would be interested as well.
- This would be a good addition to the Mental Health First Aid training that veteran peers in the Texas Military Veteran Peer Network receive, if it has not already been implemented there.

Suggestions for next steps for this intervention

- Fidelity is a good issue to investigate as is the relative contributions of trainer competence/comfort and specific components of the CRP. During a webinar yesterday, John Draper (Dir of Lifeline) mentioned that CRP may be better for SMs because there was no mention of firearm safety (which SMs could find threatening). With approximately 60% of SMs dying by firearm, it seems negligent to purposefully omit firearms from conversations with suicidal individuals.
- Assess facilitation of care. Are those who engage in this program more adherent to treatment plan, no show/reschedule less, etc.
- Note that a response of 'No' to questions regarding 'opportunity to implement' do not indicate that CRP lacks value but rather that T2 is not a clinic and so does not offer implementation opportunities.
- The one omission from the CRP intervention is lethal means safety. The topic was not listed in either the slides or the guide. Given the high rate of gun ownership (personally owned and military issued) of Service members, addressing lethal means would be critical to avoiding a suicide after a known attempt or disclosure of a plan. DSPO strongly recommends that content for lethal means safety be added to the CRP protocol.
- Please keep leadership at MOMRP informed on additional publications and or findings related to CRP so as to help with both dissemination and implementation efforts.
- Given the tendency for individuals to lose or misplace individual index cards, one might consider a smart-phone app.
- Since organizations' willingness to allow ongoing consultation seems to be a potential barrier, what can be studied to learn how to seek behavior change among organizational leaders in this regard? This is not specific to this intervention, but if studied in this intervention's implementation, it would offer implementation knowledge for the field.

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MSRC 1.0 Readiness Working Group Final Report

MCRS 1.0 Intervention: Virtual Hope Box Smartphone App

MCRS 1.0 Funded Study: Effectiveness of a Virtual Hope Box Smartphone App in Enhancing Veterans' Coping with Suicidal Ideation: A Randomized Clinical Trial

PI: Nigel Bush, PhD

Review Date: 5/25/17

Summary of Intervention

Designed for both clinical implementation and individual self-management, the Virtual Hope Box (VHB) is a smartphone app that delivers patient-tailored, well-established and thoroughly tested conventional coping tools for: Distraction, Inspiration, Relaxation, Coping, Supportive Contacts (common numbers, including suicide hotline, etc., and also space for personal contacts). (See VHB Intervention Summary for more information.)

Executive Summary of Working Group Feedback

Reviewers had a strongly positive response to the VHB, giving it an above average rating of 6.57 out of 8 on the enthusiasm rating for implementation with military personnel. While clinical evidence did not show that the VHB reduced suicidal ideation, reviewers were in unanimous agreement that there is moderate clinical evidence for use as a coping enhancement tool alongside clinical care. Reviewer consensus was that the VHB could be a powerful tool in the hands of clinicians who are trained in evidence based treatments for suicide prevention. The VHB has been widely disseminated in military contexts, won a military innovation award, and has been downloaded over 300,000 times, supporting its acceptability and feasibility. However, there was also reviewer consensus that further research is needed in an Active Duty sample and to determine if it would be effective outside of a clinical intervention (e.g. with chaplains or NCOs).

Potential Targets for Dissemination of the Intervention for Military Personnel:

1. Review with VHA for general implementation along with clinical services
2. Implementation pilot outside of clinical care (e.g. chaplains) with evaluation to determine effectiveness and no harm

Next Steps for Dissemination of the Intervention for Military Personnel:

1. T2 already disseminating through a wide range of clinician and operations trainings on use of technology
2. App available for free on T2 website and social media
3. DHCC likely to include VHB in PBI Network Tech into Care pilot

Suggestions for Research Needed to Support Dissemination and Implementation for Military Personnel:

1. Fully-powered RCT, along with study of its effect on people who are NOT in treatment.
 - o RCT of VHB to treatment as usual without the physical hope box.
 - o RCT of VHB vs. treatment following discharge from inpatient psych.
 - o Sample of those with a history of suicidal behavior (more than ideation)
2. Measure the amount of time the app was used by each participant for dose effects.

Specific Contacts to Explore Funding for Further Research:

1. None at this time.

Summary of Working Group Feedback

Table 1 Review of Clinical Evidence

Reviewer	Clinical evidence category for suicidality outcome	Clinical evidence category for other target outcome	Suggestions for further study before D&I
T2*	Minimal Evidence	Moderate Evidence	1. RCT of VHB to TAU without the physical hope box. 2. RCT of VHB vs. TAU following discharge from inpatient psych.
T2*	No Evidence	Moderate Evidence	Per previous comments, this application is currently the subject of an implementation pilot.
DHCC	No Evidence	Moderate Evidence	The intervention could benefit from: 1) larger samples for better statistical power, 2) tested in an Active Duty sample, 3) sample of those with a history of suicidal behavior (more than ideation), and 4) a measure of the amount of time the app was used by each participant (for dose effects).
DHCC*	Moderately Strong Evidence	Moderately Strong Evidence	
DHCC	Moderate Evidence	Moderate Evidence	
DHCC	No Evidence	Moderate Evidence	non-clinical populations repeat RCT to confirm results re-evaluate RCT protocol to adjust prior to repeating, given Hope Kit had bigger impact in Brown's study
D&I Core Consultant*	Minimal Evidence	Moderate Evidence	A fully-powered RCT would be very helpful, although the app isn't necessarily intended as a stand-alone intervention. However, it is available to the public so a study of its effect on people who are NOT in treatment would be especially valuable.

*Results from review of materials alone. Did not submit feedback following discussion.

Quality of Evidence for Clinical Intervention categories

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

Table 2 Feedback on Potential for Dissemination and Implementation

Reviewer	Overall enthusiasm for implementation of intervention for military personnel	See an opportunity for D&I in your office/agency	See an opportunity for D&I for military personnel	See an opportunity for D&I for other groups (e.g. Veterans, families, civilians)
T2*	7	Continued focus of T2 provider training workshops.	Yes, sort of a 'standard issue' app for newly enlisted Service members.	Yes, upon enrolling in VA services, education about this tool should be provided and offered for download.
T2*	9	The VHB is currently the subject of a KT implementation pilot project. Using DCoE's KT model, T2 has piloted the VHB within its face-to-face provider training workshops, at three facilities. Attendees at the one-day workshop included behavioral health providers at MTF's, and providers at a VA.	See response to Q #5. In addition to training MTF providers who provide clinical services to active duty personnel, a group of credentialed providers at MAMC have used the VHB in direct clinical care in group treatment settings.	Yes. Features available in the VHB have applicability across a range of clinical presentations (stress, anxiety, depression) and across a range of populations (active duty, veterans, families, civilians). Because the app is public-facing (iOS and Android), it is available to anyone with a mobile device.
DHCC	6		Again, seems like this would be a good tool to implement with new recruits in basic training.	The VHB appears to have little risk for harm, so it could be implemented with a variety of populations as a coping enhancement tool.
DHCC*	7	yes	yes	yes
DHCC	4			
DHCC	6	We will likely use this app for our Tech into Care pilot	Perhaps, after additional research is conducted	Needs more evidence of effectiveness
Consultant*	7	Yes, many clinicians use this as an adjunct procedure or tool within the context of treatment, to include my own agency.	This could be very easily implemented across agencies.	Yes, this would be highly applicable to many different audiences. the only drawback is the app's clear tie to the DOD. This isn't a huge hurdle, though.
Average enthusiasm:	6.57			

*Overall Enthusiasm for implementation of intervention for military personnel rated from 0=No enthusiasm through 8= Extremely enthusiastic

Summary of Teleconference Discussion

Reviewers Attending from DHCC, MOMRP, MSRC, T2

There were two group discussions during the teleconference. The first included all members present for this meeting. Dr. Bush and T2 members excused themselves from the second conversation. The following is a summary of both.

Following introductions, the meeting began with Dr. Nigel Bush presenting an overview of the “Effectiveness of a Virtual Hope Box Smartphone App in Enhancing Veterans' Coping with Suicidal Ideation,” a randomized controlled trial with outpatient Veterans with suicidal ideation comparing the Virtual Hope-Box (VHB) smartphone app with comparable printed information. Initially, an MSRC-funded pilot was conducted at Portland, OR VA DBT Clinic. Based on pilot findings, formatting changes were made to the VHB, then an RCT of VHB compared to treatment as usual was conducted across Portland, OR VA with a focus on stress coping, suicidal ideation and reasons for living. Study findings showed the VHB significantly improved coping self-efficacy, but no difference in suicidal ideation or reasons for living. Acceptability and feasibility of VHB was shown for Veterans and their clinicians. Dr. Bush reported pursuing further grant funding with an active duty sample but nothing has been funded to date.

VHB has been promoted extensively via media coverage including newspapers, radio, YouTube, websites, press release, and social media campaigns across Facebook, Twitter and LinkedIn. VHB is marketed as part of ongoing clinical care—as a broad stroke approach to reduce negative emotion and improve general coping—not as a stand-alone or for suicide prevention. Dr. Bush described the VHB as ideally used in combination with provider treatment, however, noted that it is being used as standalone since anyone can download the app. In fact, it has been downloaded over 300,000 times by a variety of users, including clinicians, Service Members, Veterans, and others. Dr. Bush noted that there is a need for better messaging as VHB is being disseminated, and that his group would welcome guidance in that regard.

Additionally, T2 has been conducting extensive provider training workshops teaching use of apps in clinical settings, including VHB. A reviewer commented that T2 has been successful at lower costs by digitizing trainings and outreach. T2 is considering developing videos to teach about VHB and how to integrate it, as well as a train-the-trainer protocol.

Reviewers noted that the VHB could benefit from further study in larger samples for better statistical power and from being tested in an Active Duty sample. Recommendation by reviewers was for a research RCT with Service Members and non-clinicians funded by either MSRC or DoD, if feasible. Reviewers agreed that VHB could be easily implemented across agencies, and saw opportunities for D&I in both their offices/agencies as well as for military personnel. Specific examples were:

- VHB could be used in Transition Assistance Program as Service Members transition out of the military.
- VHB could be a good tool to implement with new recruits in basic training, a 'standard issue' app for newly enlisted Service Members.
- Upon enrolling in VA services, education about this tool could be provided and offered for download.
- With good training support, implemented in Family Support Non Clinical, Military Family Resiliency (MFLACS), and FLEET Support.

A reviewer asked for clarification on the standard of evidence and whether or not VHB was found to do no harm. Consensus was that VHB appears to have little risk for harm, so it could be implemented with a variety of populations as a coping enhancement tool. However, while VHB has been found to do no harm for the population in which it was evaluated, that has not been studied generally. Feasibility work to assess “do no harm” in the general population should be conducted for evaluation for reduction in suicidal ideation. Also, further research on clinical and non-clinical with the purpose of the intervention differentiable for non-clinical was recommended

Further research is needed as there is the danger that VHB would be used in place of EBP therapy. This could be done either through program evaluation of the use of VHB after training or a randomized controlled trial.

Research is also needed with regard to ideation and behavior because VHB could be a powerful tool in the hands of clinicians who are trained in evidence based treatments for suicide prevention.

Other suggestions for further research were the following:

- A fully-powered RCT would be very helpful, along with a study of its effect on people who are NOT in treatment.
- Sample of those with a history of suicidal behavior (more than ideation)
- Measure the amount of time the app was used by each participant for dose effects.
- RCT of VHB to TAU without the physical hope box.
- RCT of VHB vs. TAU following discharge from inpatient psych.

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MSRC 1.0 D&I Readiness Working Group Final Report

MSRC 1.0 Intervention: Therapeutic Evaluative Conditioning (TEC) for Self-Injury/Suicide

MSRC 1.0 Funded Study: New Approaches to the Measurement of Suicide-Related Cognition

PI: Drs. Matthew K. Nock and Joseph C. Franklin

Materials Included:

- MSRC 1.0 Intervention Summary for the D&I Readiness Working Group
- MSRC 1.0 Intervention Summary Supplemental Materials
- MSRC 1.0 Working Group Final Report

MSRC 1.0 Intervention Summary for the D&I Readiness Working Group

Intervention	Therapeutic Evaluative Conditioning (TEC) for Self-Injury/Suicide
Intervention Descriptionⁱ	Short description: A game-like mobile conditioning app that aims to condition more negative associations with self-injury/death/suicide and more positive associations with the self Longer description: TEC uses conditioning techniques to target two factors that may play causal roles in self-injury/suicide. The form of conditioning used in TEC, evaluative conditioning, involves the pairing of stimuli (i.e., presenting stimuli at the same time). The goal of this pairing is to have the feelings caused by one stimulus (e.g., a picture of a spider) spill over into how someone feels about another stimulus (e.g., a picture of a chair). After these stimuli are paired several times, most of us would unconsciously begin to feel more negative in reaction to pictures of the chair. In other words, we would have been “conditioned” to feel more negatively about the chair. We might then avoid the chair as we would avoid a spider. TEC uses this basic conditioning approach to try to change how people feel about two things that may play important roles in self-injury/suicide: First, most of us dislike pictures of death/injury/suicide. This dislike acts as a barrier for most of us – even if we wanted to harm ourselves, the strong negative association with death/injury/suicide would push us away from actually harming ourselves. But studies indicate that many people at risk for self-injury/suicide don’t mind these stimuli, and some even like these stimuli. In other words, they don’t have the same barrier to self-injury/suicide that most of us have, so it is easier for them to engage in these behaviors. By conditioning death/injury/suicide stimuli with very unpleasant stimuli (e.g., snakes, spiders, etc., which studies show at-risk individuals do still find unpleasant), TEC seeks to rebuild this barrier. Second, most of us really like ourselves and stimuli associated with ourselves (e.g., the words “I”, “myself”, and “me”). This also acts as a barrier to self-harm for most of us – it is difficult to hurt or damage something or someone that you like. However, studies indicate that people at risk for self-injury/suicide do not like stimuli associated with themselves – they rate these stimuli similarly to how they rate spiders, snakes, and dirty toilets. TEC seeks to rebuild this barrier to self-harm by conditioning positive stimuli (e.g., cake, cookies, pleasant sunsets over beaches, etc.) with self-related words (e.g., I, myself, me). As noted below, research suggests that this “rebuilding barriers with conditioning” approach may be effective. To make this treatment fast, scalable, fun, and free, we have developed it as a game-like mobile app that takes about 1-2 minutes to play through.
PI	Joseph C. Franklin, Ph.D.
POCⁱⁱ	Joseph C. Franklin, Ph.D.
POC contact	Joseph C. Franklin, Ph.D.
Grant Summary	Project funded as part of post-doctoral fellowship funded by MSRC 1.0 study to Matthew Nock “New Approaches to the Measurement and Modification of Suicide-Related Cognition”

Recruitment Site(s) ⁱⁱⁱ	Online recruitment via web forums, primarily Reddit forums associated with suicide, depression, or substance-related topics		
Suicidality Outcome ^{iv}	Suicide attempts (any and frequency); suicide plans (number of days plan present); suicide ideation (number of days ideation present)		
Other Target Outcome ^v	Nonsuicidal self-injury, particularly nonsuicidal self-cutting Change in implicit affect toward self-injury stimuli and self-related stimuli		
Participants Included (check all that apply)	☐ Active Duty ☐ OEF/OIF/OND Veterans	☐ Reserve ☐ Veteran Previous Conflicts	☐ National Guard ☒ Civilians ☐ Other: _____
D&I Materials Please describe D&I materials including manuals, toolkits, apps, websites, forms, handouts, PowerPoint presentations, web-based trainings, demonstration videos, posters, messaging information, SharePoint, etc.			
Website: tectectech.com Demo video: https://vimeo.com/166077703 App on the Apple Store: https://itunes.apple.com/us/app/tec-tec/id1114356340?mt=8 App on Amazon (for Android devices): https://www.amazon.com/Tec-LLC-tec/dp/B01H9C7ISS?ie=UTF8&redirect=true Note that the tec-tec app available on app stores is slightly different than the version(s) studied in the Franklin et al. (2016) paper. The public app ("tec-tec") differs from the study version ("TEC") in the following ways: (1) it combines the NSSI/suicide versions into a single version; (2) it is a native app instead of a web app; (3) it includes pleasant/unpleasant stimuli that are not copyrighted (vs. copyrighted IAPS images used in the studies); and (4) it is more gamified, including trophies for earning more points, playing more games, etc.			
Readiness for Implementation using a combination of RE-AIM and Implementation Outcome Frameworks			
INSTRUCTIONS: Below you will find a list of implementation domains to report your data to date. It is not expected that your project will have data for all of these domains. If none, check "no evidence", but feel free to comment within the description box. If you do have data, please also check all sources including a clinical ^{vi} or implementation ^{vii} study or from leadership ^{viii} or other stakeholder input ^{ix} . Please specify if from Department of Defense or Veteran vs. civilian settings.			
Reach Participation rate among clients approached and representativeness of those who participate compared to those for whom this intervention is targeted. Alternatively, the penetration or integration of this intervention within a service setting and its subsystems defined by # clients receiving service/# clients eligible or # providers offering service/# providers trained			

Evidence from: ☒ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	From our initial studies: We did not require that participants complete an instance of TEC; we just described TEC and gave them a very small monetary incentive for accessing and playing it. The following are the rates at which participants played the app at least once – Study 1 (70.15%; total study N = 114); Study 2 (90.84%; total study N = 131); and Study 3 (78.53%; total study N = 163). From a clinician who works with suicidal/self-injurious populations, primarily teens and young adults: ‘I recommended the app to 5 clients, three downloaded it and found it to be helpful, with one finding it to be extremely helpful and playing hundreds of instances of tec-tec.’ A brief note on tec-tec dosage: There is strong rationale and moderate evidence to suggest that the more one plays tec-tec, the better the effects on self-injurious thoughts and behaviors. In general, conditioning is more effective with more trials of conditioning (cf. # of times one plays tec-tec) and with consistent conditioning for a long period of time to avoid extinction of conditioning (cf. persistence of playing tec-tec across several weeks, months, or years). To help with this, we have gamified tec-tec to promote more use. We would recommend playing tec-tec at least once per day, and ideally for 5-10 minutes per day (which would translate into 2-6 plays of tec-tec). However, we caution that much remains unknown about tec-tec dosage and undoubtedly several factors moderate the effects of tec-tec in general and the helpful dosage of tec-tec in particular (e.g., length/severity of self-injury history). Playing tec-tec at least once per day may be necessary to see an effect for most people. Playing tec-tec hundreds of times over the span of a few weeks (as with the clinician note above) may not be necessary for most people, but it could be necessary for some people. From the Apple store, which provides the most specific information on impressions (i.e., how many people see the app store entry) and downloads: Over the past year, there have been 25,824 impressions for tec-tec and 2,054 downloads. Figures for the Amazon store are likely to be similar. Note that the vast majority of “impressions” are not people who are actively seeking out tec-tec or anything like tec-tec – they simply happen upon the entry for a wide range of reasons.
Evidence for this Clinical Intervention^x	
Suicidality Outcome Category	☐ Strong ☐ Moderately Strong ☒ Moderate ☐ Minimal ☐ None
Other Target Outcome Category	☐ Strong ☐ Moderately Strong ☒ Moderate ☐ Minimal ☐ None
See Franklin et al. (2016) in <i>Journal of Consulting and Clinical Psychology</i> for a full description of the evidence. To summarize – Suicidality outcome effects combined across all three studies: a. (intention-to-treat analyses) Fewer participants engaged in any suicidal behaviors (regardless of frequency) in the groups assigned to the active version of TEC, but this was not significant ($p = .19$). The rate of suicidal behavior frequency was 51% lower in the groups assigned to the active version of TEC, and this was significant ($p = .01$). But this was no longer significant after controlling for past-month suicidal behaviors ($p = .07$). b. (comparing those who played the active version of TEC at least once to all others) Among those who played the active version of TEC, significantly fewer engaged in any suicidal behaviors (regardless of frequency) ($p = .02$). Similarly, the frequency of suicidal behaviors was 71% lower among participants who played the active version of TEC ($p < .001$) and this held after controlling for past month suicidal behaviors ($p < .001$).	

c. Results for suicide plans were less consistent, with significant reductions in Study 1 (43%, $p < .001$) and Study 3 (59%, $p < .05$), but not Study 2 (20%, $p > .05$). Likewise, there were no apparent effects on suicide ideation in any study.

Other target effects:

a. Nonsuicidal self-cutting frequency was lower in the groups assigned to active TEC compared to control TEC in all three studies (36%, 40%, and 32% reductions, all $ps < .001$). Self-cutting was the primary target in Studies 1 and 2, with most self-injury related stimuli depicting some form of self-cutting.

b. Proposed mechanism of TEC's impact. (1) Increased implicit aversion to self-injury/suicide stimuli – Studies 1 and 3 showed significant effects on this target, and these effects were correlated with reductions in self-injurious thoughts and behaviors, but this was not replicated in Study 2; (2) Increased likely of self-related stimuli – supporting evidence was found in Study 1, but not Studies 2 or 3.

Evidence in Support of Intervention Adoption

Percentage and representativeness of the organizations or settings that will conduct this intervention

Acceptability	Perception among leadership, clinicians, Service Member/Veteran, family or other stakeholders that this intervention is agreeable, palatable, or satisfactory
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	Given the nature of this intervention, I do not have much information on this point. Two small lines of evidence: a. We had no adverse effects among the ~250 or so people assigned to active TEC in our studies. b. A clinician who has recommended tec-tec to some of his clients wrote me to comment: "I introduce it [tec-tec] as the 'wave of the future.' An advantage is that it is an intervention that will reach those who are not willing to go to traditional therapies or it can complement traditional therapies. Plus, it's fun and uses associations in a clever way to change thoughts patterns. I'm a CBT therapist and it is entirely congruent with what I normally do. It is also unique and creative and offers something new and different. It's always helpful to offer something fresh and data-based."
Adoption	Intention, initial decision, or action to try or employ this intervention
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	(see clinician quote above)
Appropriateness	Perceived fit, relevance, or compatibility of this intervention for a given practice setting, perceived fit of this intervention to an established need to address a particular issue, and access to Service Members/Veterans who need it
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☒ Other stakeholder input ☐ No evidence	(see clinician quote above)

Implementation	
Intervention integrity or the quality and consistency of delivery	
Fidelity	Degree to which this intervention has been implemented as it was prescribed in the original study or as it was intended by the intervention developers
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	I do not have any direct evidence about this, but as tec-tec is a self-contained app, it generally can only be experienced as intended. Although the public version of the app ("tec-tec") is slightly different from the research version ("TEC") (see above), the differences are cosmetic.
Feasibility	Extent to which this intervention can be successfully used or carried out within a given agency or setting such as the ability to take on the demands of this intervention and resources to do so
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	I do not have any direct evidence of this, but I reason that tec-tec could be implemented in a wide range of settings with minimal resource cost: a. tec-tec is free and available across all Apple and Android devices (it has a responsive design whereby the app automatically formats itself for phones, tablets, computers, etc. as appropriate). It requires an internet connection to download, but does not require an internet connection to use. b. It is brief, requiring 1-2 minutes to play a single instance. It can be played anywhere and at any time. c. As indicated by the clinician example above, it can be easily integrated into traditional therapeutic settings. As indicated by the three TEC studies, it may also be viable as a standalone intervention.

Maintenance and Cost How well does the adoption or use of this intervention hold up in the long term and the extent to which it becomes institutionalized	
Sustainability	Extent to which this intervention has been maintained or institutionalized within a service setting's ongoing, stable operations (presuming it was implemented)
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	Once again, I have no direct evidence on this point. However, the app-based nature of the intervention allows it to be easily maintained within an institution. It has no marginal costs and requires no effort or updating from the institution itself. The only need is for me and my team to update the app based on changes in operating systems across various devices. We do this for free (or rather, at the cost of a few hundred hours and thousands of dollars to ourselves each year) as a public service, and intend to continue doing this as long as individuals find tec-tec to be helpful.
Cost	Cost impact of the implementation effort including: costs of this intervention itself, the implementation of the intervention and the location of service delivery
Evidence from: ☐ Clinical study ☐ Implementation study ☐ Leadership ☐ Other stakeholder input ☒ No evidence	The intervention is free and can be downloaded to any device with an internet connection. Thereafter, it can be accessed/played anywhere at any time. The development cost was ~\$150,000; the estimated annual maintenance cost is ~\$20,000, but this depends on many factors (e.g., if a major change to iOS occurs, it could necessitate a major re-write).

ⁱ Please describe the intervention in lay terms that can be understood and appreciated by military commanders, chaplains, nurses, social workers, public health administrators, etc. This is setting the framework for which they will interpret the rest of the clinical and implementation results you are presenting.

ⁱⁱ POC is the person DoD or other military partners should contact for more information about the intervention and its dissemination and implementation.

ⁱⁱⁱ Recruitment site is where study participants were identified and recruited (e.g. Fort Carson or Portland VA). If online, please provide recruitment strategy or sites where the study was advertised.

^{iv} Suicidality Outcome must be suicidal ideation or behavior. Other risk factors such as hopelessness and depression are considered other target outcomes.

^v Other Target Outcome is either the outcome or the mechanism of your study.

^{vi} Clinical study would be any study where the focus was outcomes for the clients – efficacy or effectiveness RCT, pilot study, adaptation to a new setting where the focus was client outcomes.

^{vii} Implementation study would be a formal study where the focus was not client outcomes from the intervention but its uptake, acceptability, feasibility, reach, sustainability, etc.

^{viii} Leadership feedback ranges from a clinical guideline or other mandate to more informal input such as focus groups, response to briefings on the intervention, etc.

^{ix} Other stakeholder input would include input from clinicians, other staff such as chaplains, Service Members and their families, Veterans, information technology or other relevant administrative staff, etc.

^x Quality of Evidence for Clinical Intervention categories

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

A Brief Mobile App Reduces Nonsuicidal and Suicidal Self-Injury: Evidence From Three Randomized Controlled Trials

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Adam C. Jaroszewski, Jill M. Hooley, and Matthew K. Nock
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Objective: Self-injurious thoughts and behaviors (SITBs) are a major public health problem that traditional interventions have been unable to address on a large scale. The goal of this series of studies was to take initial steps toward developing an effective SITB treatment that can be easily delivered on a very large scale. **Method:** We created a brief (1–2 min), game-like app called Therapeutic Evaluative Conditioning (TEC), designed to increase aversion to SITBs and decrease aversion to the self. In 3 separate studies, we recruited participants with recent and severe histories of SITBs from web forums focused on self-injury and psychopathology ($Ns = 114, 131, \text{ and } 163$) and randomly assigned them to receive access to the mobile treatment TEC app or a control app for 1 month. We tested the effect of TEC on the frequency of self-cutting, nonsuicidal self-injury more generally, suicide ideation, suicide plans, and suicidal behaviors. **Results:** Analyses showed that, compared with the control app, TEC produced moderate reductions for all SITBs except suicide ideation. Across studies, the largest and most consistent reductions were for self-cutting episodes (32%–40%), suicide plans (21%–59%), and suicidal behaviors (33%–77%). Two of the 3 studies showed that TEC impacted its intended treatment targets and that greater change in these targets was associated with greater SITB reductions. TEC effects were not maintained at the 1-month posttreatment follow-up. **Conclusions:** Future versions of brief, mobile interventions like that tested here may have the potential to reduce SITBs and related behaviors on a large scale.

What is the public health significance of this article?

Across 3 studies, we found that a brief mobile app generated moderate reductions in nonsuicidal and suicidal self-injury. These findings suggest that mobile interventions may have the potential to impact SITBs on a large scale.

Keywords: mobile app, NSSI, self-injury, suicide, treatment

Supplemental materials: <http://dx.doi.org/10.1037/ccp0000093.supp>

Self-injurious thoughts and behaviors (SITBs) are a major public health problem. Suicide accounts for an estimated one million worldwide deaths each year, making suicide responsible for more deaths than war, accidents, or AIDS (World Health Organization, 2012). These deaths are in addition to an estimated 25 million annual nonfatal suicide attempts, many of which result in serious medical injuries (Crosby et al., 2011).

The rates of these behaviors are exceeded by the annual prevalence of suicide plans (0.6%) and ideation (3%) (Kessler et al., 2005). Nonsuicidal self-injury (NSSI; e.g., cutting or burning without suicidal intent) is even more common, with estimates of prevalence rates ranging for 5% to 17% in general populations and more than 50% in certain clinical populations (see Swannell et al., 2014).

This article was published Online First March 28, 2016.

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Jessica D. Ribeiro is now at the Department of Psychology, Vanderbilt University.

Joseph C. Franklin and Christopher R. Franklin are co-authors on a pending patent application for TEC, and Joseph C. Franklin is owner of tec-tec, LLC. This research was funded in part by the following: The American Foundation for Suicide Prevention (Award No. PRG-048-13) to Joseph C. Franklin, Jill M. Hooley, and Matthew K. Nock; The Eric M. Mindich Research Fund for the Foundations of Human Behavior to Joseph

C. Franklin; The Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense and Health Affairs (Award No. W81XWH-10-2-0181) to Joseph C. Franklin, Jessica D. Ribeiro, and Matthew K. Nock (opinions, interpretations, conclusions and recommendations are those of the authors and are not necessarily endorsed by the MSRC or Department of Defense); The National Institute of Mental Health (Award No. T32MH18921) to Jessica D. Ribeiro; and The John D. and Catherine T. MacArthur Foundation to Matthew K. Nock.

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Given the scope and seriousness of this problem, a tremendous amount of research has been devoted to the development of effective SITB interventions over the last several decades. Unfortunately, few interventions have proven effective and even the most promising interventions have produced mixed results (Brown & Jager-Hyman, 2014; Glenn, Franklin, & Nock, 2015). Regardless of their efficacy, most existing interventions are inherently limited in their ability to reduce SITB rates on a large scale. This is because their in-person model of delivery, which typically involves a therapist and client (or group of clients) meeting face-to-face on a weekly basis for an hour, constrains the potential impact of these treatments in several ways (Kazdin & Rabbitt, 2013). First, there is approximately one therapist for every 100 mentally ill individuals; accordingly, even if all therapists practiced evidence-based treatments, there would still be little change in national and international rates of SITBs. Second, this model of delivery is often costly in terms of time, money, and client effort. These cost barriers prohibit many individuals from accessing treatments (Mojtabai et al., 2011; Sareen et al., 2007). Third, this model of delivery is unable to overcome one of the most common barriers to accessing treatment: the desire to handle one's own problems (i.e., the autonomy barrier; Mojtabai et al., 2011; Sareen et al., 2007).

These barriers help to explain why most individuals with SITBs do not receive treatment (Bruffaerts et al., 2011), which in turn helps to explain why there has been little change in SITB rates over the last several decades (Kessler et al., 2005; Nock, Borges, et al., 2008a). These patterns show a clear need for the development of effective SITB interventions that can overcome availability, cost, and autonomy barriers. The present series of studies represent initial steps toward this goal. Specifically, these studies evaluated the first iterations of a novel web app designed to reduce SITBs by targeting two recently identified SITB risk factors.

The first treatment target is the diminished aversion to SITB-related stimuli (e.g., blood, wounds, knives, skulls, etc.). Whereas most people find these stimuli extremely aversive, many people who engage in SITBs find these stimuli neutral or even pleasant (Franklin, Lee, Puzia, & Prinstein, 2014; Joiner, 2005). This diminished aversion may be partially explained by pain offset relief conditioning during episodes of self-injury (Franklin, 2014; Franklin et al., 2013; Franklin, Lee, et al., 2014; Franklin, Puzia, Lee, & Prinstein, 2014). Although pain itself is unpleasant, the removal of pain generates a powerful state of relief; any stimuli present during this relief (e.g., blood, wounds) acquire a more positive valence. Recent evidence indicates that this diminished aversion to SITB stimuli longitudinally predicts future SITBs above and beyond several other competing predictors, including prior SITBs and psychopathology (Franklin, Puzia, et al., 2014). According to recent theories, the aversion to SITB stimuli creates a barrier that dissuades most people from engaging in SITBs, and a reduction in this barrier facilitates SITBs (Franklin, Lee, et al., 2014; Franklin, Puzia, et al., 2014; Joiner, 2005). Based on this work, we hypothesized that increasing the aversion to SITB stimuli would reduce future SITBs.

The second treatment target is aversion toward the self (i.e., one's own representation of their identity or subjective experience). Most people have a positive association with the self (e.g., Koole et al., 2001), but many people who engage in SITBs show aversion toward the self, as indicated by high levels of self-

criticism and similar constructs in this population (e.g., Hooley & Germain, 2014). Recent experimental work indicates that self-aversion may be a particularly important motivator of SITBs (e.g., Hooley & Germain, 2014). Specifically, this work suggests that self-aversion generates the belief that one deserves pain, punishment, or death. In the absence of such beliefs, it may be much more difficult for SITBs to occur. Correspondingly, we hypothesized that decreasing self-aversion would reduce future SITBs.

Our preliminary work is consistent with these two treatment target hypotheses. In a pilot study, Franklin (2014) attempted to increase aversion to SITB stimuli by pairing these stimuli with mildly painful electric shocks. Compared with a control group that received shocks unpaired with SITB stimuli, a group that received aversive conditioning (i.e., shocks paired with SITB stimuli) reported significantly fewer self-cutting behaviors over the ensuing six months. Treatment response was significantly predicted by increases in physiological aversion to SITB stimuli. Similarly, Hooley and Germain (2014) found that a 5-min cognitive intervention aimed at improving self-worth normalized pain endurance in a sample of individuals with a history of self-injury. Although these preliminary findings are promising, one major limitation is that these interventions are impossible to deliver on a large scale in their present formats. Given their relatively simple proposed mechanisms of action (i.e., increasing aversion to SITB stimuli, decreasing self-aversion), however, we believed that these interventions could be transformed into a simple format amenable to large-scale dissemination.

For the present series of studies, we built on this preliminary work to place these two potential interventions into a single, novel evaluative conditioning paradigm. Evaluative conditioning is a form of Pavlovian conditioning that occurs when the liking (i.e., evaluation) of one stimulus changes as a result of its pairing with another stimulus (e.g., Hofmann et al., 2010). For example, the liking of a picture of a blue triangle may change if it is repeatedly paired with a picture of a spider. Evaluative conditioning has traditionally been employed to study changes in attitudes toward neutral stimuli in social psychology (see Hofmann et al., 2010), but more recently has been applied to study clinical phenomena (e.g., Houben et al., 2010). Although there is a wide range of evaluative conditioning procedures (see Hofmann et al., 2010), most involve the simultaneous or sequential pairing of pictures or words. These paradigms are typically short (<100 trials), passive (watching stimuli on screen), and administered a single time in a laboratory. As described in more detail below, we created a modified evaluative conditioning procedure that has an engaging, game-like design and is meant to be played many times outside of the laboratory on a mobile device. We call this procedure Therapeutic Evaluative Conditioning (TEC). In the present series of studies, we designed TEC to increase aversion to SITB-related stimuli (pairing these stimuli with unpleasant stimuli) and to increase liking of self-related words (pairing these words with pleasant stimuli). Across all studies, we hypothesized that TEC would cause decreases in SITBs.

Study 1

In Study 1, we tested TEC within a sample of individuals with a recent history of frequent NSSI. We focused on this population in our initial study because our pilot work focused on this popu-

lation and NSSI is prevalent, frequent, and strongly associated with a range of SITBs (see Franklin & Nock, in press). Participants were randomly assigned to receive access to an active version of TEC ("active group") or a control version of TEC ("control group"), and were allowed to access the appropriate version of the TEC app as much as they desired over a one-month period.

We hypothesized that, compared with the control group, the active group would display reductions in self-cutting and overall NSSI. Given the specificity of this version of TEC to self-cutting, we expected milder treatment effects for suicide ideation, plans, and behavior. We additionally hypothesized that any treatment effects would remain significant after controlling for stringent covariates including prior month SITBs, emotion reactivity, internalizing symptoms, recent psychiatric treatment (both psychosocial and pharmacological), desire to stop engaging in NSSI, and self-prediction of future NSSI.

Secondary analyses explored a range of other potential effects, including the effect of active TEC dosage on SITBs and whether any treatment effects persisted during the month after TEC access ended. We also hypothesized that active TEC would impact its intended treatment targets (i.e., diminished aversion to NSSI stimuli; heightened aversion to self-related words) and that changes in these treatment targets would be associated with SITB reductions. Finally, we explored the possibility that reductions in SITBs would be accompanied by compensatory increases in non-SITB dysregulated behaviors.

Method

Participants. Participants were 114 individuals (80.70% female) recruited from online web forums that focused on topics relating to self-injury or psychopathology. To be eligible to participate, individuals had to meet the following criteria: (a) 18 years of age or older; (b) English fluency; and (c) two or more episodes of self-cutting in past month. Most participants were young adults ($M = 23.02$ years old, $SD = 5.47$) and most identified as Caucasian (81.57%), with the remaining identifying as Asian (6.14%), Black/African American (1.75%), Hispanic (1.75%), or Other (8.77%; e.g., mixed race). Most par-

ticipants were living in the United States ($n = 96$), with the remaining living in Canada ($n = 2$), Europe ($n = 12$), Asia ($n = 3$), and Australia ($n = 1$). The majority of participants reported a history of psychiatric treatment (lifetime: 76.31%; past month: 55.26%), many reported a history of inpatient psychiatric treatment (lifetime: 29.82%; past month: 3.50%), and 50.87% were currently on psychiatric medication. Participants were randomly assigned via a random sequence generator to either the control group (which received access to the control TEC, $n = 59$) or the active group (which received access to active TEC, $n = 55$). There were no significant demographic or treatment history differences between the two groups (all $ps > .05$). Groups reported similar baseline levels of each of SITBs and covariates (see Table 1), with the exception of significantly fewer prior month suicide plans in the active group ($B = -.29$, $SE = .09$, $p = .001$). CONSORT flow diagrams for each study are presented as Supplemental Figures S1 through S3.

Therapeutic evaluative conditioning (TEC). We designed TEC to be a brief, game-like treatment that could be accessed by any device with an Internet connection. We aimed for TEC to be accessed multiple times a day at the convenience of the user. Several TEC characteristics promoted this aim: It takes 1 to 2 min to complete a single instance of TEC; TEC becomes more challenging as the trials progress; points are awarded for faster and more accurate performance; each instance of TEC is unique, increasing replay value; and although TEC was primarily intended as a mobile app, it includes a responsive design that allows it to automatically format itself for phones, tablets, laptops, and desktops (see Figure 1 and Supplemental Method for a detailed description of TEC). For the present study, we included a version of TEC that targeted self-related words (e.g., me, myself, I, mine) and SITB-related stimuli that primarily depicted self-cutting (in Studies 1 and 2) or suicide/death stimuli (in Study 3).

Measures.

Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007). The SITBI is a structured interview that assesses the presence, frequency, and characteristics of self-injurious thoughts and behaviors. As in previous studies (e.g.,

Table 1

Means and Standard Deviations for Prior Month SITBs, Covariates, and AMPs Across All Studies

Measure	Study 1		Study 2		Study 3	
	Control <i>M</i> (<i>SD</i>)	Active <i>M</i> (<i>SD</i>)	Control <i>M</i> (<i>SD</i>)	Active <i>M</i> (<i>SD</i>)	Control <i>M</i> (<i>SD</i>)	Active <i>M</i> (<i>SD</i>)
Self-cutting episodes	15.88 (28.15)	10.96 (17.85)	8.59 (11.92)	12.31 (29.27)	3.38 (6.90)	3.51 (6.18)
Self-cutting events	—	—	42.46 (80.47)	41.11 (77.61)	22.99 (74.22)	19.81 (62.02)
NSSI episodes	32.47 (61.29)	18.85 (25.61)	24.56 (61.92)	24.16 (59.12)	8.73 (17.60)	8.05 (13.07)
NSSI events	—	—	82.30 (134.17)	60.68 (86.98)	30.54 (59.58)	29.09 (54.56)
Suicide ideation	12.63 (11.30)	11.50 (12.72)	12.50 (10.90)	13.47 (11.21)	8.84 (10.36)	12.29 (12.60)
Suicide plans	6.88 (10.04)	3.85 (6.48)	5.38 (8.76)	6.66 (9.41)	4.45 (7.76)	4.81 (7.16)
Self-prediction of NSSI	4.05 (1.27)	4.13 (.96)	4.42 (.86)	4.23 (.98)	3.52 (1.15)	3.65 (1.14)
Desire to stop NSSI	2.73 (1.27)	2.96 (1.20)	2.99 (1.33)	2.94 (1.25)	2.48 (1.78)	2.55 (1.63)
ERS total	53.53 (18.18)	54.80 (19.23)	59.47 (17.49)	61.89 (14.09)	57.29 (16.34)	53.70 (18.58)
BSI total	40.98 (16.29)	39.09 (13.61)	46.69 (13.38)	43.16 (12.78)	43.45 (12.29)	41.86 (14.83)
IDB total	24.26 (4.04)	23.49 (3.07)	28.04 (2.68)	27.84 (2.66)	28.28 (2.90)	27.82 (2.79)
AMP NSSI	.47 (.30)	.57 (.32)	.52 (.32)	.47 (.30)	.41 (.28)	.48 (.27)
AMP self	.58 (.27)	.47 (.27)	.54 (.34)	.57 (.29)	.55 (.32)	.54 (.34)

Note. *M* = mean; *SD* = standard deviation; — = not available; ERS = Emotion Reactivity Scale; BSI = Brief Symptom Index; IDB = Index of Dysregulated Behaviors; AMP = Affect Misattribution Procedure. Self-cutting and NSSI events were not recorded for Study 1.

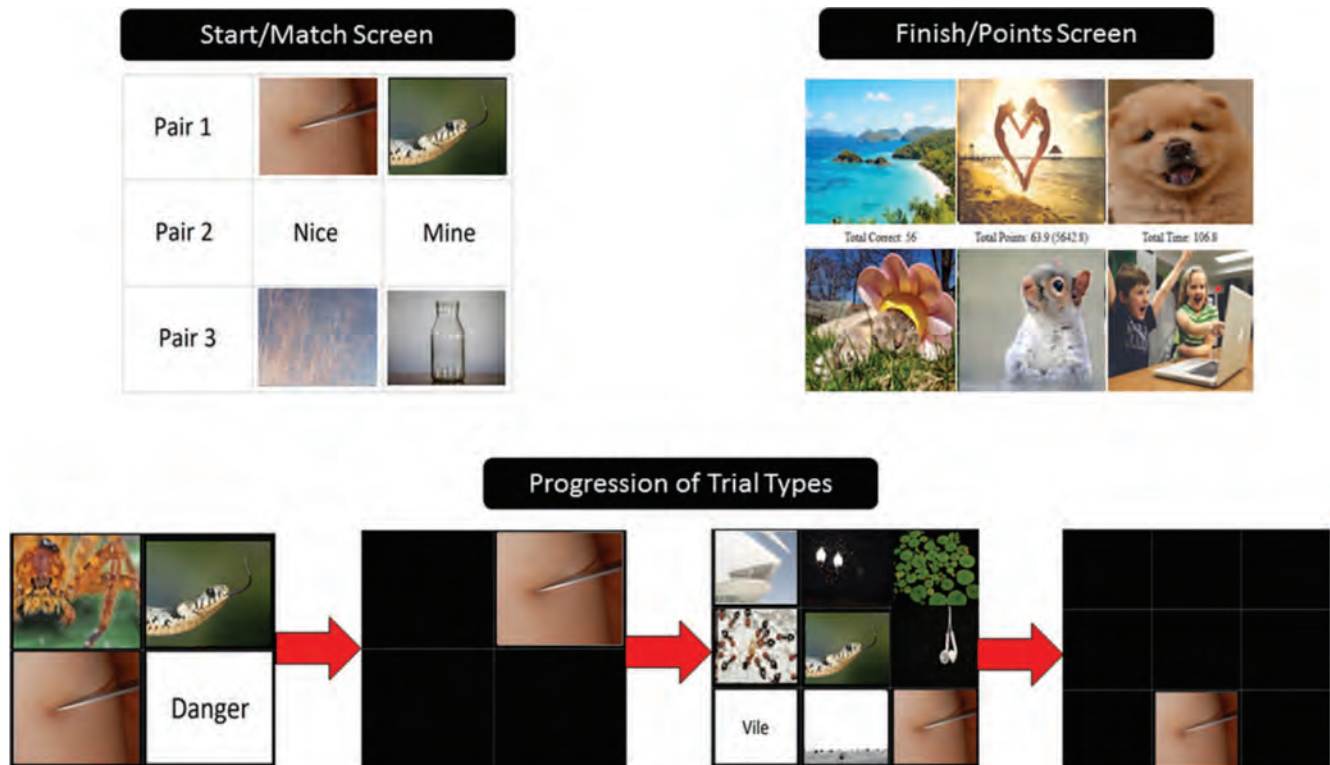


Figure 1. Screenshots of TEC screen types. TEC begins with a screen displaying matches, moves to a 2×2 grid for the first 15 trials; masks alternative options after the first pair member is selected for the second 15 trials; moves to a 3×3 grid for the third 15 trials; masks alternative options within this larger grid for the final 15 trials; and ends with a screen that displays positive (for active TEC) or neutral images (for control TEC), total trials correct, game and total points, and time elapsed for that instance of TEC. See the online article for the color version of this figure.

Franklin, Puzia, et al., 2014), in the present series of studies we employed an online self-report version of the SITBI. The online and in-person versions of the SITBI produce very similar estimates of SITB status and frequency (see Franklin, Puzia, et al., 2014). We used the SITBI to measure the following: self-cutting (defined as number of times someone has cut themselves); overall NSSI (i.e., moderate NSSI behaviors: self-cutting, burning, hitting, inserting objects under the skin, and scraping; see Franklin, Lee, et al., 2014; Franklin, Puzia, et al., 2014); suicide ideation (defined as number of days during which ideation occurred); suicide plans (defined as number of days during which plans occurred); and suicidal behaviors (defined as the number of nonfatal attempts, interrupted attempts, and aborted attempts).

We additionally used the SITBI to measure self-prediction of the likelihood of future NSSI (1 to 5 scale; 1 = definitely not, 5 = definitely) and desire to stop engaging in NSSI (1 to 5 scale; 1 = no desire, 5 = extreme desire). Finally, we used the SITBI to measure demographic and psychiatric treatment history (i.e., both psychosocial and pharmacological). At baseline, the SITBI was used to assess thoughts and behaviors over one's lifetime, past year, past month, and past week. During the treatment month of the study, the SITBI was administered weekly and the timeframe was

past week; during the posttreatment month, the SITBI was administered monthly and the timeframe was past month.

Emotion Reactivity Scale (ERS; Nock, Wedig, Holmberg, & Hooley, 2008). The ERS is a single-factor 21-item self-report scale that measures emotion reactivity, a construct that includes emotional sensitivity, intensity, and persistence. It is strongly correlated with measures of emotion dysregulation, psychopathology, and SITBs (Franklin et al., 2013; Franklin, Lee, et al., 2014; 2014b; Nock, Wedig, et al., 2008), has been shown to mediate the association between psychopathology and self-injury (Nock, Wedig, et al., 2008), and demonstrated excellent reliability in the present series of studies (Cronbach's alphas = .93 to .95). We employed the ERS as a covariate in treatment analyses.

Brief Symptom Inventory (BSI; Derogatis, 2000). The BSI is an 18-item self-report measure of past week psychological distress that includes items pertaining to internalizing symptoms such as anxiety, depression, and panic. The BSI has demonstrated strong construct validity and displayed excellent reliability in the present series of studies (Cronbach's alphas = .88 to .92). As with the ERS, we included the BSI as a covariate in treatment analyses.

Index of Dysregulated Behaviors (IDB). We created the IDB for the present study. It is an 18-item self-report measure of engagement in a wide-range of dysregulated behaviors over the

past month. Behaviors assessed include alcohol abuse, drug abuse, reckless driving, binge eating, purging behaviors, food restriction, abusive relationships, shoplifting/stealing, anger outbursts (e.g., provoking fights, breaking things, setting things on fire), unsafe/reckless sexual behavior, and gambling (beyond small bets). We included this measure to test the possibility that reduction in one dysregulated behavior (i.e., NSSI) would be compensated for by increases in other dysregulated behaviors (e.g., alcohol use, reckless behaviors).

Treatment targets: Implicit aversion to NSSI, death/suicide, and the self. We measured implicit affect with a brief computer-based task called the Affect Misattribution Procedure (AMP; Payne & Lundberg, 2014; see Supplemental Materials for more information). The present series of studies operationalized treatment targets as AMP scores for stimulus categories related to NSSI (Studies 1 and 2), death/suicide (Study 3), and self-related words (all three studies).

Procedure. All procedures were approved by the Institutional Review Board of Harvard University.

Recruitment. Similar to other recent self-injury studies (e.g., Lewis & Michal, 2015), participants were recruited from online web forums ($n = 12$) that focused on discussions of self-injury and related phenomena. Advertisements did not explicitly describe the study as a treatment study. The informed consent form made clear the treatment-related aspects of the study, but did not provide details about TEC that would have allowed participants to discern whether or not they were in the active or control group. This procedure was designed to reduce placebo effects and to more effectively target our intended population—the large number of individuals who engage in SITBs but do not actively seek treatment.

The web-based recruitment strategy provided several advantages. First, it improved speed of recruitment, ease of contact, comfort disclosing psychological and behavioral problems, attention to study instructions, geographic diversity, and number of potential participants (e.g., Casler et al., 2013; Hauser & Schwarz, 2015). On balance, however, online recruitment presents unique challenges that have the potential to threaten the quality of research (e.g., bots, study comprehension assurance). Over the past decade researchers have developed several innovative recruitment procedures and protocols to overcome these challenges (e.g., Bull et al., 2008; Ip et al., 2010). In part because of these procedures, several recent studies have found that online and in-person recruitment procedures produce nearly identical results across a wide range of tasks and populations (Casler et al., 2013; Crump et al., 2013; Hauser & Schwarz, 2015).

Second, instead of confining recruitment to a specific hospital or city, this recruitment strategy allowed us to recruit from our primary population of interest—the worldwide SITB population with an Internet connection. In particular, we were most interested in individuals with highly frequent SITBs who were not currently benefiting from traditional treatments. Third, it ensured that participants were regular Internet users. As TEC is web-based, this improved the odds that participants would regularly access TEC and complete follow-up assessments. Fourth, the large pool of potential participants made it possible to select for individuals with recent and frequent NSSI. Using traditional methods, it is difficult to recruit a large number of such participants. Fifth, compared with

local community recruitment methods, it provided greater confidence in the validity of Participant SITB status.

Building on best practice recommendations for online recruitment (e.g., Bull et al., 2008; Ip et al., 2010), we employed a five step recruitment process (see Supplemental Method for a detailed description).

Design, participation, and compensation. Assessments occurred at baseline, weekly during the treatment month, and at the end of the posttreatment month. All individuals participated anonymously. Participants were asked to provide an email address that did not include identifiable information. Through this e-mail address, participants received automatic e-mails with links to follow-up surveys and were compensated via electronic Amazon gift cards. Participants were compensated \$10 for baseline assessments, \$5 for each weekly assessment during the treatment month, and \$20 for the posttreatment month assessment. Additionally, participants were compensated based on their TEC performance: one cent for each TEC point, up to \$50 (5,000 points; the average participant would need to play TEC ~90 times to accrue this many points). The six participants with the highest point totals (who also completed each study assessment point) were compensated an additional \$100.

Implementation of TEC. Participants were allowed to access TEC as often as they desired over the course of one month (i.e., the “treatment month”). We employed this ‘open dosage’ design for two reasons. First, we wanted TEC use in the present study to approximate real world usage. As such, we did not want to artificially constrict the frequency or timing of usage. Second, because TEC is a new intervention, it was unclear which TEC dosage level would be effective. It is possible that a single dose (i.e., playing TEC once) may be sufficient to reduce SITBs, but it is also possible that SITB reductions would require hundreds of TEC doses. The open design of the present study allowed us to explore these patterns to establish an empirical basis for dosage guidelines in future studies.

Each participant was given a unique ID number for the TEC app. This app was linked to a relational database that automatically stored TEC performance information including the number of points, total correct and wrong matches, total time, and date for a given instance of TEC.

Data analytic plan.

Retention rates and missing data. We calculated retention rates across each week during the treatment month and at the end of the posttreatment month. We note here that there were no significant group differences for retention rates across studies. To determine the representativeness of nonmissing data, we conducted Little’s Missing Completely at Random (MCAR) test (see each Results section for a detailed description of missingness). This test was nonsignificant in all three of the present studies (all $ps = .99$), suggesting that data were missing completely at random. Although this indicated that effect estimates based on nonmissing data were likely accurate and unbiased, we analyzed imputed data to provide additional assurance that these estimates were accurate. Imputation methods and results are described in Supplemental Method and Table S1; nonimputed results are presented in the present paper, but we note here that imputed analyses produced nearly identical results.

Outcomes. Outcomes were SITBs, including self-cutting frequency, overall NSSI frequency (including self-cutting behaviors),

days of suicide ideation, days of suicide plans, and suicidal behavior frequency. Suicidal behaviors included suicide attempts, interrupted suicide attempts, and aborted suicide attempts. Self-cutting was examined separately from other NSSI behaviors because it is the most common form of NSSI, it is an unambiguously severe form of NSSI, our inclusion criteria specified self-cutting, and the present version of TEC primarily targeted self-cutting. Because of the low frequency of suicidal behaviors, we report these behaviors for each study but analyze them across all studies after all other analyses.

Additional outcomes were changes in implicit affect toward NSSI- and self-related stimuli, and changes in non-SITB dysregulated behaviors. These outcomes were calculated as the difference between baseline and treatment month scores.

Statistical models. SITBs are count variables that tend to produce positively skewed distributions and an excess of zeros. SITBs accordingly violate the assumptions of statistical techniques based on a normal distributions. Fortunately, there are two common statistical models based on the distributions that SITBs tend to approximate: zero-inflated Poisson (ZIP) regression and zero-inflated negative binomial (ZINB) regression. These two models are similar to one another except that ZINB includes an extra parameter that accounts for overdispersion unrelated to excess zeros (i.e., zeros that the model predicts have a 1.0 probability of being a zero). In the present series of studies, for SITB outcomes we only employed ZIP models when ZINB models indicated

nonsignificant overdispersion. We note here that both models always provided very similar results in terms of significance and effect magnitude. Both models produce incident rate ratios (IRRs), which provide the ratio of the frequency of a given behavior in the active group compared to the control group. These models are described in more detail in Supplemental Method.

Overview of treatment-related analyses. Given that TEC use was self-selected, we were primarily interested in overall group effects (i.e., effects where individuals were included in the active/control TEC group analyses regardless of whether or how much they accessed TEC). These tests resemble intention-to-treat tests, but differ from such tests in that they do not include individuals who did not participate at certain time point (true intention-to-treat analyses with imputed data are provided in Table S1). We note here that there were no significant group differences in app usage participation across studies. All dosage analyses (i.e., analyses based on active TEC points) and posttreatment month analyses were exploratory.

Group effects for treatment month. We tested whether group (active vs. control) significantly predicted SITBs during the treatment month. Because of the trade-offs of our open design (e.g., self-selection of frequency and timing of usage, exploratory dosage hypotheses) and the high volatility of SITBs from week-to-week, we primarily focused on the month-based group treatment analyses in the present series of studies. Monthly SITB frequencies were calculated as the sum of SITB frequencies during each week

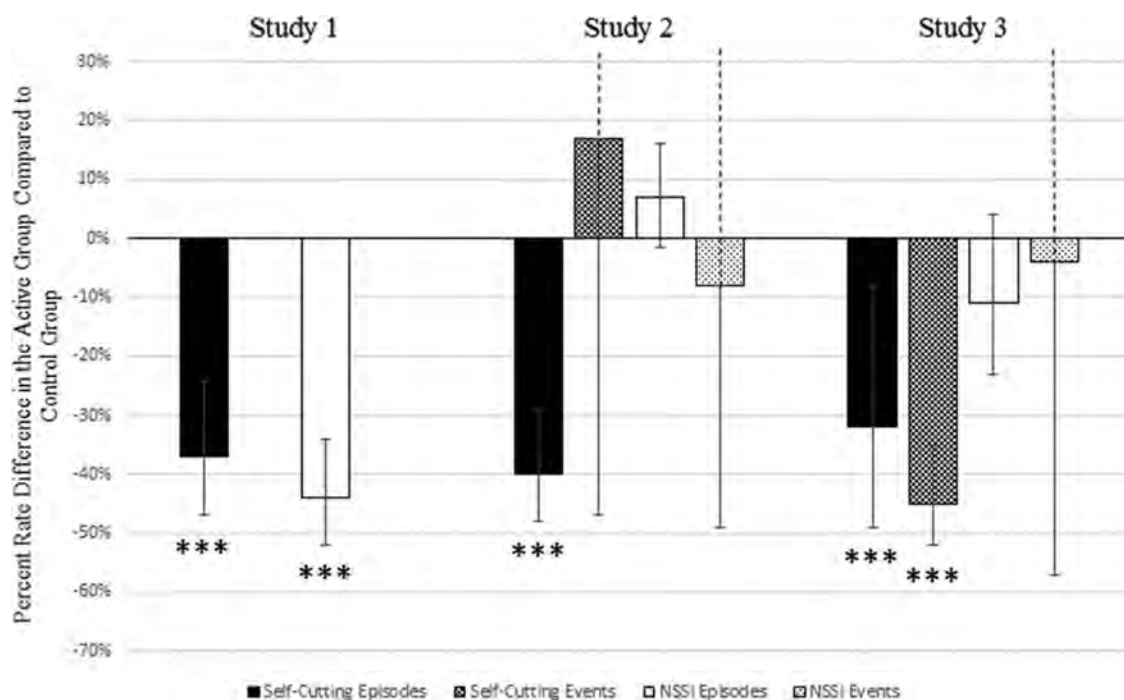


Figure 2. Effect of active TEC on NSSI-related outcomes. All comparisons controlled for several powerful covariates (see Supplemental Tables S2–S4); without these covariates, treatment effects tended to be stronger and there were significant treatment effects on overall NSSI outcomes in Study 3 (see Supplemental Table S1). Error bars = 95% confidence intervals. The upper-bound for the confidence intervals for self-cutting events in Study 2 and NSSI events from Studies 2 and 3 extend beyond the viewable area for the present graph (see Supplemental Tables S2–S4 for more information). Self-cutting events and NSSI events were not measured in Study 1. *** $p < .001$.

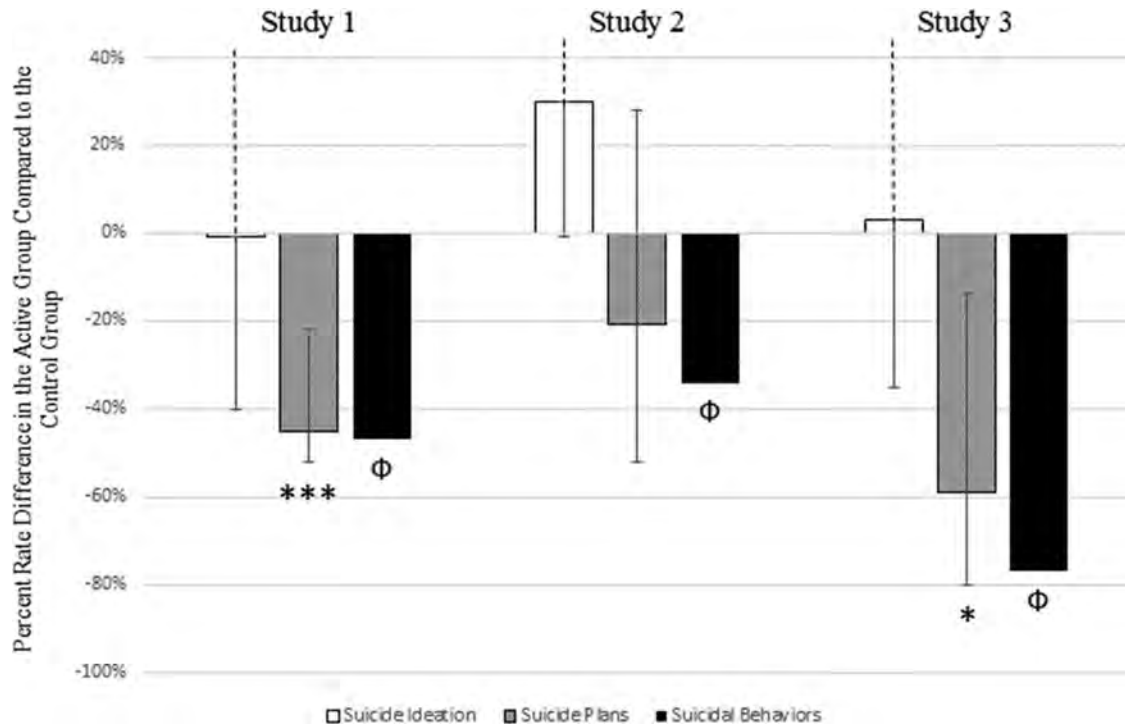


Figure 3. Effect of active TEC on suicide-related outcomes. All comparisons controlled for several covariates (see Supplemental Tables S2–S4). Error bars = 95% confidence intervals. The upper-bound for the confidence intervals for suicide ideation outcomes extend beyond the viewable area for the present graph (see Supplemental Tables S2–S4 for more information). Φ = no statistical tests were performed within individual studies for suicidal behavior outcomes; these were examined in aggregate within the text and the overall treatment effect was statistically significant. * $p < .05$; *** $p < .001$.

of the treatment month. Participants needed to complete each weekly follow-up to allow for calculation of this monthly variable.

We conducted two levels of analyses for SITB outcomes. First, we examined the effect of group on the outcome while including the relevant baseline month SITB as a covariate (e.g., if suicide ideation was the outcome, past month suicide ideation assessed at baseline was included as a covariate). Second, we examined the effect of group on the outcome while including the relevant baseline month SITB, ERS score, BSI score, baseline month treatment status, and baseline self-prediction and desire to stop NSSI (for self-cutting and NSSI analyses) as covariates. Only the latter analyses are presented, but unless otherwise noted in the results section, lower-order analyses produced nearly identical results in terms of significance. For ease of interpretation, group effects for the treatment month are presented in Figures 2 and 3; detailed analyses of group and covariate effects are included in Tables S2 through S4.

We also examined the effect of group on changes in IDB scores and treatment targets (i.e., implicit affect toward NSSI images and self-related words). We then tested whether these latter two difference scores were associated with SITBs during the treatment month. These latter analyses included the relevant baseline SITB as a covariate.

Active TEC dosage effect analyses. To explore potential dosage effects of active TEC, we calculated the proportion of participants who activated the active TEC app and how many points they

scored. Because points were so positively skewed (with a range of nearly 20,000), we transformed points into three general active TEC dosage categories. First, participants were placed in the no dose group if they either (a) were assigned to the control group and thus never had the opportunity to open the active TEC app or (b) were assigned to the active group but never opened the app. Second participants were placed in the low dose group if they scored between 0.1 and 1,999 points in the active TEC app. Third, participants were placed in the high dose group if they scored 2,000 or more points in the active TEC app. Results were similar when more fine-grained class intervals were used (e.g., 4, 5, or 6 class intervals). Including the relevant baseline month SITB as a covariate, we explored the effect of dosage on SITBs. We note here that there were no significant dosage effects for control TEC points in any study (all $ps > .05$); all presented dosage analyses refer to the dosage of active TEC.

Posttreatment month analyses. To explore whether any treatment effects persisted after TEC access ended, we examined the effect of group on SITBs during the posttreatment month while including the relevant baseline month SITB as a covariate. For comparability, only participants included in treatment month analyses were included in posttreatment month analyses.

Suicidal behavior analyses. Given the low base rates of suicidal behaviors over short intervals, we calculated suicidal behaviors over the course of both months of each study and conducted analyses on combined behaviors from all three studies (descriptive

statistics for specific types of suicidal behaviors across studies and groups is provided in Supplemental Table S6). Outcomes included the number of individuals per group reporting any suicidal behaviors and the number of suicidal behaviors per group. We analyzed group treatment effects as well as dosage group effects. Given the relatively low frequency of suicidal behaviors, participants were placed into one of two dosage groups: no active TEC dose (0 points), and any active TEC dose (.1 or more points).

Results

Descriptive statistics.

Retention rates for follow-up assessments. Retention rates gradually dropped from weeks one to four (81.57%, 67.54%, 64.91%, and 60.52%, respectively), with 86.49% of participants completing at least one follow-up during the treatment month and 52.25% of participants completing all follow-ups. Compared with the control group (42.37%), a higher proportion of the active group completed all treatment month follow-up assessments (60.00%). However, nearly identical proportions of each group completed at least one follow-up assessment during the treatment month (control group: 86.44%; active group: 87.27%). A total of 69.29% of participants completed the posttreatment month follow-up, with similar completion rates across groups (control group: 64.41%; active group: 74.54%).

Treatment participation. Most participants accessed their assigned version of the TEC app at least once (70.15%), with similar proportions across groups (control group: 67.79%; active group: 73.36%). There were no significant group differences in TEC points ($p = .45$), as both the control group ($M = 1,311.99$ points; $SD = 2,764.54$ points; $Mdn = 161.85$ points; $Range = 19,181.90$ points) and active group ($M = 1,514.53$ points; $SD = 2,742.78$ points; $Mdn = 270.2$ points; $Range = 14,889.30$ points) displayed similar point distributions. In terms of active TEC dosage, 72 participants received no dose (i.e., assigned to control TEC or assigned to active TEC but did not open the app), 29 received a low dose (.1 to 1,999 points), and 13 received a high dose (2,000 + points). As shown in Supplemental Figure S4, TEC usage was highest during the first week, dropped during the second week and slowly began to increase thereafter.

Treatment analyses.

Self-cutting. During the treatment month, the active group reported significantly fewer self-cutting episodes (i.e., count regression portion of the model; see Figure 2) and self-cutting frequency decreased significantly as active TEC dosage increased ($B = -.38$, $SE = .07$, $IRR = .68$, $p < .001$). The effect of active TEC did not extend into the posttreatment month ($p = .50$).

Overall NSSI. The active group reported significantly fewer overall NSSI behaviors during the treatment month (see Figure 2), with overall NSSI behaviors significantly decreasing as active TEC dose increased ($B = -.44$, $SE = .06$, $IRR = .64$, $p < .001$). This effect did not reach significance during the posttreatment month ($p = .16$).

Suicide ideation. Groups did not differ significantly on suicide ideation during the treatment month (see Figure 3) or posttreatment month ($p = .17$), and the dosage effect was not significant during the treatment month ($p = .08$).

Suicide plans. As shown in Figure 3, the active group reported significantly fewer suicide plans during the treatment month. As

with self-cutting and NSSI behaviors, there was a significant active TEC dosage effect on suicide plans ($B = -.40$, $SE = .17$, $IRR = .67$, $p = .02$). The active group continued to report significantly fewer suicide plans during the posttreatment month ($B = -.59$, $SE = .23$, $IRR = .55$, $p = .01$).

Suicidal behaviors. A total of nine participants reported at least one suicidal behavior; five in the active group (producing 10 behaviors) and four in the control group (producing 19 behaviors). Among participants who accessed the active TEC app at least once, three reported at least one suicidal behavior (producing five behaviors). Among participants who never accessed the TEC app, six reported suicidal behaviors (producing 24 behaviors).

Non-SITB dysregulated behaviors. There was no effect of group on non-SITB dysregulated behaviors during the treatment month ($p = .42$).

Treatment targets. Analyses showed that, compared with the control group ($M = .09$, $SD = .22$), the active group ($M = -.04$, $SD = .21$) displayed a significantly greater increase in aversion toward NSSI stimuli during the treatment month, $t(49) = 1.71$, $p = .04$, $d = .60$ (note: positive change scores diminished aversion toward stimuli, negative scores indicate increased aversion toward stimuli). Diminished aversion to NSSI stimuli during the treatment month (i.e., the inverse of the present treatment target effect on NSSI) was significantly associated with greater NSSI ($B = 1.12$, $SE = .16$, $IRR = 3.06$, $p < .001$), suicide ideation ($B = .48$, $SE = .19$, $IRR = 1.62$, $p = .02$), and suicide plans ($B = .68$, $SE = .32$, $IRR = 1.97$, $p = .04$). There was no significant effect for self-cutting. These treatment target findings showed that TEC increased aversion to NSSI stimuli and that increased aversion was associated with decreased in NSSI, suicide ideation, and suicide plans.

The active group ($M = -.05$, $SD = .27$) showed a significantly smaller drop in positive affect toward self-related words compared to the control group ($M = -.17$, $SD = .24$), $t(49) = -1.77$, $p = .04$, $d = .47$. Diminished aversion toward the self (i.e., the present treatment target effect for self) was associated with less self-cutting ($B = -2.49$, $SE = 1.10$, $IRR = .08$, $p = .02$), NSSI ($B = -.77$, $SE = .17$, $IRR = .46$, $p < .001$), suicide ideation ($B = -1.02$, $SE = .20$, $IRR = .36$, $p < .001$), and suicide plans ($B = -.92$, $SE = .36$, $IRR = .40$, $p = .01$). These results also indicated that TEC diminished aversion to self-related words and that this was associated with reductions in self-cutting, NSSI, suicide ideation, and suicide plans.

Discussion

Results indicated that active TEC had a positive impact on most SITBs. We hypothesized that active TEC would produce reductions in self-cutting and overall NSSI, but expected much milder effects on other SITBs and limited evidence of dosage and post-treatment month effects. Findings exceeded these expectations as, compared with the control version of TEC, the active version of TEC significantly reduced self-cutting (37% reduction), overall NSSI (43% reduction), and suicide plans (45% reduction), even after for including several powerful covariates. There were also fewer suicidal behaviors in the active group, especially among those who played active TEC at least once (see below for suicidal behavior analyses/discussion across all three studies).

Exploratory analyses revealed that treatment effects for some SITBs became more powerful as active TEC dosage increased. Notably, even individuals who received a high dosage of active TEC (i.e., 2,000 points or more) played TEC for less than an hour total during the treatment month. This suggests that relatively infrequent use of TEC (e.g., once per day, 15 min per week) may be effective. However, few treatment effects remained significant during the posttreatment month, indicating that persistent TEC effects may require consistent TEC use. As hypothesized, TEC appeared to impact its intended treatment targets—particularly aversion toward NSSI stimuli, and greater changes in these treatment targets were associated with greater reductions in SITBs. Contrary to findings for other SITBs, there was no effect of active TEC on suicide ideation, suggesting that TEC may primarily impact more active/behaviorally focused SITBs. Taken together, these findings suggest that TEC may generate moderate reductions in SITBs in a short amount of time.

The present findings are promising, but we emphasize that they should be interpreted with caution. In addition to several general limitations of the present series of studies (see General Discussion below), it should be kept in mind that many individual studies often either overestimate effects or cannot be replicated (e.g., Ioannidis, 2005). It is especially difficult to replicate findings of studies with small samples and highly variable outcomes (e.g., SITBs). Although the present findings were consistent with our preliminary work (Franklin, 2014; Hooley & Germain, 2014) and hypotheses, we attempted to replicate these findings to obtain a more accurate estimate of the true effects of TEC.

Study 2

We designed Study 2 to be a close replication of Study 1, with a few minor modifications. First, we altered the unpleasant stimuli in the active version of TEC to make them more disgusting and fear-inducing. We hypothesized that this change would increase the potency of TEC by more powerfully conditioning negative associations with SITB-related stimuli. Second, consistent with evidence that most replication studies are underpowered (McShane & Bockenholt, 2014), we recruited slightly more participants. Third, to retain more participants for treatment month effects, we included past month SITB questions in the week four follow-up assessment. Fourth, we enacted procedures designed to encourage increased retention rates (e.g., compensating participants immediately after assessment completions via Amazon.com). Fifth, we distinguished between self-cutting/NSSI episodes and events. These alterations are described in more detail below. Study 2 hypotheses were identical to those of Study 1.

Method

Aside from the aforementioned changes and the minor details noted below, the measures, procedures, and data analytic plan were identical to Study 1.

Participants. Participants were 131 individuals (74.05% female) recruited from online web forums primarily devoted to the discussion of topics related to self-injury or psychopathology. We recruited from a total of nine forums (out of nine forums that we requested to post advertisements on). Inclusion criteria were the same as for Study 1, except that individuals were ineligible to

participate if they had participated in Study 1. Participants were made aware of this criterion in study postings on forums and we additionally excluded anyone with email addresses or Internet Protocol addresses that were duplicates from Study 1 ($n = 0$). The majority of participants were young adults ($M = 22.91$ years old; $SD = 4.99$) and the majority identified as Caucasian (83.21%), with the remaining identifying as Asian (5.34%), Hispanic (3.82%), Native American (1.53%), or Other (6.12%). Most participants were living in the United States ($n = 107$), with other participants living in Canada ($n = 1$), Europe ($n = 19$), Asia ($n = 1$), Africa ($n = 1$), and Australia ($n = 2$). As in Study 1, most participants reported a history of psychiatric treatment (lifetime: 81.68%; past month: 46.56%), many reported a history of inpatient treatment (lifetime: 29.77%; past month: 3.05%), and nearly half were currently on psychiatric medication (45.80%). Participants were randomly assigned to either the control group ($n = 69$) or the active group ($n = 62$). There were no significant demographic or treatment history differences between the groups (all $ps > .05$). There were no significant group differences on SITBs or covariates, with the exception of significantly higher suicide ideation in the active group ($B = .18$, $SE = .05$, $p < .001$; see Table 1).

Stimuli. Study 1 included a broad range of unpleasant stimuli within the active version of TEC (and the AMP). In an effort to increase the potency of TEC, in the present study we only included unpleasant stimuli that were disgusting (e.g., infected toenails) or fear-inducing (e.g., close up of cluster of spiders). These images were a combination of IAPS pictures and Creative Commons Zero pictures from the Internet.

Data analytic plan. The data analytic plan was similar to that of Study 1, with two exceptions. First, we distinguished between self-cutting/NSSI *episodes* (i.e., discrete periods when someone self-injures; this could include a single cut to the skin or hundreds of cuts to the skin) and self-cutting/NSSI *events* (i.e., individual instances of actual or attempted tissue damage during an episode). After Study 1, we realized that some participants may interpret questions about self-cutting/NSSI frequency to refer to episodes whereas others may have interpreted these questions as referring to events. In SITBs for Studies 2 and 3, we separately defined and assessed episodes and events, thereby adding two additional SITB outcomes. As shown in Table 1, there were marked differences in the frequency of self-cutting/NSSI episodes and events, with events being 4 to 5 times more frequent. Second, we assessed past month SITBs at the week four follow-up to increase the number of participants that could be included in treatment month analyses.

Results

Descriptive statistics.

Retention rates. Retention rates were improved from Study 1, with smaller drops in retention from weeks one to four (84.73%, 82.44%, 74.81%, and 73.38%, respectively), 90.84% of participants completing at least one follow-up during the treatment month, and 64.89% of participants completing all follow-ups. Unlike Study 1, all participants who completed the week four follow-up were able to be included in treatment month analyses ($n = 96$), with very similar completion rates across groups (control group = 75.36%; active group = 70.97%). A total of 71.75% of participants completed the posttreatment month follow-up assessment (control group = 75.36%; active group = 67.74%).

Treatment participation. Compared with Study 1, a greater proportion of participants accessed the TEC app (90.84%), with high access rates in both groups (control group = 92.75%; active group = 88.71%). There were no significant group differences in points ($p = .33$), but the control group ($M = 1,737.99$, $SD = 2,924.59$; $Mdn = 500$; $Range = 21,271.30$) averaged more points than the active group ($M = 1,482.92$, $SD = 2,088.06$; $Mdn = 546.55$; $Range = 8,881.00$). In terms of active TEC dosage, 76 participants received no dose, 39 received a low dose, and 16 received a high dose. Active TEC points were highest during the first week (though much lower than in Study 1), with points diminishing during the second week and leveling off thereafter (Figure S4).

Treatment analyses.

Self-cutting episodes. The active group reported significantly fewer self-cutting episodes during the treatment month (see Figure 2), and episodes dropped significantly as active TEC dose increased ($B = -.15$, $SE = .05$, $IRR = .86$, $p < .001$). However, this treatment effect did not persist during the posttreatment month ($p = .67$).

Self-cutting events. There was no effect of group (see Figure 2) or active TEC dosage ($p = .58$) on self-cutting events during the treatment month. Likewise, there was no group effect on self-cutting events during the posttreatment month ($p = .53$).

Overall NSSI episodes. During the treatment month, there was no effect of group (see Figure 2) or active TEC dosage ($p = .44$), and no group effect during the posttreatment month effects ($p = .59$).

Overall NSSI events. As with self-cutting events, there was no effect of group on overall NSSI events during the treatment month (see Figure 2) or posttreatment month ($p = .72$), and there were no dosage effects ($p = .87$).

Suicide ideation. There was no significant effect of group (see Figure 3) or dosage ($p = .95$) on suicide ideation during the treatment month. However, the active group reported significantly more days of suicide ideation during the posttreatment month ($B = .50$, $SE = .20$, $IRR = 1.65$, $p = .01$). It is important to note that the active group did not report an increase in suicide ideation relative to baseline. Both groups showed declines in ideation across the course of the study (see Table S5); the present results indicate that the active group's decline in ideation during the posttreatment month was less steep than that of the control group.

Suicide plans. There was no significant effect of group (see Figure 3) or dosage ($p = .75$) on suicide plans during the treatment month. Similar to suicide ideation analyses, however, the active group reported significantly more days of suicide plans during the posttreatment month ($B = .85$, $SE = .35$, $IRR = 2.34$, $p = .02$). As with suicide ideation, both groups displayed declines in suicide plans across the course of the study (see Table S5). The present analyses indicate that the active group's decline in suicide plans during the posttreatment month was less steep than that of the control group.

Suicidal behaviors. Four participants in the active group reported at least one suicidal behavior (producing 14 behaviors) whereas eight participants in the control group reported at least one behavior (producing 21 behaviors). Among participants who accessed the active TEC app at least once, three reported at least one suicidal behavior (producing eight behaviors); among participants

who never accessed the active TEC app, nine reported at least one behavior (producing 27 behaviors).

Non-SITB dysregulated behaviors. As in Study 1, there was no effect of group on non-SITB dysregulated behaviors during the treatment month ($p = .68$).

Treatment targets. Contrary to the findings of Study 1, there were no group effects on change in implicit affect toward NSSI stimuli ($p = .33$) or self-related words ($p = .47$), and change in implicit affect was not significantly associated with any SITB outcome ($ps > .05$).

Discussion

Study 2 partially replicated some of the findings from Study 1, but produced much weaker results overall. Similar to Study 1, the active group displayed significant reductions in self-cutting episodes (40% reduction) that increased as active TEC dosage increased. Also similar to Study 1, the active TEC group displayed fewer suicidal behaviors, with individuals who played the active TEC app at least once reporting 70% fewer suicidal behaviors compared to those who did not play the app. Contrary to hypotheses, there were no significant effects on self-cutting/NSSI events. This suggests that TEC may primarily impact the number discrete instances that someone decides to engage in self-injury (i.e., episodes) rather than the number of times someone attempts to damage their tissue across all episodes (i.e., events). Also contrary to hypotheses, the active group displayed significantly higher suicide ideation and plans compared to the control group during the posttreatment month. As noted above, however, both groups displayed reductions in suicide ideation and plans during the study (see Table S5); reductions in the active group were less steep than those of the control group. Finally, unlike Study 1, the present study did not detect a significant effect of TEC on its intended treatment targets.

There are many possible explanations for the reduced effects observed in Study 2. One possibility is that the changes to active TEC (i.e., more disgusting and fear-inducing images) altered the effects of active TEC. Another possibility is that the present control group was more engaged and motivated than the active group. However, the most likely explanation for these divergent effects is chance. Study effects are drawn from a distribution of potential effects. Across hundreds of studies, most effects will cluster near a mean, but by chance many effects will be substantially above or below this mean. This between-studies heterogeneity is likely to be especially common among small studies and highly variable outcomes (e.g., SITBs). With just two studies, it is unclear whether Study 1 provided overly optimistic effect estimates, Study 2 produced overly pessimistic effect estimates, or both. In part to address this question, we conducted a third study.

Study 3

Study 3 was an extension of Studies 1 and 2, with one major change: it was primarily suicide-focused. SITB-related targets in the active version of TEC were primarily suicide-related (rather than NSSI-related) and participants were recruited on the basis of suicidal behavior rather than NSSI. Hypotheses were the same as those from Studies 1 and 2, except that we expected stronger effects on suicide-related outcomes and milder effects on NSSI-related outcomes.

Method

Participants. Participants were 163 individuals (58.89% female) recruited from online web forums that focused on topics related to suicide and psychopathology. We recruited from a total of nine forums (27 were contacted, 14 did not reply, four said no). Inclusion criteria were similar to Studies 1 and 2, except that participants were required to report at least one suicidal behavior within the past year and were not eligible to participate if they had participated in either of the prior studies ($n = 0$). Most participants were young adults ($M = 24.50$ years, $SD = 6.61$) and most self-identified as Caucasian (82.21%), with the remaining identifying as Hispanic (6.13%), Asian (4.91%), Black/African American (1.84%), Native American (1.23%), or Other (3.68%). The majority of participants were living in the United States ($n = 138$), with others living in Canada ($n = 7$), Europe ($n = 14$), Asia ($n = 3$), and South America ($n = 1$).

Similar to Studies 1 and 2, most participants had a history of psychiatric treatment (lifetime: 71.78%; past month: 40.49%), many reported a history of inpatient treatment (lifetime: 32.51%; past month: 1.80%) and nearly half were currently taking psychiatric medication (42.94%). Participants were randomly assigned to either the control group ($n = 85$) or active group ($n = 78$). There were no significant group differences on any demographic or treatment history variables, with the exception of age, $F(1, 161) = 4.70$, $p = .03$. The control group ($M = 25.61$, $SD = 7.26$) was slightly older than the active group ($M = 23.42$, $SD = 5.40$), and we note here that this factor did not alter the magnitude or significance of analyses when entered as a covariate. There were no group differences for any baseline SITB or covariate (see Table 1).

Stimuli. Non-SITB stimuli were the same as those from Study 2. Rather than SITB stimuli depicting only NSSI, the present study included SITB stimuli related to pill overdose ($n = 4$), hanging ($n = 2$), jumping from heights ($n = 2$), pointing a gun at one's own head ($n = 2$), self-cutting ($n = 2$), skulls/bones ($n = 2$), and the words "death" and "suicide." All stimuli were either created by our group (words and self-cutting pictures), taken from the IAPS, or Creative Commons Zero images from the Internet.

Design. The design of the present study was similar to that of Studies 1 and 2, except that participants were allowed continued access to (and compensation for) TEC during the second month of the study. This allowed us to explore whether (or to what degree) TEC use patterns declined over a longer period of time and what effect this might have on SITBs. To maximize comparability with prior studies, the data analytic plan remained the same, with analyses primarily concentrated on the first month of the study.

Results

Descriptive statistics.

Retention rates for follow-up assessments. Retention rates for Study 3 were comparable with those of Study 2, with rates gradually diminishing from weeks one to four (81%, 79.1%, 71.8%, and 67.5%, respectively). A total of 84.47% of participants had data for at least one follow-up during the first month, and 60.87% had data on all month one follow-ups for all assessments. A total of 55.21% of the sample completed the month two follow-up. As with Study 2, the present month one SITB-based analyses are based on month-based estimates of SITBs assessed during the

week four follow-up (control group: 68.24%; active group: 65.38%).

Treatment participation. TEC usage was between that of Studies 1 and 2, with 78.53% of participants accessing the TEC app at least once during the first month (control group: 78.82%; active group: 78.20%). There were no significant group differences in TEC points during the first month ($p = .35$), though the active group ($M = 1,434.85$, $SD = 3,081.06$; $Mdn = 273.65$; $Range = 21,841$) scored more points than the control group ($M = 1,054.73$; $SD = 1,867.07$; $Mdn = 165.20$; $Range = 7,882.90$). As in the two prior studies, TEC points were highest during the first week. Thereafter, TEC points remained relatively high during the second week and diminished across weeks three and four (Figure S4).

TEC usage fell sharply during the second month, with only 36.02% of participants accessing the app. Both the active group, $t(72) = 4.27$, $p < .001$, and the control group, $t(82) = 3.94$, $p < .001$, showed significant reductions in points from month one to month two. Both groups showed similar low levels of play (active: $M = 488.48$, $SD = 2,277.84$, $Mdn = 0$, $Range = 19,047$; control: $M = 355.84$, $SD = 1,340.04$, $Mdn = 0$, $Range = 11,431$), with the majority of participants receiving zero points.

Treatment analyses.

Self-cutting episodes. The active group reported significantly fewer self-cutting episodes during the first month (see Figure 2), but there was no dosage effect ($p = .22$). The treatment effect did not persist into the second month ($p = .37$).

Self-cutting events. Analyses indicated significantly fewer self-cutting events in the active group during the first month (see Figure 2) and this effect persisted into the second month ($B = -.66$, $SE = .15$, $IRR = .52$, $p < .001$); however, there was no evidence of a dosage effect ($p = .20$).

Overall NSSI episodes. Analyses that only controlled for prior month NSSI episodes (vs. the full range of covariates) revealed that the active group reported significantly fewer overall NSSI episodes during the first month (see Table S1). However, this effect was no longer significant when the full range of covariates were included (see Figure 2; Table S2). There was no effect of group on overall NSSI episodes during second month ($p = .38$), and there was no evidence of a dosage effect ($p = .65$).

Overall NSSI events. As with NSSI events, analyses that only controlled for prior month NSSI events showed that the active group displayed significantly fewer NSSI events during the first month (see Table S1). But analyses including the full range of covariates found that there was no effect of group on overall NSSI events in the first (see Figure 2) or second month ($p = .58$), and there was no dosage effect ($p = .98$).

Suicide ideation. There was no effect of group (see Figure 3) or dosage ($p = .43$) on suicide ideation during the first month, and no effect of group during the second month ($p = .12$).

Suicide plans. Analyses indicated a significant reduction in suicide plans for the active group during the first month (see Figure 3), but tests were nonsignificant for a dosage effect during the first month ($p = .09$) and a group effect during the second month ($p = .07$).

Suicidal behaviors. Three participants in the active group reported at least one suicidal behavior (producing five behaviors); five participants in the control group reported at least one behavior (producing 22 behaviors). Among participants who accessed the

active TEC app, two reported at least one behavior (producing four behaviors); among participants who never accessed the TEC app, six reported at least one behavior (producing 23 behaviors).

Non-SITB dysregulated behaviors. As in both previous studies, there was no effect of group on IDB scores ($p = .74$).

Treatment targets. Similar to Study 1, the active group ($M = -.07$, $SD = .19$) showed a significantly larger increase in implicit aversion to SITB stimuli compared with the control group ($M = .03$, $SD = .21$), $t(79) = 2.22$, $p = .02$, $d = .50$ (note: positive change scores indicate diminished aversion toward stimuli, negative scores indicate increased aversion toward stimuli). Diminished aversion to SITB stimuli (i.e., the inverse of the present treatment target effect) significantly predicted more self-cutting episodes ($B = 2.86$, $SE = .79$, $IRR = 17.46$, $p < .001$) and NSSI episodes ($B = 1.83$, $SE = .19$, $IRR = 6.23$, $p < .001$). These findings indicate that TEC increased aversion to NSSI stimuli and that this increased aversion was associated with reduced self-cutting and NSSI episodes. However, compared with the control group, the active group did not display a significant increase in positive implicit affect toward self-related words ($p = .20$).

Discussion

Study 3 extended the general TEC findings of Studies 1 and 2. The overall pattern and magnitude of effects were in between those of Studies 1 and 2, suggesting that these prior studies may have respectively provided optimistic and pessimistic estimates of TEC effects on SITBs. The active group displayed significant reductions for most SITB outcomes except suicide ideation (see Tables S1 and S4, Figure 2), and NSSI effects were no longer significant when accounting for the full range of covariates (see Table S1, Figure 2). There was some evidence of a dosage effect, but very little evidence that treatment effects extended beyond the first month. The present study extends prior TEC findings to a modified version of TEC (i.e., suicide-related stimuli) and a sample selected on the basis of prior suicidal behavior.

Suicidal Behavior Analyses Across All Three Studies

Although rates of suicidal behaviors were in the expected direction for each study, there were too few behaviors to conduct reliable analyses within each study (see Table S6 for information on specific suicidal behaviors). Accordingly, we collapsed suicidal behaviors across each study to provide a more reliable assessment of TEC on these behaviors. Given the low rate of behaviors, however, these analyses should be considered exploratory and preliminary.

Group treatment analyses. Combining data from all three studies, more individuals in the control groups reported at least one suicidal behavior ($n = 17$ of 135 participants) than in the active groups ($n = 12$ out of 130 participants), but this difference was not significant, $\chi^2(1) = .73$, $p = .19$. A significantly higher frequency of suicidal behaviors was reported in the control groups ($n = 62$ behaviors from 135 participants) compared with the active groups ($n = 29$ behaviors from 130 participants), $B = -.71$, $SE = .26$, $IRR = .49$, $p = .01$ (i.e., 51% reduction in the rate of suicidal behaviors); however, this effect was no longer significant after controlling for baseline month suicidal behaviors, $B = -.49$, $SE = .27$, $IRR = .61$, $p = .07$.

Dosage analyses. We conducted these same analyses after dividing participants into those who did and did not access active TEC at least once (i.e., any dose vs. no dose). Significantly fewer participants who received any dose of active TEC reported at least one suicidal behavior ($n = 8$ out of 117 participants) compared with those who received no dose ($n = 21$ out of 147 participants), $\chi^2(1) = 3.70$, $p = .02$. Similarly, compared with the no dose group ($n = 74$ behaviors from 147 participants), the any dose group reported significantly fewer suicidal behaviors ($n = 17$ behaviors from 117 participants), $B = -1.24$, $SE = .30$, $IRR = .29$, $p < .001$ (i.e., 71% reduction in suicidal behaviors after accounting for excess zeros). This effect held when controlling for baseline month suicidal behaviors ($B = -1.12$, $SE = .31$, $IRR = .33$, $p < .001$).

Although these effects are consistent with hypotheses and the effect of TEC on other SITBs, much larger studies are needed to provide a more reliable estimate of the effect of TEC on suicidal behaviors.

General Discussion

There is a need for SITB interventions that overcome the barriers to large-scale treatment. The present series of studies represent the initial steps toward the development of such an intervention. The results of Study 2 were relatively weak, but aggregated results across studies indicated that our brief, game-like app reduced self-cutting episodes, overall NSSI episodes, suicide plans, and suicidal behaviors. Notably, most of these reductions remained in the context of several powerful covariates—including prior month SITBs—that significantly predicted SITBs during the treatment month. Also of note, participants were not made aware of how TEC might work and qualitative debriefing interviews indicated that participants did not ascertain TEC's intended mechanisms of action. These findings suggest that TEC is a brief (i.e., 1–2 min), low effort, game-like intervention that stimulates moderate reductions in most SITBs in a short amount of time.

Although these findings are promising, several other findings make clear the need for improvements that can increase TEC potency, identify additional treatment targets, and increase user engagement. First, despite reductions in most SITBs, no study showed a significant treatment effect on suicide ideation. Second, even though group effects were reliable, there was mixed evidence that greater use of TEC was associated with greater SITB reductions. Third, treatment effects rarely persisted after TEC cessation (i.e., after month one of each study). Fourth, there was mixed evidence that TEC engaged its intended treatment targets, with TEC primarily impacting the diminished aversion to SITB stimuli target rather than the self-aversion target.

These latter results only partially support the hypothesized mechanisms of action for TEC, but they also highlight the promise of targeting a novel risk factor—the diminished aversion to SITB stimuli (or, capability for SITBs). The Benefits and Barriers Model of NSSI (Franklin, Lee, et al., 2014; Franklin, Puzia, et al., 2014) and the Interpersonal-Psychological Theory of Suicide (Joiner, 2005) both note this as a critical SITB ingredient. The present results suggest that the capability to enact nonsuicidal and suicidal self-injury is not an immutable trait; rather, it appears to be a malleable risk factor that reduces SITBs when appropriately targeted.

Along with limitations related to the present findings, several methodological limitations should be kept in mind when interpreting the results of the present study. First, all participants were recruited via online forums that focused on topics related to self-injury, suicide, and psychopathology. The present samples accordingly may have been biased in terms of desire and ability to engage in a web-based treatment. On balance, these samples were drawn from our major population of interest—the worldwide population of individuals with Internet access and a history of SITBs. Nevertheless, it would be helpful to replicate the present findings in large samples recruited from the community, local clinics, and inpatient units. Given the high concordance between in-person and Internet-based studies (e.g., Casler et al., 2013; Crump et al., 2013; Hauser & Schwarz, 2015) and the consistency of the present findings and with our in-person preliminary studies (Franklin, 2014; Hooley & Germain, 2014), we would expect similar findings across the two types of studies.

Second, an additional sampling-related limitation was that participants were primarily young adults. This is a very important population as all SITBs (with the exception of suicide death) are particularly common among this age group. However, it will be important to replicate the present findings in adolescents and older adults. This may require modifying stimuli to be appropriate for adolescents and modifying the nature of the intervention (i.e., app-based) to be more appropriate for elderly adults. Third, the present studies were large compared with most SITB treatment studies, but it would be helpful to replicate the present findings in a much larger sample (e.g., >10,000 participants). This would allow for more reliable estimates of TEC effects on very low base rate behaviors (e.g., specific types of suicide attempts) and provide sufficient power to examine moderators of TEC effectiveness.

Fourth, we paid participants to use TEC. It is unclear whether (or to what degree) participants would use TEC in the absence of such compensation. Given that the control group and active groups were both paid for TEC use and accessed their respective versions of TEC at similar rates, this payment issue is unlikely to account for the present treatment effects. Nevertheless, for feasibility purposes, studies are needed to test TEC use in the absence of monetary compensation and to determine which factors best predict TEC use. Fifth, across studies, 70% to 90% of participants opened the TEC app (whether active or control); these figures are encouraging but far from our ideal treatment engagement rate of 100%. To improve on this limitation, future versions of TEC must be modified in several ways to increase its potency, reinforcing qualities, and ability to impact SITBs on a large scale. For example, we are working on new versions that include a much higher number (and greater variety) of stimuli, greater variations in difficulty, integration of ecological momentary assessments that allow for personalization and optimization algorithms to tailor TEC to each individual across time, and a feature that automatically translates TEC into a wide range of languages.

Sixth, TEC use and dosage were self-selected. This self-directed use approximates how TEC might be used in the real world, but it also leaves open many questions about how assigned TEC dosage may affect SITBs and what the optimal dosage of TEC might be. Future studies would benefit from exploring these important questions. Seventh, the present study primarily examined TEC effects over the course of a single month and results indicated that the effects of TEC likely do not persist long after TEC cessation.

Furthermore, month two results from Study 3 suggest that TEC use may have to be fairly regular (e.g., at least once per week) to produce significant benefits. Future studies should evaluate whether improvements such as personalization algorithms and additional gamification elements generate more TEC use and more lasting TEC effects. Eighth, the active group displayed a less steep decline in suicide ideation and plans during the posttreatment month of Study 2. Given that similar patterns were not observed in Studies 1 or 3, these may be chance findings. However, it will be important for future studies to more thoroughly investigate the possibility of adverse TEC effects.

Ninth and finally, the present version of TEC was only designed to impact SITBs. Indeed, results indicated the TEC did not affect a range of other dysregulated behaviors. This suggests that the effects of TEC were specific and did not generate any compensatory dysregulated behaviors. Ideally, however, TEC would have a much broader impact. Given its design and underlying principles, TEC could be modified to target a wide range of psychological issues, especially those that can be clearly represented by specific images or words.

These significant limitations notwithstanding, the present series of studies indicates that TEC is a promising intervention for SITBs that has the potential overcome many of the traditional barriers to mass dissemination of treatment. With further testing and continued improvement, TEC may eventually extend beyond its present limitations and have the potential to generate large-scale reductions in SITBs and other psychopathological phenomena. Given its format, TEC could contribute to such reductions as either an add-on to existing treatments or as a low-cost, highly disseminable standalone intervention.

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Received June 16, 2015

Revision received February 1, 2016

Accepted February 5, 2016 ■

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Study 1 CONSORT Flow Chart

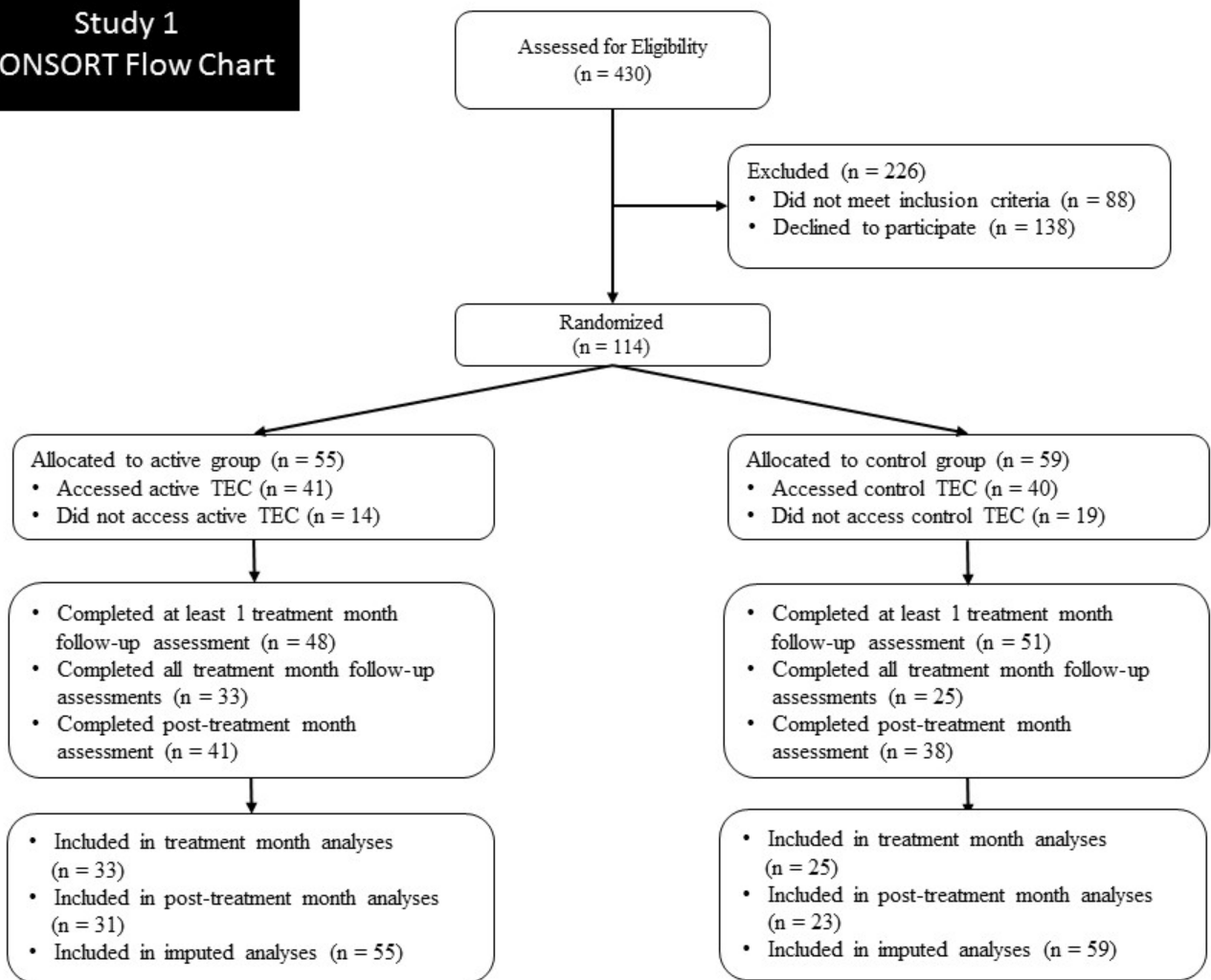


Figure S1. CONSORT Flow Chart from Study 1.

Study 2 CONSORT Flow Chart

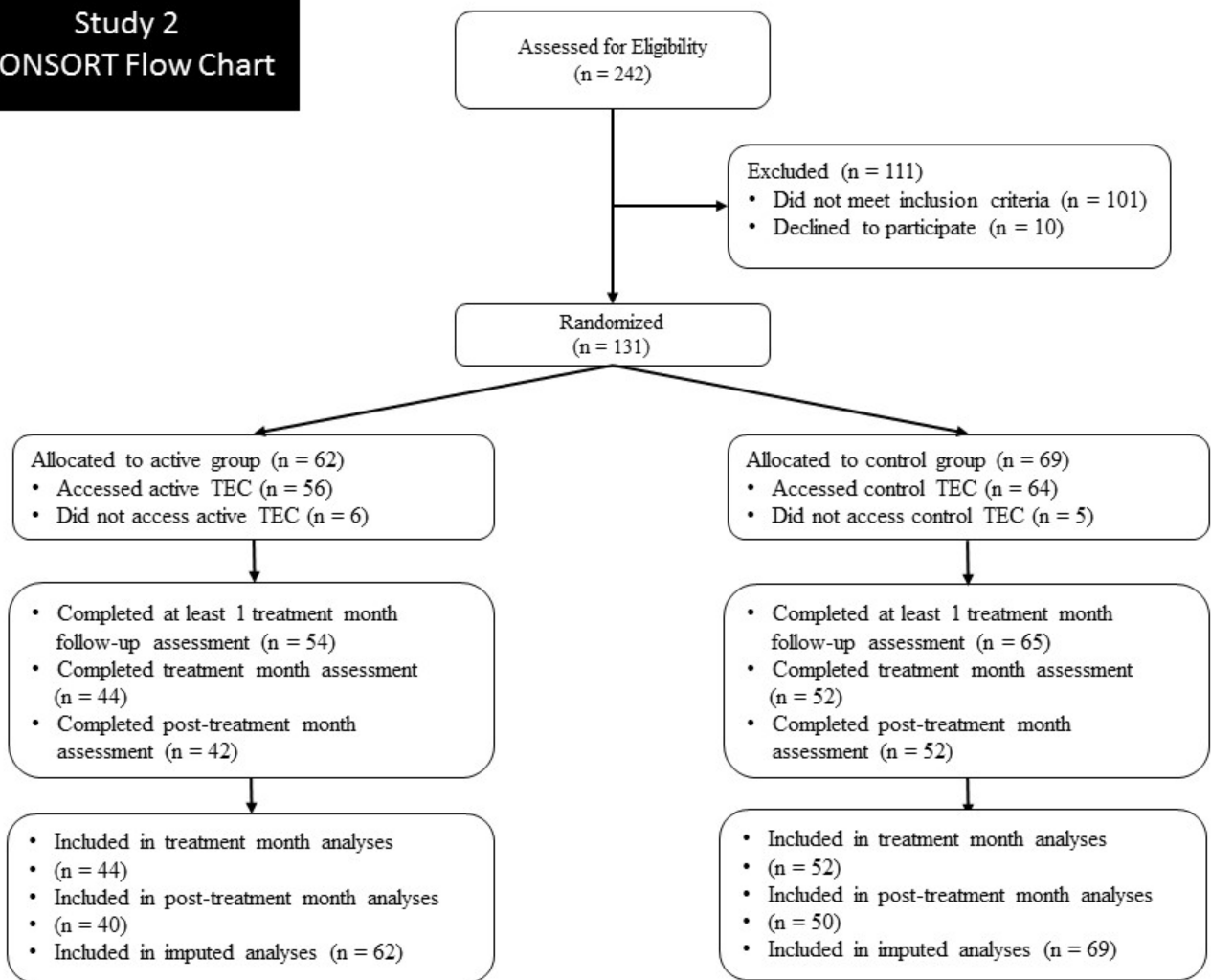


Figure S2. CONSORT Flow Chart for Study 2.

Study 3 CONSORT Flow Chart

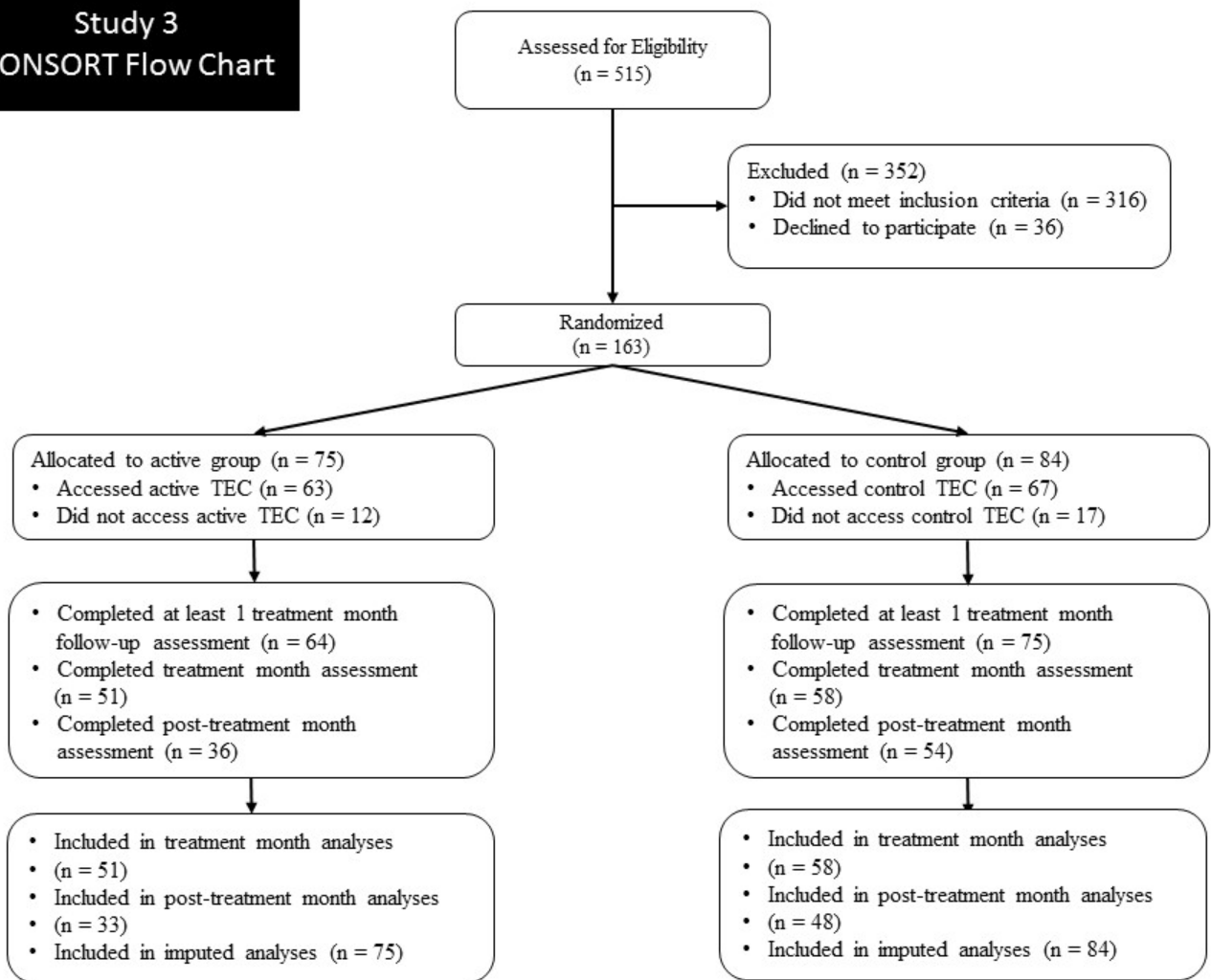


Figure S3. CONSORT Flow Chart from Study 3.

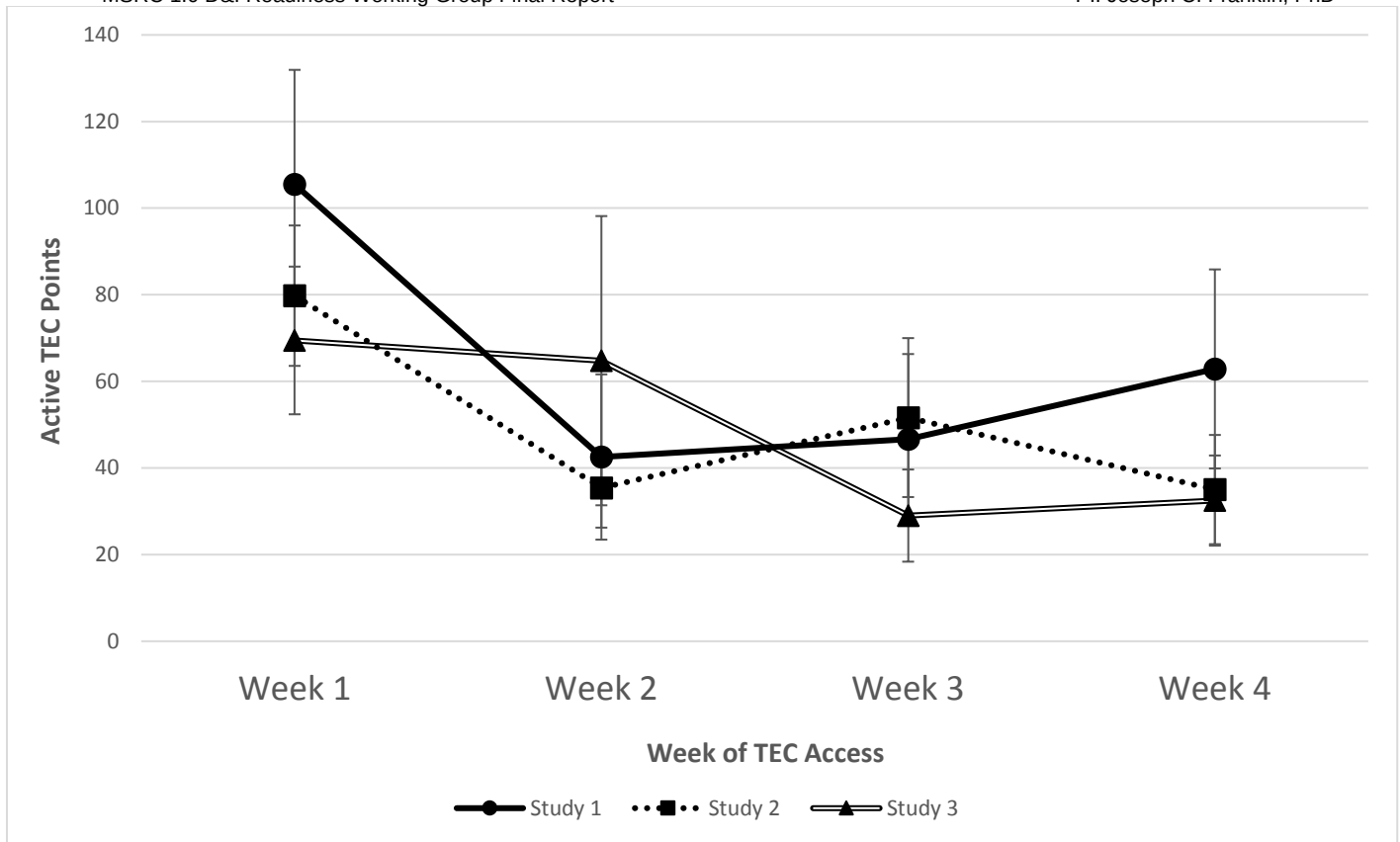


Figure S4. Average active TEC points across weeks of the treatment month.

Supplementary Table 1. Imputed zero-inflated regression analyses for primary treatment month analyses across all studies.

		Study 1							Study 2							Study 3						
		Logistic			Count				Logistic			Count				Logistic			Count			
		B	SE	OR	B	SE	IRR		B	SE	OR	B	SE	IRR		B	SE	OR	B	SE	IRR	
Self-Cutting Episodes	Active TEC	.78	.54	2.18	-.43	.16	.65*		-.14	.46	.88	-.41	.14	.66**		-.21	.39	.81	-.67	.18	.51***	
	Prior Episodes	-.02	.02	.98	.02	.01	1.02**		-.09	.04	.91*	.03	.00	1.03***		-.14	.07	.87*	.01	.01	1.01	
Self-Cutting Events	Active TEC	-	-	-	-	-	-		.03	.44	1.03	-.09	.14	.91		-.08	.38	.92	-.11	.13	.90	
	Prior Events	-	-	-	-	-	-		-.02	.01	.98*	.002	.001	1.01**		-.05	.02	.95**	.004	.001	1.01**	
NSSI Episodes	Active TEC	.25	.46	1.28	-.33	.08	.72***		.21	.51	1.23	-.13	.14	.88		-.23	.40	.79	-.25	.12	.78*	
	Prior Episodes	-.02	.02	.98	.01	.00	1.01***		-.05	.02	.95	.01	.001	1.01***		-.09	.04	.91*	.02	.004	1.02***	
NSSI Events	Active TEC	-	-	-	-	-	-		-.02	.50	.98	-.08	.11	.92		-.12	.39	.89	-.33	.15	.72*	
	Prior Events	-	-	-	-	-	-		-.01	.01	.99*	.003	.0004	1.01***		-.02	.01	.98*	.01	.001	1.01	
Suicide Ideation	Active TEC	.03	1.32	1.03	-.16	.23	.85		-.23	.52	.79	.22	.13	1.24		.03	.39	1.03	-.02	.11	.98	
	Prior Ideation	-.81	1.29	.44	.05	.01	1.05		-.13	.03	.88	.04	.01	1.04		-.07	.02	.93	.03	.003	1.03	
Suicide Plans	Active TEC	.16	.53	1.17	-.47	.18	.63*		.16	.43	1.17	-.09	.15	.91		-.08	.46	.92	-.39	.18	.68*	
	Prior Plans	-.10	.04	.90*	.03	.01	1.03***		-.06	.02	.94*	.03	.01	1.03***		-.07	.03	.93**	.04	.01	1.04***	

Notes. Self-cutting/NSSI events were not recorded for Study 1. The logistic portion of zero-inflated models predicts excess zeros, such that an odds ratio above one means that the variable predicts more excess zeros. The count portion of the models predicts the number of events (excluding excess zeros), such that an incident rate ratio above one means that the variable predicts a higher frequency of SITBs. TEC = Therapeutic Evaluative Conditioning; B = beta; SE = Standard error; OR = Odds ratio; IRR = Incident Rate Ratio; * <.05; ** <.01; *** <.001; - = not available. Bolded items represent significant treatment effects.

Supplementary Table 2. Zero-inflated regression analyses for treatment month self-cutting/NSSI episodes across all studies.

	Study 1						Study 2						Study 3					
	Logistic			Count			Logistic			Count			Logistic			Count		
<u>Self-Cutting Episodes</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>
Active TEC	1.74	.81	5.70*	-.46	.09	.63***	-.83	.58	.44	-.51	.08	.60***	-.32	.51	.73	-.38	.15	.68***
Prior Self-Cutting	.01	.02	1.01	.003	.002	1.00	-.09	.05	.91*	.01	.001	1.01***	-.31	.10	.73***	.03	.008	1.03*
Self-Prediction	-.86	.39	.42*	.59	.07	1.80***	-.87	.30	.42**	-.22	.05	.81***	-.31	.25	.73	.16	.06	1.17**
Desire to Stop	.46	.38	1.58	-.12	.05	.89**	.09	.22	1.09	-.28	.03	.76***	-.09	.15	.91	-.14	.06	.87*
Treatment History	.57	.74	1.77	.42	.11	1.52***	.97	.56	2.63	.11	.08	1.12	-.88	.56	.41	-.38	.15	.68**
ERS Scores	.02	.02	1.02	-.02	.003	.98***	.02	.02	1.02	.001	.002	1.01	.01	.02	1.01	.03	.01	1.03***
BSI Scores	-.04	.03	.96	.01	.004	1.01***	-.02	.02	.98	.02	.004	1.02***	-.01	.02	.99	-.02	.01	.98***

	Study 1						Study 2						Study 3					
	Logistic			Count			Logistic			Count			Logistic			Count		
<u>NSSI Episodes</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>
Active TEC	1.64	.91	1.31	-.58	.08	.56***	-.30	.62	.74	.07	.04	1.07	-.50	.50	.61	-.11	.08	.89
Prior NSSI	-.01	.02	.99	.001	.001	1.00	-.05	.03	.95*	.002	.001	1.01***	-.15	.05	.86**	.01	.002	1.01**
Self-Prediction	-.31	.40	.73	.33	.04	1.39***	-.92	.33	.40**	-.003	.03	1.00	-.78	.27	.46**	.09	.04	1.09*
Desire to Stop	.33	.39	1.40	-.09	.04	.91**	.04	.25	1.04	-.14	.02	.87***	-.04	.15	.96	-.06	.03	.94
Treatment History	-.38	.75	1.12	-.12	.09	.89	1.41	.63	4.09*	.02	.05	1.02	-.75	.53	.47	-.25	.08	.78***
ERS Scores	.02	.02	1.01	-.01	.002	.99***	.01	.02	1.01	.001	.002	1.00	-.01	.02	.99	.01	.003	1.01***
BSI Scores	-.02	.02	.96	.02	.003	1.02***	-.07	.03	.93	.03	.002	1.01***	-.01	.02	.99	-.02	.003	.98***

Notes. Control TEC was the reference group for the Active TEC variable. The logistic portion of zero-inflated models predicts excess zeros, such that an odds ratio above one means that the variable predicts more excess zeros. The count portion of the models predicts the number of events (excluding excess zeros), such that an incident rate ratio above one means that the variable predicts a higher frequency of SITBs.

TEC = Therapeutic Evaluative Conditioning; ERS = Emotion Reactivity Scale; BSI = Brief Symptom Inventory; B = Beta; SE = Standard error; OR = Odds ratio; IRR = Incident Rate Ratio; * <.05; ** <.01; *** <.001. Bolded items indicate significant treatment effects.

Supplementary Table 3. Zero-inflated regression analyses for treatment month self-cutting/NSSI events across studies 2 and 3.

	Study 2						Study 3					
	<u>Logistic</u>			<u>Count</u>			<u>Logistic</u>			<u>Count</u>		
	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>
<u>Self-Cutting Events</u>												
Active TEC	-.68	.55	.51	.16	.34	1.17	-.24	.47	.79	-.59	.08	.55***
Prior Self-Cutting	-.01	.01	.99	.003	.002	1.00	-.05	.02	.95*	.01	.01	1.01***
Self-Prediction	-.73	.29	.48*	.53	.23	1.70*	-.15	.25	.86	.69	.19	1.99***
Desire to Stop	.14	.22	1.15	-.49	.13	.61***	.01	.14	1.01	.07	.19	1.07*
Treatment History	.73	.53	2.08	-.43	.39	.65	-.65	.50	.52	-.85	.09	.43***
ERS Scores	.03	.02	1.03	-.02	.02	.98	-.01	.02	.99	.01	.01	1.01***
BSI Scores	-.03	.02	.97	.04	.02	1.04*	-.01	.02	.99	-.04	.01	.96***
	Study 2						Study 3					
	<u>Logistic</u>			<u>Count</u>			<u>Logistic</u>			<u>Count</u>		
	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>
<u>NSSI Events</u>												
Active TEC	-.45	.62	.64	-.08	.32	.92	-.38	.46	.69	-.04	.42	.96
Prior Self-Cutting	-.01	.01	.99	.004	.002	1.00	-.02	.01	.98	.01	.01	1.01**
Self-Prediction	-.79	.33	.45*	.16	.21	1.17	-.63	.24	.53*	.23	.20	1.26
Desire to Stop	.12	.25	1.13	-.33	.13	.72**	-.10	.13	.90	-.27	.18	.76
Treatment History	1.19	.61	3.29	.18	.36	1.20	-.29	.50	.75	-.12	.42	.89
ERS Scores	.01	.02	1.01	-.01	.02	.99	-.01	.02	.99	-.01	.01	.99
BSI Scores	-.02	.02	.98	.01	.02	1.01	-.01	.02	.99	-.01	.02	.99

Notes. Self-cutting/NSSI events were not recorded for study 1. The logistic portion of zero-inflated models predicts excess zeros, such that an odds ratio above one means that the variable predicts more excess zeros. The count portion of the models predicts the number of events (excluding excess zeros), such that an incident rate ratio above one means that the variable predicts a higher frequency of SITBs. TEC = Therapeutic Evaluative Conditioning; ERS = Emotion Reactivity Scale; BSI = Brief Symptom Inventory; B = Beta; SE = Standard error; OR = Odds ratio; IRR = Incident Rate Ratio; * <.05; ** <.01; *** <.001. Bolded items represent significant treatment effects.

Supplementary Table 4. Zero-inflated regression analyses for treatment month suicide ideation and plans across all studies.

	Study 1						Study 2						Study 3					
	Logistic			Count			Logistic			Count			Logistic			Count		
	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>
<u>Suicide Ideation</u>																		
Active TEC	.50	.86	1.65	-.01	.25	.99	-.22	.54	.80	.26	.15	1.30	.11	.45	1.12	.03	.24	1.03
Prior Ideation	-.07	.05	.93	.06	.01	1.06***	-.15	.04	.86***	.04	.008	1.04***	-.08	.02	.92**	.04	.01	1.04***
Treatment History	.98	.90	2.66	.49	.26	1.63	.35	.54	1.42	.13	.16	1.14	-.31	.45	.73	.17	.22	1.19
ERS Scores	-.02	.03	.98	-.02	.008	.98*	.02	.02	1.02	-.01	.006	.99	.01	.01	1.01	-.01	.01	.99*
BSI Scores	-.02	.03	.98	.01	.01	1.01	.02	.02	1.02	.01	.007	1.01	.01	.02	1.01	.03	.01	1.03**
	Study 1						Study 2						Study 3					
	Logistic			Count			Logistic			Count			Logistic			Count		
	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>	<u>B</u>	<u>SE</u>	<u>OR</u>	<u>B</u>	<u>SE</u>	<u>IRR</u>
<u>Suicide Plans</u>																		
Active TEC	-.62	.69	.54	-.59	.18	.55***	.34	.47	1.40	-.24	.25	.79	-.09	.54	.91	-.90	.38	.41*
Prior Plans	-.13	.05	.88*	.04	.008	1.04***	-.05	.03	.95	.04	.01	1.04**	-.08	.03	.92**	.04	.01	1.04**
Treatment History	.57	.67	1.77	.07	.11	1.07	.16	.47	1.17	.37	.23	1.45	.44	.57	1.55	.59	.33	1.80
ERS Scores	.02	.02	1.02	-.01	.005	.99	-.04	.02	.96*	-.03	.01	.97**	-.01	.02	.99	.01	.008	1.01
BSI Scores	-.05	.03	.95	.01	.007	1.01*	.01	.02	1.01	.01	.01	1.01	-.02	.02	.98	.01	.02	1.01

Notes. The logistic portion of zero-inflated models predicts excess zeros, such that an odds ratio above one means that the variable predicts more excess zeros. The count portion of the models predicts the number of events (excluding excess zeros), such that an incident rate ratio above one means that the variable predicts a higher frequency of SITBs. TEC = Therapeutic Evaluative Conditioning; ERS = Emotion Reactivity Scale; BSI = Brief Symptom Inventory; B = Beta; SE = Standard error; OR = Odds ratio; IRR = Incident Rate Ratio; * <.05; ** <.01; *** <.001. Bolded items represent significant treatment effects.

Supplementary Table 5. Raw means and standard errors across months for all studies.

	Study 1					
	Baseline Month		Treatment Month		Post-treatment Month	
	Control M(SE)	Active M(SE)	Control M(SE)	Active M(SE)	Control M(SE)	Active M(SE)
Self-Cutting Episodes	15.84 (6.57)	11.03 (2.62)	12.92 (3.17)	6.00 (1.61)	5.61 (1.84)	13.22 (7.10)
NSSI Episodes	46.76 (17.26)	21.81 (4.97)	21.52 (5.34)	9.33 (2.08)	6.70 (2.05)	6.06 (1.40)
Suicide Ideation	13.30 (2.19)	10.24 (2.39)	8.56 (1.94)	5.64 (1.20)	6.57 (2.15)	5.67 (1.51)
Suicide Plans	7.72 (2.10)	2.97 (.97)	4.92 (1.63)	1.79 (.60)	4.04 (2.04)	1.69 (.62)
	Study 2					
	Baseline Month		Treatment Month		Post-treatment Month	
	Control M(SE)	Active M(SE)	Control M(SE)	Active M(SE)	Control M(SE)	Active M(SE)
Self-Cutting Episodes	9.65 (1.83)	15.39 (5.14)	10.19 (3.27)	9.93 (2.65)	3.98 (.92)	5.55 (1.47)
Self-Cutting Events	48.44 (12.52)	46.39 (13.21)	35.15 (10.92)	25.16 (5.39)	12.68 (3.79)	15.33 (4.53)
NSSI Episodes	29.88 (9.91)	29.55 (10.36)	23.19 (6.24)	22.25 (4.71)	14.26 (5.38)	14.85 (4.58)
NSSI Events	97.55 (20.91)	65.23 (14.16)	77.21 (18.35)	65.16 (20.58)	42.44 (11.49)	32.33 (8.66)
Suicide Ideation	11.88 (1.52)	12.18 (1.63)	8.83 (1.27)	11.80 (1.67)	7.60 (1.28)	11.78 (1.89)
Suicide Plans	5.71 (1.24)	5.41 (1.35)	4.46 (1.00)	2.93 (.82)	2.14 (.85)	3.48 (1.10)
	Study 3					
	Baseline Month		Month 1		Month 2	
	Control M(SE)	Active M(SE)	Control M(SE)	Active M(SE)	Control M(SE)	Active M(SE)
Self-Cutting Episodes	3.03 (.76)	3.10 (.76)	3.05 (1.35)	2.08 (.56)	1.64 (.56)	1.36 (.59)
Self-Cutting Events	18.55 (8.64)	20.20 (10.07)	9.09 (2.89)	5.78 (2.27)	3.67 (1.48)	2.09 (.82)
NSSI Episodes	8.10 (2.03)	7.88 (1.76)	6.71 (1.98)	6.84 (1.37)	4.08 (1.22)	6.12 (2.55)
NSSI Events	28.72 (7.07)	29.06 (8.40)	20.75 (5.84)	15.26 (3.96)	10.54 (3.80)	11.25 (4.45)
Suicide Ideation	9.09 (1.41)	11.71 (1.60)	4.81 (1.04)	5.65 (1.27)	3.85 (1.20)	6.18 (1.73)
Suicide Plans	5.05 (1.08)	5.04 (1.08)	2.12 (.68)	1.43 (.50)	2.17 (.99)	3.06 (1.39)

Notes. These are the raw means and standard errors of the mean based on normality assumptions. Actual analyses were based on estimated marginal means and standard errors derived from mixture model zero-inflated regression analyses with covariates. For comparability, these statistics are from the subset of participants included in treatment month analyses. M = Mean; SE = Standard Error.

Supplementary Table 6. Specific suicidal behavior frequencies across studies, groups, and dosage.

Group Treatment Analyses									
	<u>Actual Attempts</u>		<u>Interrupted Attempts</u>		<u>Aborted Attempts</u>		<u>Total Suicidal Behaviors</u>		
	Active	Control	Active	Control	Active	Control	Active	Control	Sum
Study 1	4	5	2	6	4	8	10	19	29
Study 2	4	4	7	5	3	12	14	21	35
Study 3	1	0	2	10	2	12	5	22	27
Total	9	9	11	21	9	32	29	62	91

Dosage Analyses									
	<u>Actual Attempts</u>		<u>Interrupted Attempts</u>		<u>Aborted Attempts</u>		<u>Total Suicidal Behaviors</u>		
	Any Dose	No Dose	Any Dose	No Dose	Any Dose	No Dose	Any Dose	No Dose	Sum
Study 1	2	8	2	6	2	10	5	24	29
Study 2	4	4	1	11	3	12	8	27	35
Study 3	1	0	1	11	2	12	4	23	27
Total	6	12	4	28	7	34	17	74	91

Notes. Any Dose = participants who opened the active TEC app. No Dose = The control group plus all participants who had access to the active TEC app but never opened it. These analyses span two months.

MSRC 1.0 Readiness Working Group Final Report**MSRC 1.0 Intervention:** Therapeutic Evaluative Conditioning (TEC) for Self-Injury/Suicide**MSRC 1.0 Funded Study:** New Approaches to the Measurement of Suicide-Related Cognition**PI:** Drs. Matthew K. Nock and Joseph C. Franklin**Review Date:** 9 NOV 2017**Summary of Intervention**

A game-like mobile conditioning app that aims to condition more negative associations with self-injury/death/suicide and more positive associations with the self. TEC uses conditioning techniques to target two factors that may play causal roles in self-injury/suicide. The form of conditioning used in TEC, evaluative conditioning, involves the pairing of stimuli (i.e., presenting stimuli at the same time). The goal of this pairing is to have the feelings caused by one stimulus (e.g., a picture of a spider) spill over into how someone feels about another stimulus (e.g., a picture of a chair). TEC uses this basic conditioning approach to try to change how people feel about two things that may play important roles in self-injury/suicide. Please see TEC Intervention Summary for more information.

Note: TEC is an application based on research Dr. Nock was originally contracted by MSRC to conduct. At that time, Dr. Franklin was a Post-Doctoral Fellow working with Dr. Nock and thus received indirect funding from MSRC to conduct the TEC study. There was no peer review by the MSRC nor an MEAB review for TEC. The population for the TEC study was civilians.

Executive Summary of Working Group Feedback

The study PI provided an intervention summary report that was made available to the MSRC Readiness Working Group (WG) prior to the scheduled review. The following summary presents WG feedback derived from pre and post meeting surveys as annotated in the tables below integrated with WG review meeting discussion of 10 WG members. Ratings are based on most recent rating (pre or post review survey).

The PI and Working Group members were in agreement that further research is needed across military samples and populations regarding acceptability, adoption, and appropriateness for implementing TEC within the military given the population for the study was primarily civilian. Reviewers returned five ratings that gave TEC an overall rating of 3.4 on an 8-point enthusiasm scale.* Reviews were evenly distributed between ambivalent (2 out of 5) and little enthusiasm (2 out of 5), with one rating of 5, which falls between ambivalent/neutral and little enthusiasm. Reviews were also evenly distributed in rating the clinical evidence for suicidality outcome** between minimal (2 out of 5) and moderate (2 out of 5), with one reviewer seeing no evidence. The majority rating for clinical evidence for other target outcomes (e.g. anxiety, coping, marital satisfaction) was moderate (4 out of 5), with one reviewer rating for minimal evidence. None of the reviewers saw an opportunity for implementing TEC for military personnel within their office/agency or another at this time. One of the five believed there could be an opportunity to implement TEC for other groups (e.g. Veterans, family, civilians). In addition to the comments in the tables below, reviewers noted that the TEC app appears to reduce the frequency of NSSI and other suicidal behavior in populations/samples with very high rates of these behaviors, but does not appear as effective for stopping or eliminating these behaviors. All five reviewers believed that additional research is needed to support dissemination and implementation of this intervention for military personnel. Three of the five reviewers indicated that additional research should be conducted prior to D&I with military personnel, and two of the five indicated that while further research is needed, it could be done during or as part of dissemination and implementation to military personnel.

The Working Group (WG) review concluded the app was at an early stage of development and there were multiple issues that should be addressed through additional study. Although the app appears to reduce the frequency of NSSI and other suicidal behavior in civilian populations with very high rates of these behaviors, it does not appear to be as effective for stopping or eliminating these behaviors. This raised questions by the WG about impact for reducing military suicides and the need for further study of TEC's duration of conditioning effects. The WG observed that while the app is available on iOS and Amazon there are minimal instructions provided to the user. The WG believed the app should be reviewed by experienced military personnel for cultural relevance (military), practicality, and design that supports tailoring the app for stimuli (images, color, etc.) with which Soldiers would most likely to relate. It was also noted that the app should have more instructions on the App Store and for use in clinical settings. The WG indicated the redesigned app with an expanded instructions "package" would better facilitate larger scale studies to assess its efficacy for reducing suicidal thoughts and behaviors in military personnel.

Primary DoD Applications Suggested by the MSRC Working Group

N/A (non suggested)

Potential Target for Dissemination of the Intervention within the Military

N/A (not ready for dissemination)

Recommendations to Facilitate Dissemination and Implementation within the Military

N/A (none suggested)

Potential Funding Sources for Future Research for this Intervention

- MSRC 2.0 funds
- MOMRP BAA
- NIMH

*Overall enthusiasm for implementation of intervention for military personnel rated as 0=No Enthusiasm 2=Little Enthusiasm 4=Ambivalent/Neutral, 6=Enthusiastic, 8=Extremely Enthusiastic

****Quality of Evidence for Clinical Intervention categories**

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

Verbatim Summary of Working Group Feedback Survey Responses

The feedback below was received via online survey from WG members and is provided for situational awareness. The MSRC D&I Core will follow up with the study PI to determine possible next steps based on this information.

Suggestions for Further Study Prior to D&I
• RCTs testing efficacy on suicidal thoughts and behaviors. The app could be tested as a standalone intervention and as an adjunct to mental health treatment. • In addition to the recommendations from the pre-meeting survey, I agree with the panel that more research needs to be conducted re: suicide-related outcomes, military service members, and instructions for the app. • Further development of app into mature product. Further testing in civilian arena for practical longitudinal utility, effect on suicidality. If successfully effective on civilian suicide, then usability testing in military environment with military providers, service members, patients, for practicality and cultural appropriateness. • Particularly interested in knowing more about effective 'dosage' levels, sustainment of treatment effects, use of the application with a military population, self-reported usability, use without monetary incentive. • I would recommend additional research in military populations re: acceptability, adoption, appropriateness given the population was primarily civilian for this study.
Opportunity for D&I in Office/Agency
None suggested
Opportunity for D&I for military personnel
None suggested
Opportunity for D&I for other groups (e.g. Veterans, families, civilians)
Possibly civilians who engage in frequent NSSI
Suggestions for next steps for this intervention
More testing across samples and populations

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MSRC 1.0 Readiness Working Group Final Report

MSRC 1.0 Intervention: Cognitive Anxiety Sensitivity Treatment (CAST)

MSRC 1.0 Funded Study: Development and Evaluation of a Brief, Suicide Prevention Intervention Targeting Anxiety and Mood Vulnerabilities

PI: Brad Schmidt, PhD

Review Date: 27 Apr 2017

Summary of Intervention

Cognitive Anxiety Sensitivity Treatment (CAST) is a web-based intervention featuring audio, video, and interactive features designed to reduce anxiety sensitivity (i.e., fear of physiological arousal and other sensations related to anxiety), a risk factor for anxiety, depression, and suicide. The program is designed to dispel exaggerated thoughts (“myths”) regarding the immediate dangers of stress on the body. Participants engage in exercises that are designed to correct the conditioned fear of these bodily sensations and teach participants that anxiety sensations are safe.

Executive Summary of Working Group Feedback

Reviewers responded with above average enthusiasm to CAST, giving it an average rating of 5.8 on a 1 – 8 scale for implementation for military personnel. General consensus was that there is moderate clinical evidence for other target outcomes (e.g., anxiety, coping, marital satisfaction). Opinions for suicidal ideation, however, varied widely from minimal to one rating of strong evidence. This may relate to the lack of direct effects of CAST on suicidality – the effect is found only for those whose anxiety sensitivity decreased. While there was generally positive potential seen for CAST dissemination through T2 or DSPO, stronger support was for further research with active duty military personnel.

Potential Targets for Dissemination of the Intervention for Military Personnel:

1. New recruits
2. Family members of National Guard personnel

Specific Next Steps for Dissemination of Intervention in Military Personnel

None at this time.

Suggestions for Research Needed to Support Dissemination and Implementation for Military Personnel:

1. Pilot study outside of clinical setting in order to prove no harm from intervention and to test effectiveness
2. RCT with Active Duty sample with history of Suicide Attempt

Specific Contacts to Explore Funding for Further Research:

None at this time.

Summary of Working Group Feedback

Table 1 Review of Clinical Evidence

Reviewer	Clinical evidence category for suicidality outcome	Clinical evidence category for other target outcome	Suggestions for further study before D&I
DHCC	Minimal Evidence	Moderate Evidence	As stated previously, the intervention could benefit from 1) an AD or military personnel sample, 2) suicide-specific outcomes targeted, 3) a sample with SI or SA, and 4) larger sample size(s).
T2	Minimal Evidence	Moderate Evidence	Suicide [behavior], as an outcome, needs to be assessed.
T2	Moderate Evidence	Moderate Evidence	Testing with active duty
T2*	Strong Evidence	Strong Evidence	Possibly pilot work with an active duty population.
Consultant*	Moderate Evidence	Moderate Evidence	Needs to be tested in a military sample. Considering effects on suicidal behavior would be helpful, as the existing studies mostly target risk factors for suicidal behavior.

*Results from review of materials alone. Did not submit feedback following discussion.

Quality of Evidence for Clinical Intervention categories

- **Strong Research Evidence.** Evidence presented from at least two well designed, adequately powered randomized controlled published trials or quasi-experimental studies that has been peer reviewed. At least one of the studies must have been conducted in an active duty military context.
- **Moderately Strong Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study in an active duty military context that has been peer reviewed.
- **Moderate Research Evidence.** Evidence presented from at least one well designed, adequately powered randomized controlled published trial or quasi-experimental study that has been peer reviewed. No evidence specific to an active duty military context.
- **Minimal Research Evidence.** Some minimal or pilot empirical support (published or unpublished findings) is available but further research is needed to establish the efficacy/effectiveness of the intervention.
- **No Research Evidence.** Initial research indicates that the intervention is not effective or has negative effects. Hypothesized results not supported and other findings supporting the intervention are not relevant.

Table 2 Feedback on Potential for Dissemination and Implementation

Reviewer	Overall enthusiasm for implementation of intervention for military personnel ¹	See an opportunity for D&I in your office/agency	See an opportunity for D&I for military personnel	See an opportunity for D&I for other groups (e.g. Veterans, families, civilians)
DHCC	4	From what T2 mentioned during the call, it sounds like they can help the CAST group run a trial implementation with the military in order to obtain larger samples. One of my main concerns was that CAST did not appear to have been tested with adequately large samples or with AD samples.		
T2	6	Low cost, low risk, and potentially autonomous intervention. Could be disseminated broadly via web or app. Could be 'game-ified.'		dedicated VA computer stations where patients engage in this while waiting for appts., pharmacy visits, etc.
T2	7	Not immediately within T2 but promising for future consideration	Perhaps better suited to DSPO?	
T2*	7	The proposal referred to three RCT's, two of which included military veterans, with none of the studies involving active duty samples. In this case, the lack of an active duty sample should not diminish a potential opportunity to introduce the intervention into an active duty setting. Technically, note that an implementation/ knowledge translation study might be subject to review by entities within the DoD.		Potentially, military families might benefit from the intervention, for both educational purposes (coping with emotions demonstrated by the active duty spouse) and for individual emotion regulation.
Consultant*	5			Possibly for the general community.
Average enthusiasm:	5.8			

¹ Overall Enthusiasm for implementation of intervention for military personnel rated from 0=No enthusiasm to 8= Extremely enthusiastic

*Results from review of materials alone. Did not submit feedback following discussion.

Summary of Teleconference Discussion

Reviewers Attending from DHCC, DSPO, MSRC, T2

Following introductions, the teleconference began with an overview presented by Ms. Nicole Short (on behalf of Dr. Schmidt) on the randomized clinical trial, “Development and Evaluation of a Brief, Suicide Prevention Intervention Targeting Anxiety and Mood Vulnerabilities” that evaluated three versions of brief computerized interventions for mood and anxiety risk factors. CAST has thus far been tested in three separate grants: CAST (MSRC), CATS (American Foundation for Suicide Prevention [AFSP]), and DARTS (MSRC). For the purposes of this review the CAST study was the focus as it was the first in testing the Cognitive Anxiety Sensitivity Treatment. Study findings showed that active interventions reduced risk, including decreased suicidal ideation, in the sample consisting of civilians and Veterans.

Reviewers generally viewed CAST as a user-friendly, low-risk intervention for reducing anxiety sensitivity that could easily be integrated at relatively low cost. Reviewers commented on its potential as an autonomous intervention that could easily be disseminated broadly via the Web, app, or even be 'game-ified.'

Although the effectiveness of CAST in reducing Anxiety Sensitivity and, in turn, risk for suicide was looked at in three randomized controlled trials with Veterans as participants, none included adequately large samples or Active Duty personnel and reviewers commented that the intervention could benefit from further study using a larger sample size with that population.

Reviewers pointed out to Ms. Short that the existing studies mainly targeted anxiety sensitivity as a risk factor for suicidal behavior, so it could be beneficial to consider the direct effects on suicidal behavior. Ms. Short noted that while she agreed that a direct effect on suicidality has not been shown, they did not expect CAST to improve suicidality in cases where anxiety sensitivity did not improve. Reviewers also suggested further study in samples with more significant suicidal ideation or a suicide attempt.

One reviewer noted that although the three RCTs studies did not involve active duty samples, that should not diminish a potential opportunity to introduce the intervention into an active duty setting. CAST was discussed as promising for future consideration at T2, but reviewers also suggested it was perhaps best suited to DSPO.

It was suggested that initially CAST could be made accessible to the general community and that military families might benefit from the intervention as a means for coping with emotions demonstrated by the active duty spouse or for their own emotion regulation. Access could be made available via dedicated VA computer stations where patients or family members could engage while waiting for appointments, pharmacy visits, etc.

Dr. Schmidt and his team are actively seeking to make connections within DoD in order to conduct pilot work with an Active Duty population. T2 may have the ability to assist him run a trial implementation of CAST with the military in order to obtain larger samples. Note that an implementation/ knowledge translation study might be subject to review by entities within the DoD.

Working Group Membership as of 27 Apr 2017

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Published in final edited form as:

J Affect Disord. 2017 February ; 209: 114–123. doi:10.1016/j.jad.2016.11.032.

Thwarted Belongingness as an Explanatory Link between Insomnia Symptoms and Suicidal Ideation: Findings from Three Samples of Military Service Members and Veterans

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Abstract

Background—Although insomnia has been identified as a robust predictor of suicidal ideation and behaviors, little is known about the mechanisms by which sleep disturbances confer risk for suicide. We investigated thwarted belongingness as an explanatory link between insomnia symptoms and suicidal ideation across three military service member and veteran samples.

Methods—Data were collected among United States military service members and veterans ($N_1=937$, $N_2=3,386$, $N_3=417$) who completed self-report measures of insomnia symptoms, thwarted belongingness, suicidal ideation, and related psychiatric symptoms (e.g., anxiety, hopelessness). Bias-corrected bootstrap mediation analyses were utilized to examine the indirect effects of insomnia symptoms on suicidal ideation through thwarted belongingness, controlling for related psychiatric symptoms.

Results—Consistent with study hypotheses, thwarted belongingness significantly accounted for the relationship between insomnia and suicidal ideation across all three samples; however, insomnia symptoms did not significantly account for the relationship between thwarted belongingness and suicidal ideation, highlighting the specificity of our findings.

Limitations—This study utilized cross-sectional, self-report data.

Conclusions—Insomnia may confer suicide risk for military service members and veterans, in part, through the pathway of thwarted belongingness. Additional prospective studies are warranted to further delineate this model of risk. Our results offer a potential target for the therapeutic prevention of suicide, via the promotion of belongingness, among service members and veterans experiencing insomnia symptoms.

Keywords

Insomnia; Suicidal Ideation; Loneliness; Thwarted Belongingness; Military; Veterans

Introduction

In the past decade, rates of suicide and suicide attempts have increased among United States military personnel (LeardMann et al., 2013; Ramchand et al., 2011) and veterans (Department of Veterans Affairs Office of Public and Intergovernmental Affairs, 2016; LeardMann et al., 2013). Currently, the prevalence of suicidal behaviors among service members exceeds rates found among matched civilian populations (Nock et al., 2014; Nock et al., 2015; Ursano, Heeringa, et al., 2015; Ursano, Kessler, et al., 2015). In response, there has been a call for increased suicide prevention efforts among both military personnel and veteran populations (Kuehn, 2009; Ramchand et al., 2011). To inform these efforts and illuminate potential points of intervention, there is a critical need to identify suicide risk factors and to understand the pathways by which these factors lead to suicidal thoughts and behaviors.

Among the most robust risk factors for suicide is insomnia (see Bernert, Kim, Iwata, & Perlis, 2015 and Pigeon, Pinquart, & Conner, 2012 for review). For instance, insomnia has been repeatedly shown to predict future suicidal ideation (Wong and Brower, 2012; Wong et al., 2011) as well as death by suicide (Bernert, Turvey, Conwell, & Joiner, 2014; Goldstein, Bridge, & Brent, 2008; Kodaka et al., 2014). This association has also been demonstrated among military service members and veterans. For example, a study by Ribeiro and colleagues (2012) found that insomnia symptoms predicted suicidal ideation among a sample of military service members above and beyond other risk factors (e.g., hopelessness, depression, diagnosis of posttraumatic stress disorder [PTSD]). In another study, veteran suicide decedents who reported sleep disturbances at their last health care visit died within a shorter period of time after this visit than those without sleep disturbances (Pigeon et al., 2012a). These findings highlight insomnia as a critical warning sign for suicide among veterans.

Given this well-established link, there is a strong rationale to better understand the pathways by which insomnia and sleep disturbances confer risk for suicide among military service members and veterans, especially since insomnia is highly prevalent in these populations (Capaldi et al., 2011; Kroenke et al., 1998; Lewis et al., 2009; Miller et al., 2011; Neylan et al., 1998; Peterson et al., 2008; Seelig et al., 2010). Since few studies to date have empirically tested the mechanisms underlying the association between insomnia and suicide risk, a theoretical approach may provide a useful framework for exploring this relationship.

The interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010), which has amassed growing empirical support (e.g., Bryan, Morrow, Anestis, & Joiner, 2010; Christensen, Batterham, Soubelet, & Mackinnon, 2013; Cukrowicz, Jahn, Graham, Poindexter, & Williams, 2013; Czyz, Berona, & King, 2014; Joiner & Van Orden, 2008), may provide one possible explanation for the robust connection between insomnia and suicide risk. This theory proposes that lethal and near-lethal suicide attempts occur when an

individual has both the desire and capability for suicidal behavior. Suicidal desire emerges when thwarted belongingness (i.e., the feeling that one does not belong) and perceived burdensomeness (i.e., the belief that one's death is worth more than one's life) co-occur. Capability for suicide is characterized by increased pain tolerance and fearlessness about death.

Using the interpersonal theory as a guide, insomnia may confer risk for suicide specifically by increasing feelings of thwarted belongingness. Since insomnia is defined by recurrent difficulties falling asleep, staying asleep, and/or waking up too early (American Psychiatric Association [APA], 2013), those suffering from insomnia are likely to experience extended periods of wakefulness during hours when the majority of the population is asleep. This experience may itself be lonely. Clinically significant insomnia also leads to functional impairment, including minor irritations and interferences in one's social life and relationships (see Sateia, Doghramji, Hauri, & Morin, 2000, and Shochat, Cohen-Zion, & Tzischinsky, 2014, for review). For example, studies have found that poor sleep is associated with difficulties both establishing and maintaining relationships (Roberts and Duong, 2013; Roberts et al., 2001). This may then result in isolation and feelings of loneliness. Furthermore, inadequate sleep is related to impaired emotion regulation abilities (see Walker, 2009 for review). Indeed, studies have shown that individuals with poor sleep quality may have greater difficulties reappraising negative situations (Mauss et al., 2013) and chronic sleep restriction may impact the effective regulation of emotions (Baum et al., 2014). These difficulties may, in turn, increase individuals' vulnerability to maladaptive thoughts about their belongingness. Taken together, chronic insomnia may contribute to feelings of loneliness (cf. thwarted belongingness), resulting in elevated suicidal desire and, ultimately, greater suicide risk.

Findings from recent studies support this proposed pathway. Our research group has found both a cross-sectional and prospective relationship between insomnia symptoms and loneliness across six samples, including undergraduates, community-dwelling adults, and military personnel. Similarly, Chu and colleagues (2016) not only found a significant association between insomnia symptoms and thwarted belongingness but also demonstrated that thwarted belongingness significantly accounted for the association between insomnia and suicidal ideation in a sample of South Korean university students. Chu and colleagues (in press) replicated these findings across three additional samples—U.S. undergraduates, adult mental health outpatients, and adult primary care patients—and demonstrated that this pattern of findings remained even after controlling for anxiety symptoms. Finally, Nadorff and colleagues (2014) examined the relationship between insomnia symptoms, interpersonal theory constructs, and suicide risk in two undergraduate samples. Interpersonal theory constructs did not significantly account for the relationship between insomnia symptoms and suicidal ideation in one of the samples. However, in the other sample, this relationship was no longer significant after controlling for interpersonal theory constructs. These findings suggest that interpersonal theory constructs, including thwarted belongingness, may serve as an explanatory link between insomnia and suicide risk. Consistent with this assertion, a study of older adults also revealed that insomnia symptoms were no longer related to suicide risk after controlling for interpersonal theory variables (Golding et al., 2015). However,

these equivocal results emphasize the need for further investigation into the relationship between these symptom constellations.

The Present Investigation

In considering the (1) relatively high rates of suicidal thoughts and behaviors among military service members and veterans, (2) prevalence of sleep disturbances in these populations, and (3) vast body of evidence identifying insomnia as a potent suicide risk factor, empirical exploration of the mechanisms underlying the relationship between insomnia and suicide risk is indicated. As such, we investigated whether thwarted belongingness may serve as an explanatory link between insomnia symptoms and suicidal ideation across three large samples of military service members and veterans. Based on prior research and propositions of the interpersonal theory of suicide, we hypothesized that (1) insomnia symptom severity would be associated with more severe suicidal ideation and greater thwarted belongingness, and (2) thwarted belongingness would significantly account for the relationship between insomnia symptoms and suicidal ideation, controlling for related psychiatric symptoms. To evaluate the specificity of effects, we conducted secondary analyses to examine whether insomnia symptoms may serve as an explanatory link in the association between thwarted belongingness and suicidal ideation.

Consistent with similar studies we controlled for symptoms associated with both sleep problems and suicide risk. Specifically, where possible, we controlled for: (1) anxiety sensitivity and anxiety symptoms (Capron et al., 2012; Hendin, Maltzberger, & Szanto, 2007; Johnson, Roth, & Breslau, 2006); (2) perceived burdensomeness (Christensen et al., 2013; Cukrowicz et al., 2013; Nadorff et al., 2014); and (3) general hopelessness (Beck, Brown, & Steer, 1989; Beck, Steer, Kovacs, & Garrison, 1985; Woosley, Lichstein, Taylor, Riedel, & Bush, 2014). We also controlled for depression symptoms where possible (Brown et al., 2000; Cavanagh et al., 2003); however, these analyses were exploratory in light of evidence for conceptual and empirical problems with controlling for depression in analyses predicting suicidal ideation (Rogers et al., 2016). Lastly, though less is known about perceived burdensomeness' role in the insomnia and suicidal ideation relationship, this construct is posited as necessary for the emergence of suicidal desire (Joiner, 2005; Van Orden et al., 2010). Thus, where possible, we conducted exploratory analyses examining: (1) thwarted belongingness and perceived burdensomeness as parallel explanatory factors and (2) whether perceived burdensomeness moderated thwarted belongingness' mediating effects. All participants provided informed consent prior to study participation, and relevant Institutional Review Boards approved procedures for each study.

Study 1

In Study 1, we tested the mediating role of thwarted belongingness in the relationship between insomnia symptoms and suicidal ideation, controlling for hopelessness and anxiety sensitivity, in a sample of military services members and veterans.

Methods

Participants and Procedures—A total of 937 United States military service members and veterans were included in Study 1. Participants ranged in age from 18 to 88 years ($M=38.2$, $SD=14.5$), and the sample was predominantly male (82.1%). In terms of race, 67.9% identified as White, 15.2% Black/African American, 1.7% American Indian/Alaska Native, 1.5% Multiracial, 1.1% Asian, 0.7% Native Hawaiian/Other Pacific Islander, and 11.9% declined to state. For branch of service, 49.6% reported an Army affiliation, 21.7% Navy, 18.1% Marine Corps, 7.0% Air Force, 0.5% Coast Guard, 0.1% National Guard, and 2.9% other. Participants' current military status (i.e., active duty, reserve, separated) was not systematically collected. Data were aggregated from fifteen independent studies funded by the Military Suicide Research Consortium (MSRC). There was variation across studies in recruitment methods, study setting, study aims and designs, and survey administration. However, all participants were asked to complete the same battery of self-report measures at baseline/study enrollment.

Measures—Due to study setting constraints, factor analyses of prior datasets were used to select a subset of items from each measure to comprise a brief assessment battery (Gutierrez and Joiner, 2016). This common set of survey items was administered across all fifteen studies.

Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986): A 5-item version of the 16-item ASI was used to assess individuals' tendency to fear the consequences of bodily sensations related to anxiety. Items are rated on a 5-point scale (1= *Very Little*, 5= *Very Much*), with total scores ranging from 5 to 25 and greater scores reflecting greater anxiety sensitivity. The ASI has demonstrated strong psychometric properties (Zvolensky et al., 2001), and its internal consistency in this study was strong ($\alpha=.91$).

Beck Hopelessness Scale (BHS; Beck, Weissman, Lester, & Trexler, 1974): A 3-item version of the original 20-item BHS was used to assess hopelessness. Participants are asked to rate statements about their attitudes toward the future as "True" or "False." Total scores on the abbreviated BHS range from 0 to 3, with higher scores reflecting greater hopelessness. The BHS has been shown to have good internal consistency and reliability (Beck et al., 1974; Steed, 2001), and the 3-item BHS in this study demonstrated adequate internal consistency ($\alpha=.62$).

Depressive Symptom Inventory – Suicidality Subscale (DSI-SS; Metalsky & Joiner, 1997): The DSI-SS is a 4-item measure of suicidal ideation severity. Individuals are presented with four statement groups (e.g., controllability of thoughts) and select the statement from each group that best characterizes them. DSI-SS total scores range from 0 to 12, with increasing scores indicating greater symptom severity. The DSI-SS demonstrates good psychometric properties (Joiner, Pfaff, & Acres, 2002), including compared to other suicide risk measures (Batterham et al., 2014). Internal consistency of the DSI-SS was good ($\alpha=.86$).

Insomnia Severity Index (ISI; Bastien, Vallieres, Morin, Vallières, & Morin, 2001): An abbreviated 5-item version of the 7-item ISI was used to measure insomnia symptom severity. Individuals are asked to rate various sleep complaints (e.g., difficulties falling asleep) on a 5-point Likert scale. Total scores on the abbreviated ISI range from 0 to 20, with greater scores signaling more severe insomnia symptoms. Prior studies indicate that the full ISI has high internal consistency and validity (Bastien et al., 2001; Morin et al., 2011). In this study, the abbreviated ISI demonstrated good internal consistency ($\alpha=.82$).

Interpersonal Needs Questionnaire–Thwarted Belongingness Subscale (INQ-TB; Van Orden, Cukrowicz, Witte, & Joiner, 2012): An adapted 5-item version of the 9-item INQ-TB was used to detect thwarted belongingness. Individuals rate each item on a 7-point Likert scale, and total scores range from 5 to 35, with higher scores signaling greater thwarted belongingness. The INQ has good internal consistency and predictive validity (Van Orden, Cukrowicz, Witte, & Joiner, 2012), including when a shortened version is utilized (Hill et al., 2015). The abbreviated INQ-TB used in this study demonstrated good internal consistency ($\alpha=.89$).

Data Analytic Plan—Bias-corrected bootstrap mediation analyses (5,000 bootstrap resamples; Preacher & Hayes, 2008) were utilized to test the study hypothesis that INQ thwarted belongingness would significantly account for the relationship between ISI insomnia symptoms and DSI-SS suicidal ideation. Analyses controlled for both ASI anxiety sensitivity and BHS hopelessness. As noted above, to test the specificity of indirect effects, secondary analyses were conducted to test whether ISI insomnia symptoms would significantly account for the relationship between INQ thwarted belongingness and DSI-SS suicidal ideation, again controlling for ASI anxiety sensitivity and BHS hopelessness. Effects were considered statistically significant if the 95% confidence interval (CI) did not cross zero. Data regarding perceived burdensomeness and depression symptoms were not collected in this study; thus, we were unable to conduct exploratory analyses in this sample.

Results

Descriptive Statistics (Table 1)—More severe ISI insomnia symptoms were significantly correlated with more severe DSI-SS suicidal ideation ($r=.21, p<.01$) and greater levels of INQ thwarted belongingness ($r=.22, p<.01$). Greater INQ thwarted belongingness was also significantly associated with more severe suicidal ideation ($r=.33, p<.01$).

Primary Analyses: Thwarted Belongingness as a Mediator (Figure 1A)—The overall regression model was significant ($F[3,933]=65.14, p<.01$) and accounted for 17.3% of the variance in suicidal ideation. ISI insomnia symptoms were significantly associated with INQ thwarted belongingness ($B=.21, SE=.06, p<.01$), and INQ thwarted belongingness was significantly associated with DSI-SS suicidal ideation ($B=.08, SE=.01, p<.01$); however, the direct effects of ISI scores on DSI-SS scores were not significant ($B=.03, SE=.02, p=.19$), indicating an “indirect only” effect. The indirect effects of ISI scores on DSI-SS scores through INQ-TB scores were significant (95% CI: .01, .03). All analyses controlled for BHS hopelessness and ASI anxiety sensitivity.

Secondary Analyses: Insomnia Symptoms as a Mediator (Figure 1B)—The overall regression model was significant ($F[3,393]=82.46, p<.01$), explaining 21.0% of the variance in DSI-SS suicidal ideation. Although INQ thwarted belongingness was significantly associated with ISI insomnia symptoms ($B=.07, SE=.02, p<.01$), ISI insomnia symptoms were not significantly associated with DSI-SS suicidal ideation ($B=.03, SE=.02, p=.19$). The direct effects of INQ-TB scores on DSI-SS scores were significant ($B=.08, SE=.01, p<.01$); however, the indirect effects of INQ-TB scores on DSI-SS scores through ISI scores were not (95% CI: $-.01, .01$). Similarly, all analyses included BHS hopelessness and ASI anxiety sensitivity as covariates.

Discussion

Findings are consistent both with study hypotheses and prior studies in this domain. As noted previously, findings from our research group indicate that more severe insomnia symptoms have been shown to be associated with greater levels of thwarted belongingness, even after controlling for anxiety symptoms. These findings also mirror results from a study by Chu and colleagues (2016), in which thwarted belongingness significantly accounted for the association between insomnia symptoms and suicidal ideation in a sample of South Korean undergraduates. This finding suggests that the relations between insomnia symptoms, thwarted belongingness, and suicidal ideation may demonstrate similar patterns across populations and may not be specific to South Korean young adults or military service members and veterans. In our current sample, it is also worthwhile to note that thwarted belongingness remained a significant mediator even after controlling for hopelessness and anxiety sensitivity, both of which have been associated with suicide risk and sleep problems (Beck, 1986; Capron et al., 2012; Klonsky, Kotov, Bakst, Rabinowitz, & Bromet, 2012). This finding underscores the robustness of this study's results. On the other hand, insomnia symptoms did not significantly account for the relationship between thwarted belongingness and suicidal ideation, highlighting the specificity of the relationship between these variables. Despite these findings, the use of abbreviated measures and heterogeneity of the sample (e.g., both service members and veterans recruited across 15 distinct studies with varying aims and designs) represented limitations of this study. Indeed, inconsistent with prior work (Beck et al., 1989; Woosley et al., 2014), hopelessness was negatively associated with insomnia symptoms and suicidal ideation, which may have been due to the BHS' low internal consistency (i.e., $\alpha=.62$).

Study 2

Study 2 aimed to address Study 1's limitation of sample and study design heterogeneity (i.e., use of aggregated data from fifteen unique studies) by examining thwarted belongingness as an explanatory factor in the relationship between insomnia symptoms and suicidal ideation, controlling for perceived burdensomeness, in a single sample of Army recruiters.

Methods

Participants and Procedures—A total of 3,386 Army recruiters participated in Study 2. Participants were majority male (91.5%) and ranged in age from 20 to 57 years ($M=29.91, SD=4.93$). For self-reported race/ethnicity, the majority identified as White (66.2%),

followed by Black/African American (14.8%), Hispanic/Latino (13.5%), Asian (2.7%), Native Hawaiian/Other Pacific Islander (1.6%), and American Indian/Alaska Native (1.1%). Detailed study procedures have previously been published (see Ribeiro et al., 2015).

Measures—As in Study 1, given study setting constraints, a subset of items from each measure was selected via factor analyses of prior datasets to comprise a brief survey battery.

ISI (Bastien, Vallieres, Morin, Vallières, & Morin, 2001): The same abbreviated 5-item version of the 7-item ISI from Study 1 was used to measure insomnia symptom severity. In the current study, the abbreviated ISI exhibited good internal consistency ($\alpha=.87$).

INQ (Van Orden, Cukrowicz, Witte, & Joiner, 2012): For this study, an abbreviated 8-item version of the 15-item INQ was utilized. Four items measured thwarted belongingness (INQ-TB) and four perceived burdensomeness (INQ-PB). Responses occur on a 7-point response scale (1=*Not at all true for me*; 7=*Very true for me*). The INQ-TB and INQ-PB were found to have good to strong internal consistency in this study ($\alpha=.91$ and $.87$, respectively).

DSI-SS (Metalsky & Joiner, 1997): See Study 1 for a full description of the DSI-SS. In this study, the DSI-SS also demonstrated adequate internal consistency ($\alpha=.70$).

Data Analytic Plan—Study 2 employed the same data analytic approach as Study 1. Based on available self-report measures, we controlled for INQ perceived burdensomeness rather than ASI anxiety sensitivity and BHS hopelessness. Additionally, exploratory bootstrap mediation analyses were conducted to evaluate: (1) INQ-TB and INQ-PB as parallel mediators of the relationship between ISI insomnia symptoms and DSI-SS suicidal ideation; and (2) INQ-PB as a moderator of INQ-TB's mediating role in the relationship between ISI insomnia symptoms and DSI-SS suicidal ideation.

Results

Descriptive Statistics (Table 1)—Again, more severe ISI insomnia symptoms were significantly associated with more severe DSI-SS suicidal ideation ($r=.11$, $p<.01$) and greater levels of INQ thwarted belongingness ($r=.27$, $p<.01$). Greater levels of INQ thwarted belongingness were significantly related to more severe DSI-SS suicidal ideation ($r=.21$, $p<.01$).

Primary Analyses: Thwarted Belongingness as a Mediator (Figure 2A)—The overall regression model was significant ($F[3,3382]=141.93$, $p<.01$; $R^2=.11$). ISI insomnia symptoms were significantly correlated with INQ thwarted belongingness ($B=.25$, $SE=.02$, $p<.01$), and INQ thwarted belongingness was significantly correlated with DSI-SS suicidal ideation ($B=.01$, $SE<.01$, $p<.001$). The direct effects of ISI scores on DSI-SS scores were not significant ($B<.001$, $SE<.01$, $p=.36$), indicating an “indirect only” effect, in which the indirect effect of ISI scores on DSI-SS scores through INQ-TB scores was significant (95% CI: $<.01$, $.01$). All analyses controlled for INQ perceived burdensomeness.

Secondary Analyses: Insomnia Symptoms as a Mediator (Figure 2B)—Again, the overall regression model was significant ($F[3,3382]=141.93, p<.01; R^2=.11$). INQ thwarted belongingness was significantly associated with ISI insomnia symptoms ($B=.18, SE=.01, p<.01$); however, ISI insomnia symptoms were not significantly associated with DSI-SS suicidal ideation ($B<.01, SE<.01, p=.36$). The direct effects of INQ thwarted belongingness on DSI-SS suicidal ideation were significant ($B=.01, SE<.01, p<.01$), but the indirect effects of INQ-TB scores on DSI-SS scores through ISI scores were not significant (95% CI: $<-.01, <.01$). Of note, INQ-PB burdensomeness was included as a covariate in all analyses.

Exploratory Analyses: Effects of Perceived Burdensomeness—The overall regression model with INQ-TB and INQ-PB as parallel mediators was significant ($F[3,3382]=141.92, p<.01; R^2=.11$). The mediating effects of INQ-TB scores (95% CI: $>.01, >.01$) and INQ-PB scores (95% CI: $>.01, .01$) were both significant; however, the pairwise contrast indicated that neither effect was significantly stronger (95% CI: $-.01, >.01$). Moderated mediation analyses revealed that INQ-PB did not serve as a moderator of INQ-TB's mediating role in the relationship between ISI insomnia symptoms and DSI-SS suicidal ideation (95% CI: $-.01, >.02$).

Discussion

Findings from Study 2 were consistent with those from Study 1 and further suggest that thwarted belongingness may serve as an explanatory link in the relationship between insomnia symptoms and suicide risk. Notably, perceived burdensomeness was included as a covariate in analyses. Perceived burdensomeness is strongly associated with suicide risk and depression symptoms (Cukrowicz, Cheavens, Van Orden, Ragain, & Cook, 2011; Jahn, Cukrowicz, Linton, & Prabhu, 2011; Van Orden et al., 2008). Therefore, that our hypotheses were supported even after controlling for this construct is particularly striking. Additionally, similar to Study 1, insomnia symptom severity did not mediate the relationship between thwarted belongingness and suicidal ideation, which emphasizes the specificity of the relationships between these variables. Once again, however, the use of abbreviated measures represented a limitation of the current study. Participants in this sample also reported relatively low rates of suicidal ideation; thus, further work is needed to replicate these findings in a higher-risk military sample.

Interestingly, our exploratory analyses indicated that, when examined as parallel mediators, both perceived burdensomeness and thwarted belongingness served as explanatory factors in the association between insomnia symptoms and suicide risk. As noted previously, insomnia has been shown to impact daytime functioning and emotion regulation abilities (Sateia et al., 2000; Walker, 2009); thus, it is not surprising that more severe insomnia symptoms may then contribute to beliefs that one is a burden on others, explaining this pattern of findings. It is also worth noting that perceived burdensomeness did not moderate thwarted belongingness' mediating effects, suggesting that thwarted belongingness may serve as an explanatory link between insomnia and suicidal ideation regardless of how severe an individual's perceptions of being a burden are. This appears to contrast somewhat with propositions of the

interpersonal theory (Joiner, 2005; Van Orden et al., 2010) and thereby warrants further investigation.

Study 3

Similar to Studies 1 and 2, we evaluated thwarted belongingness as an explanatory factor in the relationship between insomnia and suicidal ideation. However, Study 3 controlled for anxiety symptoms and perceived burdensomeness, and it utilized full versions of study measures.

Methods

Participants and Procedures—A total of 417 United States military veterans participated in Study 3. Participants ranged in age from 20 to 98 years ($M=50.73$, $SD=16.65$), and the majority of participants were male (67.8%). For race/ethnicity, 86.4% of participants identified as White/Caucasian, 7.3% as Multiracial, 1.7% as Black/African American, 0.2% as American Indian/Alaska Native; and 2.2% declined to state. In terms of branch of service, 36.5% reported an Army affiliation, 17.5% Navy, 1% Air Force, 7.7% Marine Corps, 2.6% National Guard, 1.9% Army Reserves, 0.7% Coast Guard, and 16.8% refused to answer. Participants were recruited from the community and completed a battery of web-based self-report measures.

Measures

ISI (Bastien, Vallieres, Morin, Vallières, & Morin, 2001): The full 7-item ISI was used to measure insomnia symptom severity. Total scores range from 0 to 28, and increasing scores represent increasing severity of insomnia symptoms. In the current study, the full-scale ISI was found to have good internal consistency ($\alpha=.94$).

INQ (Van Orden, Cukrowicz, Witte, & Joiner, 2012): The full 15-item INQ was utilized for this study, with 9 items measuring thwarted belongingness (INQ-TB), and 6 items measuring perceived burdensomeness (INQ-PB). The INQ-TB and INQ-PB demonstrated good to strong internal consistency in this study ($\alpha=.85$ and $.96$, respectively).

Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001): The 4-item SBQ-R is a measure of lifetime and past-year suicidal ideation, as well as future likelihood of suicidal behavior. Total scores range from 3 to 18, and greater scores signal greater suicide risk. Past studies have shown that the SBQ-R has good internal consistency and convergent validity (Osman et al., 2001), and it demonstrated good internal consistency in this study ($\alpha=.81$).

Multidimensional Health Profile—Psychosocial Functioning (MHP-P; Ruehlman, Lanyon, & Karoly, 1999): The MHP-P is a 58-item broadband measure of psychosocial and health functioning. Three items probing anxiety symptoms and three probing depression symptoms were included in this study. Respondents rate each item (e.g., “How often have you felt worried?”) on a 1 to 5 Likert scale (1=*Not at all*; 5=*Very*). Total scores on both the MHP-P anxiety and depression subscales range from 3 to 15, with increasing scores

representing greater symptom severity. The MHP-P anxiety and depression subscales have good internal consistency and convergence with other anxiety and depression measures (Ruehlman et al., 1999). In our study, both MHP-P anxiety and depression subscales demonstrated acceptable internal consistency ($\alpha=.90$ and $.86$, respectively).

Data Analytic Plan—Study 3 utilized the same data analytic approach as Study 2; however, the SBQ-R was used to measure suicidal ideation. Also, primary and secondary analyses controlled specifically for INQ perceived burdensomeness and MHP-P anxiety symptoms. We then conducted analyses additionally controlling for MHP-P depression symptoms, but we recommend that these results be interpreted with caution due to evidence suggesting that what remains when depression is covaried out of suicidal ideation lacks conceptual meaning (Rogers et al., 2016). Exploratory analyses first controlled for MHP-P anxiety symptoms and then both MHP-P anxiety and depression symptoms.

Results

Descriptive Statistics (Table 1)—More severe ISI insomnia symptoms were significantly associated with more severe SBQ-R suicide risk ($r=.34$, $p<.01$) and greater levels of INQ-TB thwarted belongingness ($r=.60$, $p<.01$). Greater levels of INQ-TB thwarted belongingness were also significantly correlated with more severe SBQ-R suicide risk ($r=.49$, $p<.01$).

Primary Analyses: Thwarted Belongingness as a Mediator (Figure 3A)—The overall regression model was significant ($F[4,412]=48.16$, $p<.01$) and explained 31.9% of the variance in suicidal ideation. More severe ISI insomnia symptoms were significantly associated with greater INQ-TB thwarted belongingness ($B=.39$, $SE=.08$, $p<.01$), and INQ-TB thwarted belongingness was significantly associated with more severe SBQ-R suicide risk ($B=.04$, $SE=.01$, $p<.01$). The direct effects of ISI scores on SBQ-R scores were not significant ($B=-.01$, $SE=.02$, $p=.82$); however, the indirect effects of ISI scores on SBQ-R scores through INQ-TB scores was significant (95% CI: $.01$, $.03$), indicating an “indirect only” effect. INQ-PB perceived burdensomeness and MHP-P anxiety symptoms were included as covariates in these analyses. When additionally controlling for MHP-P depression symptoms, INQ-TB scores no longer accounted for the association between ISI scores and SBQ-R scores (95% CI: $<-.01$, $.02$).

Secondary Analyses: Insomnia Symptoms as a Mediator (Figure 3B)—The overall regression model was significant ($F[4,412]=48.16$, $p<.01$) and accounted for 31.9% of the variance in suicidal ideation. Greater INQ-TB thwarted belongingness was significantly associated with more severe ISI insomnia symptoms ($B=.15$, $SE=.03$, $p<.01$), but more severe ISI insomnia symptoms were not significantly associated with more severe SBQ-R suicide risk ($B=-.01$, $SE=.02$, $p=.82$). The direct effects of INQ-TB thwarted belongingness on SBQ-R suicide risk were significant ($B=.04$, $SE=.01$, $p=.01$), but the indirect effects of INQ-TB scores on SBQ-R scores through INQ-TB scores were not (95% CI: $-.01$, $.01$). Similarly, we controlled for INQ-PB perceived burdensomeness and MHP-P anxiety symptoms in all of these analyses. When additionally controlling for MHP-P

depression symptoms, ISI scores no longer accounted for the relationship between INQ-TB and SBQ-R scores (95% CI: -.01, >.01).

Exploratory Analyses: Effects of Perceived Burdensomeness—The overall regression model with INQ-TB and INQ-PB as parallel mediators, controlling for MHP-P anxiety symptoms, was significant ($F[5,408]=39.38, p<.01, R^2=.33$). Both mediators significantly accounted for the association between ISI and SBQ-R scores (INQ-TB 95% CI: .01, .06; INQ-PB 95% CI: .07, .14); however, neither was identified as exerting a significantly stronger effect (95% CI: -.04, .01). When also controlling for MHP-P depression symptoms, neither INQ-TB (95% CI: >-.01, .01) nor INQ-PB (95% CI: -.01, .02) significantly mediated the relationship between ISI insomnia symptoms and SBQ-R suicide risk. Moderated mediation analyses revealed that INQ-TB served as an explanatory factor in the relationship between ISI insomnia symptoms and DSI-SS suicidal ideation, controlling for MHP-P anxiety symptoms, at low (i.e., -1 SD; 95% CI: .03, .06) but not high (i.e., +1 SD; 95% CI: -.01, .02) levels of INQ-PB. The same pattern of findings was observed when additionally controlling for MHP-P depression symptoms (i.e., at low levels of INQ-PB, 95% CI: <.01, .03; at high levels of INQ-PB, 95% CI: -.01, .01).

Discussion

The primary findings from Study 3 were consistent both with study hypotheses and findings from Studies 1 and 2. These results underscore the explanatory role that thwarted belongingness may play in the relationship between insomnia symptoms and suicide risk. This is consistent with aforementioned experimental findings and theoretical suicide risk frameworks. Similar to Studies 1 and 2, thwarted belongingness significantly accounted for the relationship between insomnia symptoms and suicide risk, controlling for perceived burdensomeness and anxiety symptoms. This finding further emphasizes the potential prominent role of thwarted belongingness in the insomnia-suicide link. However, our pattern of findings no longer emerged after controlling for depression symptoms. It is possible that by removing the variance accounted for by depression symptoms from suicidal ideation, a large portion of what meaningfully defines suicidal ideation was covaried out (Rogers et al., 2016), thereby reducing our ability to detect significant effects. These results may also be a manifestation of the highly overlapping nature of insomnia, depression, and suicidal ideation, further complicated by our use of cross-sectional data and inability to delineate the temporal relationship between these three constructs. Though this study was more methodologically rigorous than Studies 1 and 2 due to use of more psychometrically sound measures, use of objective sleep measures and inclusion of other psychiatric symptoms as covariates (e.g., PTSD symptoms) would enhance the robustness of findings. Replication of this study across more demographically diverse samples is also needed to enhance generalizability, though we were able to replicate our hypothesized pattern of findings even when using an alternate measure of suicidal ideation (i.e., SBQ-R instead of DSI-SS), representing a strength of this investigation.

With regard to exploratory analyses, similar to Study 2, we found that perceived burdensomeness served as a parallel mediator, alongside thwarted belongingness, of the relationship between insomnia symptoms and suicide risk. Collectively, these findings

identify perceived burdensomeness as another potential underlying mechanism that warrants further empirical study. In contrast to Study 2, however, thwarted belongingness emerged as an explanatory factor among those with low but not high levels of perceived burdensomeness. Even more strikingly, these moderated mediation results held even when controlling for both anxiety and depression symptoms. It may be, then, that thwarted belongingness specifically explains the relationship between insomnia symptoms and suicide risk when other robust suicide risk factors (i.e., perceived burdensomeness) are less potent. Additional research is needed, though, to replicate this result and better understand the factors that may account for this finding.

General Discussion

Overall, across military service member and veteran samples, more severe insomnia symptoms were significantly associated with more severe suicidal ideation and greater thwarted belongingness. Additionally, across samples, findings revealed that thwarted belongingness significantly accounted for the relationship between insomnia symptom severity and suicidal ideation. However, insomnia symptoms did not conversely appear to explain the relationship between thwarted belongingness and suicidal ideation.

First, our findings are consistent with previous work demonstrating a strong association between insomnia symptoms and thwarted belongingness and prior studies showing that thwarted belongingness may help to account for the relationship between sleep disturbances and suicidal ideation (Chu et al., 2016; Nadorff et al., 2014). As mentioned previously, the repeated experience of wakefulness while most others are asleep and impairments in social functioning resulting from fatigue and irritability—both of which are hallmark symptoms of insomnia (APA, 2013)—are likely to increase feelings of loneliness and social isolation. These effects of sleep deprivation may also make it more difficult for individuals to manage conflict in their interpersonal relationships (i.e., due to diminished executive function and interpreting behavioral intentions), further contributing to a sense of thwarted belongingness. These hypothesized connections are also supported by literature demonstrating that sleep disturbances may contribute to greater difficulties in emotion regulation (Gruber and Cassoff, 2014; Gujar et al., 2011; Kyle et al., 2014; Mauss et al., 2013), poorer mood and negative affect (Baum et al., 2014), and increased reactivity to daily stressors (Minkel et al., 2012; Zohar et al., 2005). Each of these problems likely serves to decrease positive interpersonal connectedness by increasing frequency and severity of negative social interactions, as well as decreasing interest or motivation to engage in social situations. Thus, it is unsurprising that, across samples, sleep problems were associated with thwarted belongingness, and thwarted belongingness significantly accounted for the relationship between insomnia symptoms and suicidal ideation. Strikingly, these effects remained even when controlling for other psychiatric symptoms (e.g., anxiety, hopelessness, perceived burdensomeness), each of which have been shown to be important suicide risk factors (Beck, Brown, & Steer, 1989; Brown, Beck, Steer, & Grisham, 2000; Capron et al., 2012; Joiner et al., 2009), underscoring the significance of these present findings. Of note, these effects did not remain in the one sample for which we were able to control for depression symptoms, but further work—particularly prospective research—is needed to delineate the nature of the relationship between these highly overlapping constructs.

That insomnia symptom severity did not appear to significantly account for the association between thwarted belongingness and suicidal ideation is also noteworthy. This finding reveals the potential specificity of thwarted belongingness as an explanatory link in the relationship between sleep disturbances and suicidal ideation among service members and veterans. That is, poor sleep appears to be related to suicide risk in part because it may contribute to feelings of social disconnection. Social disconnection and sleep problems have been associated in with each other in this and other investigations (Cacioppo et al., 2002; Hawkey and Cacioppo, 2010), and it appears that their relationship to suicide risk is specific to thwarted belongingness as a link between insomnia and suicidal ideation.

It is also notable that the same pattern of findings held in all three of our studies. Given the variation across samples with regard to military status, branch of service, and demographics, this consistency bolsters evidence for our hypothesis that insomnia may confer risk for suicide among military service members and veterans by increasing feelings of loneliness and social disconnection. Additionally, the correspondence between our findings and aforementioned similar studies with non-military samples (Chu et al., 2016; Nadorff et al., 2014) suggests that pathways between insomnia symptoms, thwarted belongingness, and suicidal ideation may be relatively similar across populations, and indicates that similar prevention and intervention approaches can be utilized across vulnerable groups to thwart the trajectory from insomnia to suicidal ideation.

Finally, on this point, our results suggest that sleep disturbances and thwarted belongingness may be important therapeutic targets to reduce suicide risk among military service members and veterans. Fortunately, efficacious interventions, such as cognitive-behavioral therapy for insomnia (CBT-I; Edinger & Means, 2005), exist to treat insomnia. In addition to being effective in addressing insomnia complaints (Edinger et al., 2009, 2001; Koffel et al., 2015), studies also suggest that CBT-I reduces symptoms of depression and suicidality in the general population (Manber et al., 2011, 2008) and veterans (Trockel et al., 2015). Furthermore, since sleep problems appear to predict soldiers' treatment engagement above and beyond other psychiatric symptoms (e.g., suicidal ideation, hopelessness; Hom et al., 2016), a focus on assessing and treating insomnia may represent a strategic suicide prevention approach among service members. Findings from our study also indicate that assessment of loneliness, social isolation, and social connectedness, particularly among service members and veterans with sleep problems, may be clinically useful. Routine assessment and monitoring of thwarted belongingness can critically inform suicide risk level categorizations and reveal potential areas for problem-solving, development of coping skills, restructuring of negative thoughts, and behavioral activation techniques (e.g., developing interpersonal effectiveness skills, scheduling social activities; see Joiner, Van Orden, Witte, & Rudd, 2009 as a guide). This may, in turn, reduce suicide risk and mitigate the impact of sleep disturbances on suicidal ideation.

Limitations and Future Directions

This investigation's limitations should also be considered. First, since only cross-sectional data were collected, we were unable to investigate causal relationships between variables of interest. Future prospective studies will be critical in evaluating these relationships.

However, our analyses were grounded in prior theoretical and empirical findings, and we were able to test an alternate model. Second, further work is indicated to replicate study findings in more demographically diverse samples. Such investigations may also be enhanced by the collection of additional military service information (e.g., years of service; deployment characteristics) to examine the factors moderating the relationships between constructs of interest. Third, as noted above, only self-report data was utilized. Implicit measures of suicidal ideation (e.g., Nock et al., 2010) and objective sleep disturbance measures (e.g., polysomnography) may help circumvent stigma concerns and inaccurate reporting in future studies. Abbreviated self-report measures were also used in a number of cases, which may have impacted our findings by reducing our ability to detect significant effects and yielding relatively low correlations in some instances. Though these abbreviated versions have demonstrated preliminary reliability and validity (Gutierrez and Joiner, 2016), use of full-length, robustly validated measures is indicated for replication studies. Last, we were limited in available symptom measures; thus, it may be useful for future studies to control for other psychiatric symptoms often associated with sleep disturbances and suicidal ideation (e.g., PTSD; APA, 2013). There were also some symptom measures (e.g., depression symptoms) that were not available across all samples. Consequently, research is needed to replicate our results and resolve equivocal findings (e.g., moderated mediation results). On this point, factors other than thwarted belongingness may help to explain the relationship between insomnia and suicidal ideation (e.g., overarousal; Ribeiro et al., 2012; Ribeiro et al., 2014). Thus, further research is warranted to identify other mechanisms that might account for the strong association between insomnia and suicide risk, including further probing perceived burdensomeness as an explanatory link.

Conclusions

Although prior work has established a robust association between insomnia and suicide risk, as well as between thwarted belongingness and suicide risk, this three-study investigation represents the first evaluation of these constructs among military service members and veterans within a single model. Although further, prospective studies are needed to investigate these associations in additional, diverse military and veteran samples, and with more rigorous measurement techniques, our results are an important first step in understanding the role of thwarted belongingness as a link between insomnia symptom severity and suicidal ideation in military service member and veteran populations, and reveal potential avenues for future research and suicide prevention efforts.

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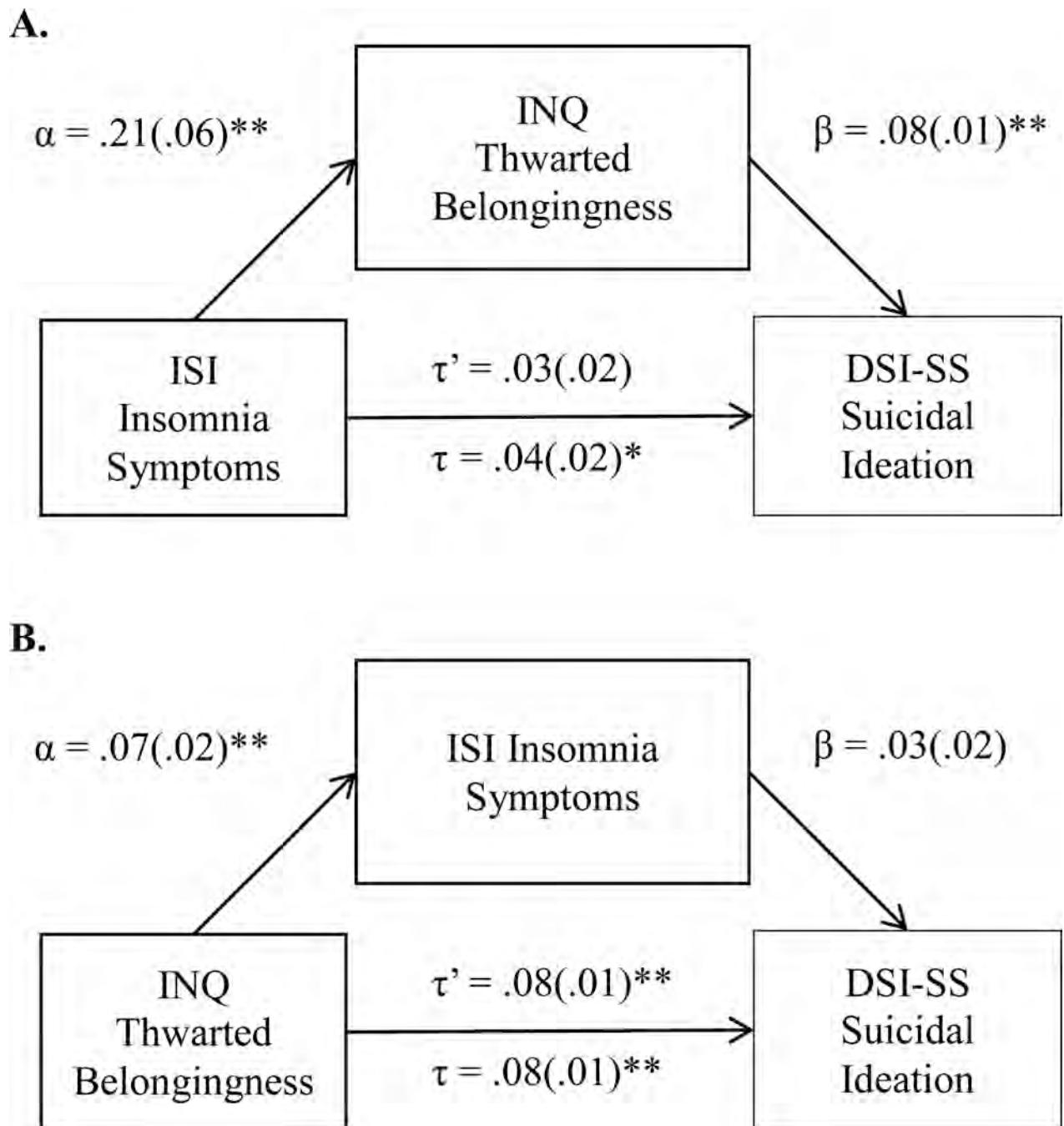


Figure 1.

Study 1 Unstandardized Regression Coefficients and Standard Errors from Mediation Analyses

$p < .05$; ** $p < .01$

Note. α = independent variable to mediator path; β = mediator to dependent variable path; τ' = direct effects of independent variable on dependent variable; τ = total effects of independent variable on dependent variable; ISI = Insomnia Severity Index; INQ =

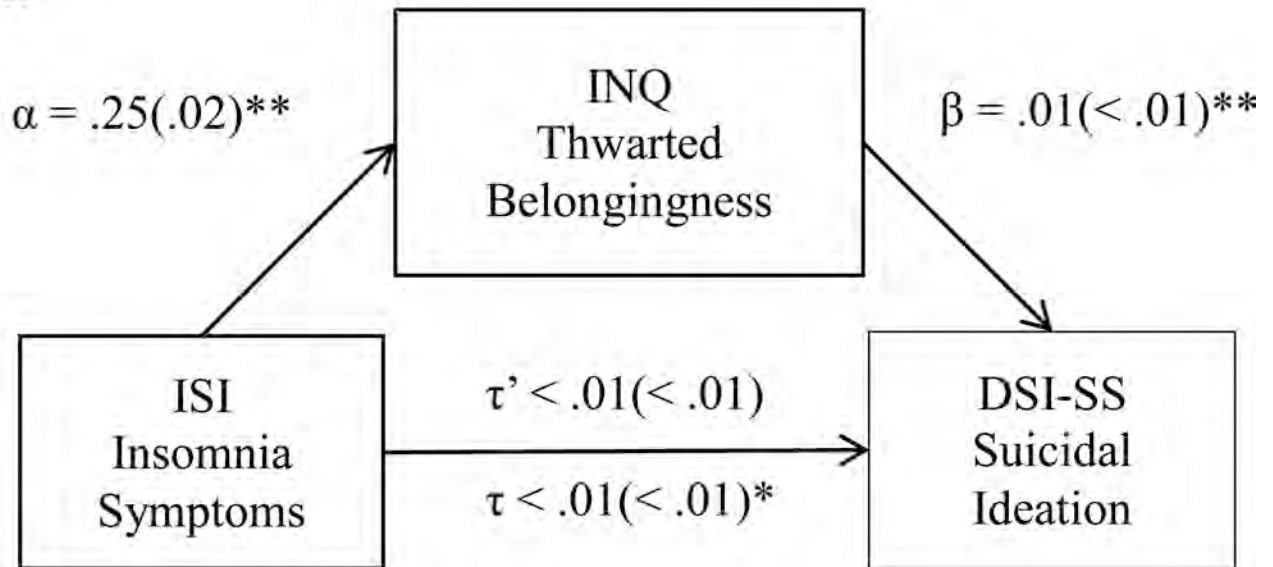
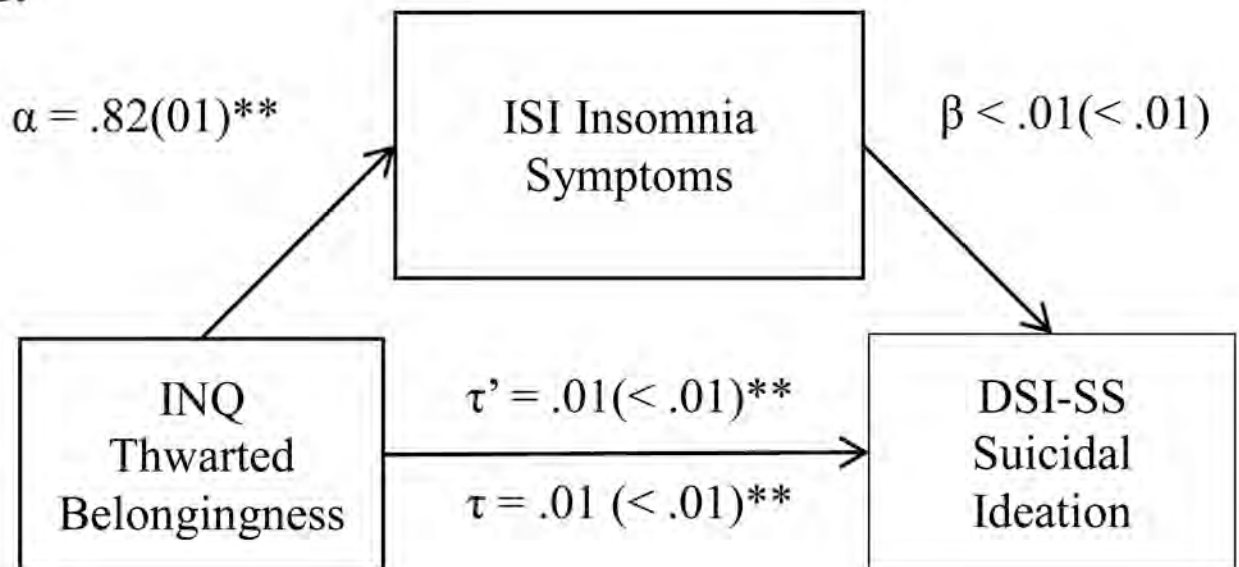
Interpersonal Needs Questionnaire; DSI-SS = Depressive Symptoms Index—Suicidal-
ity Subscale; Analyses controlling for anxiety sensitivity and hopelessness

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A.**B.****Figure 2.**

Study 2 Unstandardized Regression Coefficients and Standard Errors from Mediation Analyses

* $p < .05$; ** $p < .01$

Note. α = independent variable to mediator path; β = mediator to dependent variable path; τ' = direct effects of independent variable on dependent variable; τ = total effects of independent variable on dependent variable; ISI = Insomnia Severity Index; INQ =

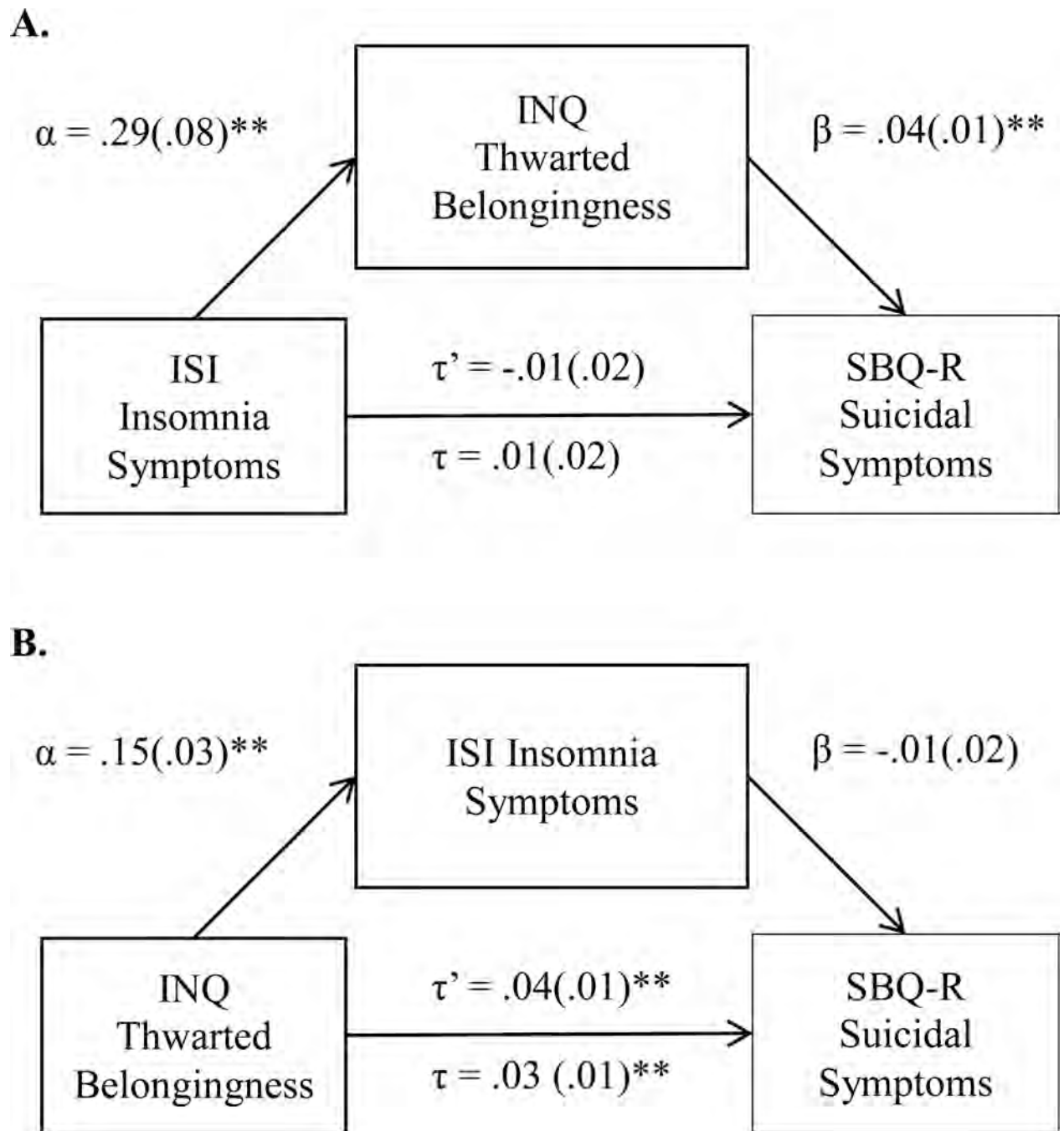
Interpersonal Needs Questionnaire; DSI-SS = Depressive Symptoms Index—Suicidal-
ity Subscale; Analyses controlling for perceived burdensomeness

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**Figure 3.**

Study 3 Unstandardized Regression Coefficients and Standard Errors from Mediation Analyses

** $p < .01$

Note. α = independent variable to mediator path; β = mediator to dependent variable path; τ' = direct effects of independent variable on dependent variable; τ = total effects of independent variable on dependent variable; ISI = Insomnia Severity Index; INQ =

Interpersonal Needs Questionnaire; SBQ-R = Suicidal Behaviors Questionnaire—Revised;
Analyses controlling for anxiety symptoms and perceived burdensomeness

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Table 1

Means, Standard Deviations, and Intercorrelations for Self-Report Measures

STUDY 1	1	2	3	4	5	M	SD	Range	α
ISI Insomnia Symptoms ¹	--					11.49	4.91	0–20	.82
2. INQ Thwarted Belongingness ²	.22**	--				19.98	8.24	5–35	.89
3. DSI-SS Suicidal Symptoms	.21**	.33**	--			3.30	3.03	0–12	.86
4. BHS Hopelessness ³	-.11**	.29**	-.27**	--		1.23	1.11	0–3	.62
5. ASI Anxiety Sensitivity ⁴	.41**	.25**	.34**	-.13**	--	13.18	6.20	5–25	.91
STUDY 2	1	2	3	4	5	M	SD	Range	α
1. ISI Insomnia Symptoms ¹	--					4.43	3.73	0–20	.87
2. INQ Thwarted Belongingness ⁵	.27**	--				7.20	4.57	4–28	.91
3. DSI-SS Suicidal Symptoms	.11**	.21**	--			.03	.25	0–7	.70
4. INQ Perceived Burdensomeness ⁵	.22**	.35**	.32**	--		4.43	1.70	4–28	.87
STUDY 3	1	2	3	4	5	M	SD	Range	α
1. ISI Insomnia Symptoms	--					16.08	7.87	3–31	.94
2. INQ Thwarted Belongingness	.60**	--				30.16	14.53	9–62	.85
3. SBQ-R Suicide Risk	.34**	.49**	--			8.12	2.75	4–18	.81
4. INQ Perceived Burdensomeness	.54**	.73**	.55**	--		14.18	10.14	7–42	.96
5. MHP-P Anxiety Symptoms	.66**	.63**	.40**	.63**	--	8.20	3.80	3–15	.90
6. MHP-P Depression Symptoms	.70**	.77**	.48**	.67**	.70**	8.55	3.55	3–15	.86

**
 $p < .01$ ¹5-item version of the 7-item ISI²5-item version of the 9-item INQ-ITB³3-item version of the 20-item BHS⁴5-item version of the 16-item ASI

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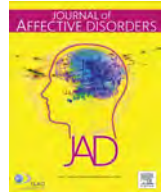
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8-item version of the INQ, with 4 INQ-TB and 4 INQ-PB items

Note. ISI = Insomnia Severity Index; INQ = Interpersonal Needs Questionnaire; DSI-SS = Depressive Symptoms Index—Suicidality Subscale; BHS = Beck Hopelessness Scale; ASI = Anxiety Sensitivity Index; SBQ-R = Suicidal Behavior Questionnaire—Revised; MHP-P = Multidimensional Health Profile—Psychosocial Functioning



Research paper

Exploring the association between exposure to suicide and suicide risk among military service members and veterans

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ARTICLE INFO

Keywords:

Suicide
Bereavement
Survivor
Military service member
Veteran

ABSTRACT

Background: Past research suggests that suicide has a profound impact on surviving family members and friends; yet, little is known about experiences with suicide bereavement among military populations. This study aimed to characterize experiences with suicide exposure and their associations with lifetime and current psychiatric symptoms among military service members and veterans.

Methods: A sample of 1753 United States military service members and veterans completed self-report questionnaires assessing experiences with suicide exposure, lifetime history of suicidal thoughts and behaviors, current suicidal symptoms, and perceived likelihood of making a future suicide attempt.

Results: The majority of participants (57.3%) reported knowing someone who had died by suicide, and of these individuals, most (53.1%) reported having lost a friend to suicide. Chi-square tests, one-way ANOVAs, and logistic regression analyses revealed that those who reported knowing a suicide decedent were more likely to report more severe current suicidal symptoms and a history of suicidal thoughts and behaviors compared to those who did not know a suicide decedent. Hierarchical linear regression analyses indicated that greater self-reported interpersonal closeness to a suicide decedent predicted greater self-reported likelihood of a future suicide attempt, even after controlling for current suicidal symptoms and prior suicidal thoughts and behaviors.

Limitations: This study utilized cross-sectional data, and information regarding degree of exposure to suicide was not collected.

Conclusions: Military personnel and veterans who have been bereaved by suicide may themselves be at elevated risk for suicidal thoughts and behaviors. Additional work is needed to delineate the relationship between these experiences.

1. Introduction

Suicide claims the lives of over 40,000 individuals in the United States (U.S.) each year (Centers for Disease Control and Prevention [CDC], 2015), and for each life lost to suicide, many other individuals are estimated to be impacted by the grief and pain associated with bereavement of the suicide decedent (Cerel et al., 2016; Shneidman, 1972). Military service members and veterans represent a group at especially high risk for suicide, with a number of studies revealing elevated rates of suicide deaths, attempts, and ideation in this population (Hoge and Castro, 2012; Kuehn, 2009; Nock et al., 2014; Ursano

et al., 2015). Consequently, it is likely that many current and former military personnel know or will know an individual who has died by suicide. Despite this assumption, there has been a notable dearth of research among individuals with a military service history who have been exposed to suicide, affected by suicide, and/or bereaved by suicide.¹

A growing body of research among non-military populations suggests that loss of a loved one to suicide can profoundly impact one's own mental health and suicide risk. For example, findings from a recent review of 57 studies on suicide bereavement experiences suggest that individuals who have lost a romantic partner to suicide are at

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¹ Throughout the manuscript, we will aim to utilize nomenclature proposed by Cerel et al. (2014) to capture the continuum of suicide survivorship. Specifically, the following three terms will be used: *exposed to suicide* (i.e., knowing someone who has died by suicide), *affected by suicide* (i.e., having experienced significant psychological distress following the suicide death of another individual with whom one may or may not have had a close relationship); and *bereaved by suicide* (i.e., short-term or long-term clinically significant distress following the suicide death of an individual with whom one had a close personal relationship). These categories are viewed as being nested (i.e., those *bereaved by suicide* have also been *affected by suicide* and *exposed to suicide*) rather than mutually exclusive.

increased suicide risk, parents bereaved by the suicide of a child are at elevated risk for involuntary psychiatric hospitalization, and children who have lost a parent to suicide may be at increased risk for developing depression (Pitman et al., 2014). Individuals who lose a parent to suicide during their childhood have also been shown to be at increased risk for death by suicide (Guldin et al., 2015). Importantly, a population-based study conducted by Omerov et al. (2013) found that the increased risk for depression observed among suicide-bereaved parents was not significantly accounted for by mental health problems that predated the suicide death (i.e., the suicide death itself appeared to confer depression risk). There is also evidence suggesting that grief reactions may be more severe among those who lose a loved one to suicide than those who lose a loved one to non-suicide causes of death (Barrett and Scott, 1990; de Groot et al., 2006; Jordan, 2001).

Regarding experiences with suicide survivorship among military populations specifically, to our knowledge, only one study to date has examined the impact of exposure to suicide in a military sample. In this study, Cerel et al. (2014) investigated the prevalence and correlates of exposure to suicide among military veterans in the U.S. state of Kentucky using a random digit dial survey study design. Of the 931 veterans who participated, nearly half (47.1%) reported exposure to suicide at some point during their lives. Consistent with aforementioned research, those with lifetime exposure to suicide were significantly more likely to report clinically significant depression and anxiety symptoms, as well as suicidal ideation, than those without exposure to suicide. Notably, these symptoms were elevated among those who reported greater perceived closeness to the suicide decedent. These findings provide preliminary evidence for the impact of suicide exposure and bereavement on future suicide risk among military veterans, but the authors note that the study's sampling strategy limits its generalizability (e.g., one southern U.S. state, relatively older veterans [$M_{age}=61.6$, $SD=15.42$]). They also recommend that future studies in this domain include younger, active duty military members to enhance relevance to current behavioral health efforts among military service members and veterans.

Taken together, it is evident that exposure to suicide and suicide bereavement—and their association with suicidal thoughts and behaviors—are areas deserving of further empirical investigation among military service members and veterans. If experiences with suicide bereavement appear to be prevalent and/or to confer risk for suicide and the development of psychiatric symptoms in this population, then this may illuminate an important intervention avenue for military populations.

1.1. The present study

To better understand the experiences that United States military service members and veterans have had with knowing someone who has died by suicide, the aims of this study were:

Aim 1: To characterize service members' and veterans' experiences with suicide exposure, being affected by suicide, and/or suicide bereavement.

Aim 2: To examine the extent to which suicide exposure, *closeness* to a suicide decedent, and *impact* of a suicide death are each associated with service members' and veterans' own (a) lifetime history of suicidal thoughts, suicide plans, suicide attempts, and non-suicidal self-injury and (b) current suicidal symptom severity.

Aim 3: To investigate the extent to which *closeness* and *impact* are associated with service members' and veterans' (a) current suicidal symptom severity and (b) self-reported likelihood of a future suicide attempt, controlling for other suicidal symptoms and lifetime history of suicidal thoughts and behaviors.

2. Methods

2.1. Participants

A total of 1753 U.S. military service members and veterans were included in the present study. The current sample represents an aggregate of common data elements (CDEs) collected across fifteen independent studies funded by the Military Suicide Research Consortium (MSRC, 2015). The sample was predominantly male (81.5%), and individuals ranged in age from 18 to 88 years ($M=33.44$; $SD=13.38$). In terms of race, 64.8% identified as White, 19.7% Black/African American, 1.4% American Indian/Alaska Native, .9% Multiracial, .6% Asian, .3% Native Hawaiian/Other Pacific Islander, and 12.2% declined to state their race. For military service branch, 69.5% reported an Army affiliation, 12.9% Navy, 10.8% Marine Corps, 4.4% Air Force, .4% Coast Guard, .1% National Guard, and 2.0% other. Neither current military status (e.g., Active Duty, Reserve) nor rank was systematically collected across studies; thus, this information is not included in our analyses. For marital status, participants were most likely to report being single (41.1%), followed by married (28.3%), divorced (20.7%), separated (8.1%), widowed (.9%), and cohabitating (.8%). Finally, with respect to highest education level completed, 49.3% reported completing some college, 30.9% high school/GED, 12.2% a college degree, and 5.5% more than a college degree; 2.0% reported not completing high school.

2.2. Measures

The following measures were administered as a battery of CDEs across fifteen unique studies.² This assessment battery has been shown to have strong psychometric properties, including among military service member and veteran samples (Gutierrez and Joiner, 2016).

2.2.1. Demographics questionnaire

Demographic and military service characteristics were collected using a brief self-report questionnaire inquiring about sex, age, race, marital status, highest level of education completed, and branch of service.

2.2.2. Suicide exposure and bereavement experiences

Individuals responded to questions regarding their experiences knowing someone who had died by suicide. They were asked: "Do you know anyone who has died by suicide?" (Response options: Yes/No); "Did the death occur during your military career?" (Response options: Yes/No); "What was your relationship to the person who died by suicide?" (Open-ended response); "How close would you describe your relationship with this person?" (1="Not Close," 3="Somewhat Close," and 5="Very Close"); and "Thinking about the effect of the person's suicide on your life, please circle the most appropriate number below" (1="The death had little effect on my life," 2="The death had somewhat of an effect on me but did not disrupt my life," 3="The death disrupted my life for a short time," 4="The death disrupted my life in a significant or devastating way, but I no longer feel that way," and 5="The death had a significant or devastating effect on me that I still feel").

2.2.3. Depressive Symptom Inventory—Suicidality Subscale (DSI-SS; Metalsky and Joiner, 1997)

This 4-item self-report measure was used to assess current suicidal symptom severity. Individuals were presented with four groups of statements—each assessing a different domain of suicidality (e.g.,

² Although the Cerel et al. (2014) study was also funded by the Military Suicide Research Consortium, to prevent redundancies in reporting of findings, these data were not included in the present analyses.

frequency of suicidal thoughts, controllability of suicidal thoughts)—and then were asked to select the statement that best describes them in the past two weeks. DSI-SS total scores range from 0 to 12, with higher scores representing greater severity of symptoms. Past research suggests that the DSI-SS has strong psychometric properties (Joiner et al., 2002), including when compared to other self-report suicide risk measures (Batterham et al., 2014). The DSI-SS also demonstrated strong internal consistency in the present study ($\alpha=.90$).

2.2.4. Suicidal Behaviors Questionnaire—Revised (SBQ-R; Osman et al., 2001)

The SBQ-R is a 4-item self-report measure assessing various aspects of an individual's experiences with suicidal thoughts and behaviors. For the current study, Item 1 was used to assess lifetime history of suicide ideation, plans, and attempts (“Have you ever thought about or attempted to kill yourself?”), and Item 4 was used to assess self-reported future likelihood of a suicide attempt (“How likely is it that you will attempt suicide someday? ”; 0=“Never” to 6=“Very Likely”). The SBQ-R has been shown to have strong reliability and validity across clinical and non-clinical samples (Osman et al., 2001).

2.2.5. Interpersonal Needs Questionnaire—Thwarted Belongingness Subscale (INQ-TB; Gutierrez and Joiner, 2016; Van Orden et al., 2012)

An abbreviated 5-item version of the 9-item INQ-TB was used as a measure of thwarted belongingness (i.e., perception that one lacks meaningful social connections). According to the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010), thwarted belongingness is required for the emergence of suicidal desire. For the INQ-TB, participants rated each item on a 7-point Likert scale (1=“Not at all true for me,” 4=“Somewhat true for me,” 7=“Very true for me”). Total scores range from 5 to 35, with lower scores indicating greater thwarted belongingness. The INQ has been shown to have good internal consistency and predictive validity (Van Orden et al., 2012), including when a shortened version is utilized (Hill et al., 2015). The abbreviated INQ-TB used in this study demonstrated good internal consistency ($\alpha=.89$).

2.2.6. Non-suicidal self-injury (NSSI) measure

A single self-report item (“How many times in your life have you purposely hurt yourself *without* wanting to die?”), adapted from the Self-Injurious Thoughts and Behaviors Interview (Nock et al., 2007), was used to assess lifetime history of non-suicidal self-injury. Individuals who responded “0” were categorized as not having a lifetime history of NSSI, whereas those who provided a response ≥ 1 were categorized as having a lifetime history of NSSI.

2.3. Procedures

As noted, this study represents an aggregate of data collected across fifteen independent studies funded by the MSRC. Studies varied in recruitment strategies (e.g., community flyers, provider referral), study setting (e.g., university research laboratory, Veterans Affairs [VA] or military psychiatric inpatient unit, outpatient mental health clinic), survey administration method (e.g., computer-based, paper-and-pencil), and study design and aims (e.g., group treatment trial, web-based intervention study, neuroimaging investigation). Despite this, all participants in this study completed the same battery of self-report measures either at their baseline study visit or upon study enrollment. All participants provided informed consent prior to study enrollment, and the relevant Institutional Review Board(s) for each investigation approved all study procedures. The Department of Defense's Human Research Protection Office also verified compliance with all applicable human subjects policies.

Based on survey responses, participants were categorized as either

having known ($n=1004$) or not having known ($n=749$) someone who died by suicide. For participants who reported knowing someone who had died by suicide, each open-ended response to the question “What was your relationship to the person who died by suicide?” was coded as belonging to one of the following eleven categories: (1) Spouse/Romantic Partner; (2) Child (Daughter, Son); (3) Parent (Mother/Father); (4) Sibling (Sister, Brother); (5) Aunt, Uncle, Cousin; (6) Grandparent; (7) Other Family Member; (8) Friend; (9) Fellow Service Member (i.e., directly worked with service member); (10) Other Military Contact (i.e., did not directly work with service member); or (11) Other (e.g., Acquaintance, Co-worker).

2.4. Data analysis

For Aim 1, descriptive statistics were used to describe the prevalence of suicide exposure. For Aim 2, chi-square tests of independence were used to assess whether those who knew someone who had died by suicide were more likely to report a lifetime history of suicide ideation, plans, and attempts, as well as NSSI, than those who did not know a suicide decedent. One-way ANOVAs were utilized to evaluate differences in self-report symptom measure scores (i.e., DSI-SS total score, SBQ-R Item 4, INQ-TB total score) between (1) those who did and did not know someone who had died by suicide and (2) those who did and did not lose a fellow service member, specifically, to suicide. Additionally a series of univariate linear regression analyses were conducted to evaluate the extent to which (1) *closeness* to the suicide decedent and (2) *impact* of the suicide death were associated with scores on self-report symptom measures (DSI-SS total score, SBQ-R Item 4, INQ-TB total score) among those with exposure to suicide. Similarly, logistic regression analyses were employed to evaluate the extent to which *closeness* and *impact* were associated with self-reported lifetime suicide ideation, plans, and attempts, and NSSI.

Lastly, for Aim 3, two hierarchical linear regression analyses were implemented among those who had lost someone to suicide, specifically. This analytic approach was employed to investigate the unique contributions of lifetime suicidal thoughts and behaviors, current suicidal symptoms, and suicide bereavement experiences to current self-reported suicidal ideation and self-reported likelihood of a future attempt. The first analysis examined predictors of DSI-SS current suicidal ideation severity. Lifetime suicide ideation, plans, and attempts, and NSSI were entered in Step 1. Then, SBQ-R Item 4 and the INQ-TB total scores were entered in Step 2. Finally, *closeness* and *impact* were entered in Step 3. The second analysis examined predictors of SBQ-R likelihood of a future suicide attempt. Again, lifetime suicide ideation, plans, and attempts, and NSSI were entered in Step 1. Next, DSI-SS and INQ-TB total scores were entered in Step 2. Finally, both *closeness* and *impact* were entered in Step 3.

Of note, additional exploratory analyses were conducted to evaluate whether the pattern of findings for each analysis described above remained the same after controlling for age, sex, and marital status. Follow-up chi-square tests, one-way ANOVAs, and moderation analyses were also conducted to examine the role of male and female sex in our findings. These analyses were not conducted with age and marital status given that these characteristics were likely different at the time of exposure to suicide, which would limit the interpretability of results.

3. Results

Means, standard deviations, and zero-order correlations for all self-report measures are presented in Table 1.

3.1. Experiences with suicide exposure

Suicide exposure experiences are presented in Table 2. A total of 1004 (57.3%) participants reported knowing someone who had died by suicide, and of these individuals, 43.3% reported that a suicide death

Table 1
Means, standard deviations, and zero-order correlations of self-report measures.

	1	2	3	4	5
1. DSI-SS Suicidal Ideation	–				
2. INQ Thwarted Belongingness	-.34**	–			
3. SBQ-R Item 4 Future Likelihood	.72**	-.41**	–		
4. Closeness to Decedent	.12**	-.09*	.20**	–	
5. Impact of Death	.18**	-.08*	.24**	.63**	–
M	2.01	20.04	1.34	2.98	2.60
SD	2.84	8.26	1.64	1.38	1.34
Range	0–12	5–35	0–6	1–5	1–5
α	.90	.90	–	–	–

Note. DSI-SS=Depressive Symptom Inventory–Suicidality Subscale; INQ=Interpersonal Needs Questionnaire; SBQ-R=Suicidal Behaviors Questionnaire-Revised.

* $p < .05$.

** $p < .01$.

Table 2
Factors among Participants Reporting Suicide Exposure (N=1004).

	n	Valid %
Relationship to Individual Who Died by Suicide^a		
Spouse/Romantic Partner	16	1.7%
Child (Daughter, Son)	3	.3%
Parent (Mother, Father)	19	1.9%
Sibling (Sister, Brother)	25	2.6%
Aunt, Uncle, Cousin	84	8.9%
Grandparent	10	1.1%
Other Family Member	82	8.7%
Friend	502	53.1%
Fellow Service Member	100	10.6%
Other Military Contact	21	2.2%
Other (Acquaintance, Co-worker, etc.)	180	19.0%
Suicide Death Occurred During Military Career		
No	555	56.7%
Yes	423	43.3%
Missing	26	–
Closeness of Relationship with Suicide Decedent (M=3.01, SD=1.36)		
1=Not Close	187	19.3%
2	154	15.9%
3=Somewhat Close	273	28.2%
4	172	17.8%
5=Very Close	182	18.8%
Missing	35	–
Effect of Death on Participant's Life (M=2.62, SD=1.34)		
1=Little effect on life	215	22.2%
2=Somewhat of an effect but did not disrupt life	298	30.8%
3=Disrupted life for a short time	196	20.2%
4=Disrupted life in a significant or devastating way, but no longer feel that way	122	12.6%
5=Significant or devastating effect that is still felt	131	13.5%
Missing	42	–

^a Categories are not mutually exclusive.

had occurred during their military careers. Participants most commonly reported losing a Friend ($n=502$; 53.1%), followed by Other ($n=180$; 19.0%); Fellow Service Member ($n=100$; 10.6%); Aunt, Uncle, Cousin ($n=84$; 8.9%); Other Family Member ($n=82$; 8.7%); Sibling ($n=25$; 2.6%); Other Military Contact ($n=21$; 2.2%); Parent ($n=19$; 1.9%); Spouse/Romantic Partner ($n=16$; 1.7%); Grandparent ($n=10$; 1.1%); and Child ($n=3$; .3%). A plurality of participants ($n=273$; 28.2%) who had known someone who died by suicide reported being “Somewhat Close” to the suicide decedent, and a plurality ($n=298$; 30.8%) also reported that the suicide death had “Somewhat of an effect but did not disrupt life.”

Table 3
History of lifetime suicide ideation, plans, and attempts, and non-suicidal self-injury in association with knowing someone who died by suicide.

	Knows someone who died by suicide				χ^2	p
	Yes (n=1004)		No (n=749)			
	N	Valid %	N	Valid %		
Lifetime Suicidal Ideation	680	67.7%	334	44.6%	94.168	< .001
Lifetime Suicide Plans	535	53.3%	257	34.3%	62.357	< .001
Lifetime Suicide Attempts	291	29.0%	123	16.4%	37.527	< .001
Lifetime Non-Suicidal Self-Injury	291	29.0%	119	15.9%	41.061	< .001

3.2. Suicide exposure and lifetime suicidal behaviors/current suicidal symptoms

Suicide-exposed individuals were significantly more likely than those not exposed to suicide to report a lifetime history of suicide ideation ($\chi^2=94.168$, $p < .001$), suicide plans ($\chi^2=62.357$, $p < .001$), suicide attempts ($\chi^2=37.527$, $p < .001$), and NSSI ($\chi^2=41.061$, $p < .001$). These data are detailed in Table 3.

Participants who reported exposure to suicide reported more severe DSI-SS current suicidal ideation ($F[1,1666]=43.822$, $p < .001$, $M_{Yes}=2.40$, $M_{No}=1.48$) and a greater SBQ-R likelihood of a future suicide attempt ($F[1,1666]=64.160$, $p < .001$, $M_{Yes}=1.61$, $M_{No}=.97$). There were no differences between the two groups with respect to INQ thwarted belongingness ($F[1,1017]=.089$, $p=.766$, $M_{Yes}=19.99$, $M_{No}=20.15$). Of note, individuals who reported losing a fellow service member to suicide ($n=100$) did not report more severe DSI-SS current suicidal ideation ($F[1,910]=.322$, $p=.570$), greater SBQ-R likelihood of a future suicide attempt ($F[1,917]=.705$, $p=.401$), or INQ thwarted belongingness ($F[1,681]=.982$, $p=.322$) than individuals who reported losing a non-fellow service member (i.e., other military contact) to suicide.

3.3. Closeness to suicide decedent and lifetime suicidal behaviors/current suicidal symptoms

Participants who reported greater closeness to the suicide decedent also reported more severe DSI-SS current suicidal ideation ($\beta=.110$, $t[925]=3.361$, $p=.001$, partial $r^2=.012$), greater SBQ-R likelihood of a future suicide attempt ($\beta=.191$, $t[926]=5.934$, $p < .001$, partial $r^2=.036$), and greater INQ thwarted belongingness ($\beta=-.085$, $t[684]=-2.242$, $p=.025$, partial $r^2=.007$). Logistic regression analyses revealed that those who reported greater closeness to the suicide decedent were also more likely to report a lifetime history of suicidal ideation ($B=.229$, $SE=.052$, $p < .001$), suicide plans ($B=.215$, $SE=.048$, $p < .001$), and suicide attempts ($B=.183$, $SE=.052$, $p < .001$), but not NSSI ($B=.094$, $SE=.052$, $p=.071$). Findings are presented in Tables 4 and 5.

3.4. Impact of suicide death and lifetime suicidal behaviors/current suicidal symptoms

Individuals reporting a greater negative impact of a suicide death on their lives also reported more severe DSI-SS current suicidal ideation ($\beta=.174$, $t[925]=5.389$, $p < .001$, partial $r^2=.030$), SBQ-R likelihood of a future attempt ($\beta=.233$, $t[926]=7.290$, $p < .001$, partial $r^2=.054$), and INQ thwarted belongingness ($\beta=-.078$, $t[684]=-2.044$, $p=.041$, partial $r^2=.006$). Logistic regression analyses indicated that

Table 4

Univariate linear regression with closeness to suicide decedent and impact of suicide death predicting self-report symptom measure severity.

	R^2	β	t	p	partial r^2
DSI-SS Suicidal Ideation					
Closeness to Suicide Decedent	.012	.110	3.361	.001	.012
Impact of Suicide Death	.030	.174	5.389	< .001	.030
SBQ-R Future Likelihood of a Suicide Attempt					
Closeness to Suicide Decedent	.037	.191	5.934	< .001	.036
Impact of Suicide Death	.054	.233	7.290	< .001	.054
INQ Thwarted Belongingness					
Closeness to Suicide Decedent	.007	-.085	-2.242	.025	.007
Impact of Suicide Death	.006	-.078	-2.044	.041	.006

Note. DSI-SS=Depressive Symptom Inventory–Suicidality Subscale; SBQ-R=Suicidal Behaviors Questionnaire-Revised; INQ=Interpersonal Needs Questionnaire.

Table 5

Logistic regression with closeness to suicide decedent and impact of suicide death predicting lifetime suicidal behavior type.

	B	SE	Wald	p
Lifetime Suicidal Ideation				
Closeness to Suicide Decedent	.229	.052	19.535	< .001
Impact of Suicide Death	.439	.059	55.105	< .001
Lifetime Suicide Plan				
Closeness to Suicide Decedent	.215	.048	19.866	< .001
Impact of Suicide Death	.363	.052	49.369	< .001
Lifetime Suicide Attempt				
Closeness to Suicide Decedent	.183	.052	12.153	< .001
Impact of Suicide Death	.243	.053	21.281	< .001
Lifetime Non-Suicidal Self-Injury				
Closeness to Suicide Decedent	.094	.052	3.265	.071
Impact of Suicide Death	.142	.052	7.390	.007

greater negative impact of a suicide death was also associated with a greater likelihood of reporting a lifetime history of suicidal ideation ($B=.439$, $SE=.059$, $p<.001$), suicide plans ($B=.363$, $SE=.052$, $p<.001$), suicide attempts ($B=.243$, $SE=.053$, $p<.001$), and NSSI ($B=.142$, $SE=.052$, $p=.007$). Results are presented in Tables 4, 5.

3.5. Predictors of current suicidal ideation severity and likelihood of a future suicide attempt

Findings from hierarchical multiple linear regression analyses are presented in Table 6. Greater self-reported closeness to the suicide decedent was associated with less severe DSI-SS current suicidal ideation ($\beta=-.079$, $t[636]=-2.050$, $p=.041$, partial $r^2=.002$), controlling for lifetime suicide ideation, plans, and attempts; SBQ-R likelihood of a future suicide attempt; INQ thwarted belongingness; and suicide death impact. The overall model including all variables was also significant ($F[8,636]=55.336$, $p<.001$), accounting for 41.0% of the variance in DSI-SS current suicidal ideation scores; however, the change in R^2 values between Steps 2 and 3 was not significant ($F[2,636]=2.201$, $p=.112$). Greater self-reported closeness to the suicide decedent was also associated with reporting a greater likelihood of making a future suicide attempt ($\beta=.095$, $t[636]=2.550$, $p=.011$, partial $r^2=.010$), controlling for lifetime suicide ideation, plans, and attempts; DSI-SS current suicidal ideation; INQ thwarted belongingness; and suicide death impact. Again, the overall model including all variables was significant ($F[8,636]=64.716$, $p<.001$), accounting for 44.9% of the variance in SBQ-R Item 4 scores; however for these analyses, the change in R^2 values between Steps 2 and 3 was significant

($F[2,636]=5.016$, $p=.007$).

Additionally, when these analyses were conducted excluding individuals who reported knowing a family member who died by suicide, the pattern of findings remained the same. This indicates that the impact of suicide bereavement on one's suicidal symptoms that was found in the present study was likely not merely a manifestation of genetic transmission (e.g., see Brent and Mann [2005], Brent and Melhem [2008], Brent et al. [2004]).

3.6. Exploratory analyses with demographic variables

The patterns of findings described above remained the same after accounting for the effects of age, sex, and marital status. Follow-up chi-square tests revealed that, of those exposed to suicide, females were significantly more likely than males to report a lifetime history of NSSI (37.8% of females, 27.1% of males; $\chi^2=8.433$, $p=.003$), but not suicide ideation, plans, or attempts. Follow-up one-way ANOVAs did not reveal sex differences in severity of self-reported current suicidal symptoms among those exposed to suicide ($ps>.05$). Finally, moderation analyses did not indicate that sex was a significant moderator of the relationships between (1) closeness to a suicide decedent and current suicidal symptoms ($ps>.05$); or (2) impact of suicide death and current suicidal symptoms ($ps>.05$).

4. Discussion

This study aimed to describe the prevalence of exposure to suicide, as well as the associations between suicide exposure and indices of suicide risk, among a large sample of military service members and veterans. Findings revealed that the majority of military service members and veterans (57.3%) had been exposed to suicide. In turn, being exposed to suicide, greater closeness to a suicide decedent, and greater perceived negative impact of the suicide death on one's life were each significantly associated with elevated rates of lifetime suicidal thoughts and behaviors, rates of lifetime NSSI (with rates higher among females), current suicidal symptoms, and self-reported likelihood of a future suicide attempt. Notably, these findings remained even after controlling for sex, age, and marital status, which strengthens our confidence in the generalizability of our findings. Most strikingly, greater closeness to a suicide decedent was significantly associated with greater self-reported likelihood of a future suicide attempt, even when controlling for other suicide risk factors. These findings have numerous implications for research, clinical work, and military mental health, each of which will be detailed below.

First, the results of this study extend a growing body of literature documenting the ways in which the tragedy of suicide afflicts not only the suicide decedent but also the bereaved (for reviews, see Cerel et al. [2008], Pitman et al. [2014]). Our pattern of findings was consistent with the aforementioned study of military veterans (Cerel et al., 2015). In this study, they found a similar rate of exposure to suicide as well as significant associations between prior suicide exposure and current suicidal ideation among their participants. Together, our study and theirs begin to paint a picture of the potentially troubling effects of suicide bereavement among military populations—specifically, that loss of a loved one, friend, and/or peer to suicide may increase one's own risk for suicide. Important to note, the mean age of participants in the Cerel et al. (2014) study was markedly higher than that of the present study sample (61.6 ± 15.42 years and 33.44 ± 13.38 years, respectively). It is likely, then, that rates of exposure to suicide may effectively be significantly higher in this sample than in the Cerel et al. (2014) study when accounting for the longer time frame in which exposure to suicide may have occurred. This is not surprising given the increasing rates of suicide observed in the military in recent years (Kuehn, 2009) and, again, emphasizes the critical need to better understand the impact of suicide bereavement on military service members and veterans. The finding that exposure to suicide was associated with

Table 6

Multiple hierarchical linear regression examining predictors of current suicidal ideation severity and likelihood of a future suicide attempt.

	R^2	p (F -Change)	β	t	p	partial r^2
Dependent Variable: DSI-SS Current Suicidal Ideation Severity						
Step 1:	.193	–				
Lifetime Suicidal Ideation			.130	2.951	.003	.013
Lifetime Suicide Plan			.290	6.026	< .001	.054
Lifetime Suicide Attempt			.080	1.924	.055	.006
Lifetime Non-Suicidal Self-Injury			.052	1.415	.158	.003
Step 2:	.406	< .001				
Lifetime Suicidal Ideation			.038	.992	.322	.002
Lifetime Suicide Plan			.149	3.514	< .001	.019
Lifetime Suicide Attempt			.033	.913	.361	.001
Lifetime Non-Suicidal Self-Injury			–.012	–.370	.711	< .001
SBQ-R Future Suicide Attempt			.485	13.473	< .001	.365
INQ Thwarted Belongingness			–.100	–3.018	.003	.104
Step 3:	.410	.112				
Lifetime Suicidal Ideation			.038	1.001	.317	.002
Lifetime Suicide Plan			.149	3.522	< .001	.019
Lifetime Suicide Attempt			.035	.968	.333	.001
Lifetime Non-Suicidal Self-Injury			–.012	–.388	.698	< .001
SBQ-R Future Suicide Attempt			.491	13.606	< .001	.226
INQ Thwarted Belongingness			–.101	–3.066	.002	.015
Closeness to Suicide Decedent			–.079	–2.050	.041	.002
Impact of Suicide Death			.034	.880	.379	.006
Dependent Variable: SBQ-R Future Likelihood of a Suicide Attempt						
Step 1:	.223	–				
Lifetime Suicidal Ideation			.160	3.710	< .001	.021
Lifetime Suicide Plan			.266	5.622	< .001	.047
Lifetime Suicide Attempt			.088	2.165	.031	.007
Lifetime Non-Suicidal Self-Injury			.122	3.396	.001	.018
Step 2:	.440	< .001				
Lifetime Suicidal Ideation			.079	2.140	.033	.132
Lifetime Suicide Plan			.114	2.763	.006	.180
Lifetime Suicide Attempt			.045	1.296	.196	.085
Lifetime Non-Suicidal Self-Injury			.092	2.994	.003	.048
DSI-SS Suicidal Ideation			.457	13.473	< .001	.222
INQ Thwarted Belongingness			–.149	–4.687	< .001	.033
Step 3:	.449	.007				
Lifetime Suicidal Ideation			.076	2.052	.041	.132
Lifetime Suicide Plan			.109	2.656	.008	.180
Lifetime Suicide Attempt			.042	1.210	.227	.085
Lifetime Non-Suicidal Self-Injury			.091	2.992	.003	.048
DSI-SS Suicidal Ideation			.459	13.606	< .001	.365
INQ Thwarted Belongingness			–.143	–4.517	< .001	.129
Closeness to Suicide Decedent			.095	2.550	.011	.010
Impact of Suicide Death			–.002	–.056	.955	< .001

Note. DSI-SS=Depressive Symptom Inventory–Suicidality Subscale; SBQ-R=Suicide Behaviors Questionnaire-Revised; INQ=Interpersonal Needs Questionnaire.

higher lifetime rates of NSSI among females than males especially warrants further investigation given that rates of NSSI in the general population are not associated with sex (Klonsky, 2011) and that little is known about NSSI among service members and veterans.

Second, although closeness to a suicide decedent was both positively associated with current suicidal ideation and self-reported likelihood of a future attempt in univariate analyses, after controlling for the effects of lifetime suicidal thoughts and behaviors and other suicidal symptoms, the direction of the association between closeness and current suicidal ideation was reversed. That is, closeness to a suicide decedent was still positively associated with self-reported likelihood of a future attempt but now was negatively associated with current suicidal ideation. What might account for this seeming paradox? For one, it is important to highlight that differential pathways likely account for the emergence of suicidal ideation and suicide attempts (Klonsky and May, 2014). Moreover, it is plausible that current suicidal ideation, which itself is a symptom of major depressive disorder (American Psychiatric Association, 2013) and may not signal an actual threat to life (i.e., often, although not always, in the case of passive suicide ideation), is a more fluid construct than future likelihood of a suicide attempt. This finding is additionally consistent with prior research revealing differential relationships between closeness to

a suicide decedent and subsequent risk of suicidal ideation and suicide attempts (Brent et al., 1993a,b). Finally, these individuals may view suicide as more acceptable or possible now that someone close to them has died by suicide, and therefore, may be more likely envision themselves dying by suicide—a point that will be discussed below.

Third, in understanding the effects that suicide has on the bereaved, whether the suicide decedent was a family member, friend, co-worker, or roommate, there are several factors that may serve as potential mechanistic explanations, either independently or in conjunction with one another. Potential mechanistic links include suicide contagion (Cox et al., 2012; Joiner, 1999); genetic effects whereby psychiatric disorders are pre-morbidly transmitted from decedent to offspring (Brent and Mann, 2005; Brent et al., 2004); assortative relating, whereby individuals with risk factors for suicide are prone to comingle (Joiner, 2003); maladaptive bereavement responses (American Psychiatric Association, 2013); and/or more permissible attitudes about suicide (Renberg and Jacobsson, 2003). Past research among adolescents exposed to a peer's suicide also suggests that the negative impact of exposure to suicide may be especially potent among those with a prior history of stressful life events (Swanson and Colman, 2013) and feelings of accountability for the suicide death (Bridge et al., 2003). The current study is not positioned to definitively claim that one or

more of these processes are at play among military service members and veterans, though research and future work in this domain would benefit from investigation of these processes.

Regardless of the mode of transmission, that military service members and veterans bereaved by suicide may subsequently be at elevated risk for suicidal thoughts and behaviors warrants empirical and clinical attention. In the same way that treatment engagement and connection to mental health services are critical among suicidal individuals (Hom et al., 2015), it is important to ensure that service members and veterans bereaved by suicide also receive high-quality, evidence-based care. Indeed, spouses and first-degree relatives bereaved by suicide have been found to have a greater perceived need for professional help than those who have lost a spouse or first-degree relative to another cause of death (de Groot et al., 2006). Individuals bereaved by suicide may also experience a more complicated presentation of grief than individuals bereaved by natural causes of death (e.g., physical illness; Barrett and Scott, 1990; de Groot et al., 2006; Rings et al., 2014).

To address this need for mental health services, past research suggests that support groups for service members and veterans bereaved by suicide may be particularly helpful, in part because they are both cost-effective and highly disseminable (Barlow et al., 2010; Cerel et al., 2009; see also Schneider et al., 2011). However, prior to dissemination among military populations, further work is needed to empirically test the efficacy of these interventions utilizing a randomized controlled trial design. Whether the clinical modality is treatment or assessment, it is additionally important to consider that an individual bereaved by suicide may have more negative views towards mental health treatment (Ward-Ciesielski et al., 2015). In this regard, it may be useful to empathize and emphasize that the health care system did indeed fail; however, it is the clinician's goal to ensure suicide—including among those bereaved by suicide—does not occur moving forward (cf., Zero Suicide [<http://zerosuicide.sprc.org>]).

Lastly, it is also noteworthy that empirically-informed suicide risk assessment and management frameworks often include questions probing if the patient has experienced the death by suicide of a family member (Chu et al., 2015). This question is likely included in standardized frameworks to account for genetically transmitted risk for suicide (e.g., see Brent and Mann [2005], Brent and Melhem [2008], Brent et al. [2004]), and the patient's answer to this question typically does not yield actionable steps to the same degree as, for instance, current plans or preparations for a suicide attempt. Despite this, our study's findings suggest that a simple additional probe inquiring whether an individual has been close to anyone who died by suicide (i.e., not only a genetic relative) may aid in risk detection and have clinical utility.

4.1. Limitations and future directions

To our knowledge, this study is among the first to examine the psychological impact of suicide exposure among military service members and veterans; however, its limitations must also be noted. First, its use of cross-sectional data limited our ability to investigate the temporal relationship between participants' exposure to suicide and their own suicidal thoughts and behaviors. Similarly, data were not available on when reported suicide deaths had occurred; thus, we were unable to control for "time since event" in analyses or to determine time effects. Consequently, prospective studies will be critical in delineating the relationship between these experiences. Second, future studies may benefit from utilization of structured response options rather than open-ended responses when probing participants' relationship to a suicide decedent. Third, it remains unknown whether respondents had been directly exposed to the suicide death itself (e.g., finding the deceased's body). Fourth, given the relatively low mean scores for self-reported likelihood of a future attempt, it is recommended that these findings be interpreted with caution. Further

investigation is warranted to replicate these results. Fifth, data were pooled across a variety of studies (e.g., community samples, treatment trials), these studies selected for specific populations (e.g., veterans at elevated suicide risk), and representative sampling strategies were not utilized, limiting the generalizability of findings. However, as noted above, that our pattern of findings remained after controlling for demographic characteristics strengthens our confidence in our results. Finally, data were not available regarding key military metrics, including whether individuals were current military service members or veterans, years of service, time since separation (for veterans), and deployment history and status. These variables may serve as important moderators of the relationship between exposure to suicide and service members' and veterans' future suicide risk. Investigation of whether methods, too, are contagious—a point consistent with familiarity with means posited by the capability construct of the interpersonal theory of suicide—may also be informative (Joiner, 2005; Van Orden et al., 2010).

Despite the clear need for research investigating suicide bereavement among military service members and veterans, in addition to general population samples, this work is not without its challenges. Challenges include potential difficulties interfacing with institutional review boards (Hom et al., 2016; Moore et al., 2013) and inexcusable misperceptions that issues surrounding suicide bereavement (cf., postvention) are intended strictly for the clinical, rather than empirical, domain (Moore et al., 2013). By delineating the underlying mechanisms that account for the relationship between suicide bereavement and psychiatric symptoms, we may then be able to enhance our identification of potentially lifesaving treatment targets.

5. Conclusions

Converging evidence across multiple populations suggests that exposure to suicide may have a significant impact on individuals' own psychological functioning, including increased risk for suicidal thoughts and behaviors. The current study extended this line of research by examining the impact of suicide exposure on military personnel and veterans, specifically. These preliminary findings suggest that service members who report being bereaved by suicide are themselves at increased suicide risk. This appears to be especially true among those reporting greater closeness to the suicide decedent, with effects observed even when controlling for current suicidal symptoms and prior suicidal thoughts and behaviors. As research and clinical work remains deservedly focused on finding ways to prevent suicide deaths, complementary efforts are needed to better understand the experiences of those left in their wake. This may dramatically enhance both upstream suicide prevention efforts as well as suicide-specific interventions.

Acknowledgements

This work was supported, in part, by grants awarded to Florida State University (W81XWH-10-2-0181) and the Rocky Mountain Mental Illness Research, Education and Clinical Center (W81XWH-10-2-0178) by the Department of Defense. The Department of Defense had no further role in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication. The content of this paper is solely the responsibility of the authors and the views and opinions expressed do not necessarily represent those of the Military Suicide Research Consortium, Department of Defense, or the United States Government.

The authors would like to thank the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs, for being the funding source of the provided data and to express their gratitude to the following principal investigators (PIs) for providing data used in this submission: Dr. Michael D. Anestis, PI of the study "Predicting Suicide Risk in a

Military Population”; Dr. Sean M. Barnes, PI of the study “Behaviorally Assessing Suicide Risk”; Dr. Rebecca A. Bernert, PI of the study “Behavioral Sleep Intervention for the Prevention of Suicidal Behaviors in Military Veterans”; Dr. Nigel E. Bush, PI of the studies “Usability and Utility of a Virtual Hope Box (VHB) for Reducing Suicidal Ideation” and “Effectiveness of VHB Smartphone App in Enhancing Veterans’ Coping with Suicidal Ideation”; Dr. Katherine A. Comtois, PI of the study “Continuity Contacts via Text Message: Testing a Brief Intervention to Prevent Suicidal Ideation and Behavior”; Drs. Peter M. Gutierrez and Thomas E. Joiner, PIs of the study “Toward a Gold Standard for Suicide Risk Assessment for Military Personnel”; Dr. Lori Johnson, PI of the study, “Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans”; Dr. Matthew K. Nock, PI of the study “Looking for Cognitive Differences in Suicidal Veterans”; Dr. Gina M. Signoracci, PI of the study “Assessment of Cognitive Functioning as It Relates to Risk for Suicide in Veterans with HIV/AIDS”; and Drs. Deborah A. Yurgelun-Todd and Perry F. Renshaw, PIs of the study “Neuroimaging Correlates of Suicide.” This data is the property of the stated PIs and cannot be used without prior written approval.

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Psychological Assessment

Initial Validation of Brief Measures of Suicide Risk Factors: Common Data Elements Used by the Military Suicide Research Consortium

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Online First Publication, November 13, 2017. <http://dx.doi.org/10.1037/pas0000519>

CITATION

Ringer, F. B., Soberay, K. A., Rogers, M. L., Hagan, C. R., Chu, C., Schneider, M., Podlogar, M. C., Witte, T., Holm-Denoma, J., Plant, E. A., Gutierrez, P. M., & Joiner, T. E. (2017, November 13). Initial Validation of Brief Measures of Suicide Risk Factors: Common Data Elements Used by the Military Suicide Research Consortium. *Psychological Assessment*. Advance online publication. <http://dx.doi.org/10.1037/pas0000519>

Initial Validation of Brief Measures of Suicide Risk Factors: Common Data Elements Used by the Military Suicide Research Consortium

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The Military Suicide Research Consortium (MSRC) developed a 57-item questionnaire assessing suicide risk factors, referred to as the Common Data Elements (CDEs), in order to facilitate data sharing and improve collaboration across independent studies. All studies funded by MSRC are required to include the CDEs in their assessment protocol. The CDEs include shortened measures of the following: current and past suicide risk, lethality and intent of past suicide attempts, hopelessness, thwarted belongingness, anxiety sensitivity, posttraumatic stress disorder symptoms, traumatic brain injury, insomnia, and alcohol

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This research was supported in part by a grant from the Military Suicide Research Consortium, an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs under Award W81XWH-10-2-0181 and W81XWH-10-2-0178. This research was also supported, in part, by a grant from the National Institute of Mental Health (T32 MH093311-04). Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the Military Suicide Research Consortium, the Department of Defense, or the National Institute of Mental Health. We thank the following principal investigators (PIs) who provided the data presented in this article: Michael D. Anestis, PI of the study "Identifying Factors Associated with Future Suicidal Self-Directed Violence within a Sample of Mississippi National Guard Personnel"; Courtney Bagge and Ken Conner, PIs of the study "Warning Signs for

Suicide Attempts"; Sean M. Barnes, PI of the study "Behaviorally Assessing Suicide Risk"; Rebecca A. Bernert, PI of the study "A Behavioral Sleep Intervention for the Prevention of Suicidal Behaviors in Military Veterans"; Nigel E. Bush, PI of the studies "Usability and Utility of a Virtual Hope Box (VHB) for Reducing Suicidal Ideation" and "Effectiveness of VHB Smartphone App in Enhancing Veteran's Coping with Suicidal Ideation"; Julie Cerel, PI of the study "Suicide Bereavement in Military and their Families"; Katherine A. Comtois, PI of the study "Military Continuity Project (MCP): A Suicide Prevention Study"; Jesse Cogle, PI of the study "Controlled Evaluation of a Computerized Anger-Reduction Treatment for Suicide Prevention"; Collin Davidson, PI of the study "Longitudinal Assessment of Physical Activity and Suicide Risk"; Peter M. Gutierrez and Thomas E. Joiner, PIs of the study "Toward a Gold Standard for Suicide Risk Assessment for Military Personnel"; Lori Johnson, PI of the study, "Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans"; Matthew K. Nock, PI of the study "New Approaches to the Measurement and Modification of Suicide-Related Cognition"; Brad Schmidt, PI of the study "Development and Evaluation of a Brief, Suicide Prevention Intervention Reducing Anxiety Sensitivity"; Gina M. Signoracci, PI of the study "Assessment of Cognitive Functioning as It Relates to Risk for Suicide in Veterans with HIV/AIDS"; and Deborah A. Yurgelun-Todd and Perry Renshaw, PIs of the study "Neuroimaging Correlates of Suicide."

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abuse. This study aimed to evaluate the psychometric properties of the CDE items drawn from empirically validated measures. Exploratory factor analysis was used to examine the overall structure of the CDE items, and confirmatory factor analyses were used to evaluate the distinct properties of each scale. Internal consistencies of the CDE scales and correlations with full measures were also examined. Merged data from 3,140 participants (81.0% military service members, 75.6% male) across 19 MSRC-funded studies were used in analyses. Results indicated that all measures exhibited adequate internal consistency, and all CDE shortened measures were significantly correlated with the corresponding full measures with moderate to strong effect sizes. Factor analyses indicated that the shortened CDE measures performed well in comparison with the full measures. Overall, our findings suggest that the CDEs are not only brief but also provide psychometrically valid scores when assessing suicide risk and related factors that may be used in future research.

Public Significance Statement

The current study supports the use of CDEs as brief measures of suicide risk and a comprehensive range of risk factors of suicide in research settings among military populations. The CDEs facilitate collaboration among researchers and dissemination of research findings, aiding suicide prevention efforts.

Keywords: military, risk assessment, suicidal ideation, suicidal behavior, suicide

Supplemental materials: <http://dx.doi.org/10.1037/pas0000519.supp>

Suicide prevention is a worldwide public health priority that warrants considerable research and intervention (World Health Organization, 2015). According to the Centers for Disease Control and Prevention (2013), suicide was ranked as the tenth leading cause of death across all age groups in the United States. Historically, the suicide rate among active duty military service members has been lower than that among civilians matched demographically for age and sex (Nock et al., 2013). However, the current national rate for suicide was 12.6 per 100,000 in 2013 (Centers for Disease Control and Prevention, 2013). In comparison, the suicide rate for all active components of the military was 18.7 per 100,000 service members in 2013, and 26.2 per 100,000 for Reserve and National Guard members in 2013 (Smolenski et al., 2015). As the suicide rates among military populations have risen recently and appear to be higher than civilian rates, it is imperative to evaluate factors that may confer increased risk among this population.

Previous research has shown that there are unique stressors for active duty military service members, Reserve and National Guard members, and veterans compared with civilian populations. Specifically, military culture includes distinct values, traditions, hierarchy, codes of conduct, and concerns about confidentiality that differ from civilian culture (Anestis & Green, 2015; Coll, Weiss, & Yarvis, 2011; Dennesson et al., 2015; Pease, Billera, & Gerard, 2016). As such, it is vital to accurately assess not only suicidal ideation in this population but also suicidal behavior, defined as engagement in a behavior motivated by at least some intent to die. Importantly, assessing suicidality, or an individual's risk for suicide, which encompasses suicidal ideation, suicidal behavior, and other relevant risk factors, requires specific knowledge of how various risk factors may operate to increase this risk.

From a theoretical perspective, many risk factors may be contextualized within Joiner's (2005) interpersonal theory of suicide (see also Joiner, Hom, Hagan, & Silva, 2016; Van Orden et al., 2010). This theory states that suicidal desire comprises both thwarted belongingness and perceived burdensomeness (i.e., a

feeling of being a liability to others). Similarly, a third component, known as "capability for suicide," refers to an individual's ability to engage in lethal or near-lethal suicidal behavior and includes the individual's familiarity and comfort with means as well as the ability to withstand the physiological and psychological discomfort associated with a suicide attempt. It is posited that an individual is at risk for a lethal or near-lethal suicide attempt if the individual has both high levels of suicidal desire and acquired capability (Joiner, 2005). Some of the previously mentioned risk factors have established associations with aspects of the interpersonal theory of suicide, in which the risk factor has been shown to be associated with either thwarted belongingness, perceived burdensomeness, or capability. One example of this association is the relationship between insomnia, thwarted belongingness, and suicidal ideation. It has been demonstrated that thwarted belongingness accounts for the relationship between severity of insomnia symptoms and increased suicidal ideation (Chu et al., 2016).

A broad range of risk factors may be associated with significantly higher suicide risk. Studies have indicated that one of the most salient predictors for death by suicide across demographics was prior history of suicidal behavior (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Joiner et al., 2005; Ribeiro et al., 2016; Villatte et al., 2015). Other risk factors include symptoms of insomnia, which are associated with suicidal ideation and attempts (Pigeon, Pinquart, & Conner, 2012; Ribeiro, Pease, et al., 2012) and higher levels of hopelessness (A. T. Beck, Steer, Kovacs, & Garrison, 1985; Holma et al., 2010). In addition to factors that confer increased risk for suicide in the general population, military populations may also exhibit unique vulnerabilities, which heighten suicide risk. Psychiatric diagnoses such as depression, anxiety, and substance use are significantly associated with higher risk of suicide among service members (LeardMann et al., 2013). Similarly, posttraumatic stress disorder (PTSD) has been associated with death by suicide and with higher levels of suicidal thoughts and behaviors among veterans (Ramchand, Rudavsky, Grant, Ta-

nielian, & Jaycox, 2015). Thwarted belongingness, a component of suicidal desire according to the interpersonal theory of suicide, involves a lack of interpersonal connections with others. This construct has been identified as a significant risk factor (Joiner, 2005; Van Orden et al., 2010) and found to predict suicidal thoughts and behaviors among service members (Anestis, Khazem, Mohn, & Green, 2015). Moreover, physical conditions, such as traumatic brain injury (TBI), are related to increased risk of death by suicide among veterans (Brenner, Ignacio, & Blow, 2011). These psychological and physical conditions are important suicide-related risk factors, as they may aid in better understanding an individual's risk for suicide, and they may each be targeted for intervention.

One of the biggest challenges to understanding the complexities of suicide is data quality (World Health Organization, 2015), as variation in data collection across research efforts, particularly the use of related but distinct measures, results in various obstacles. According to Villatte and colleagues (2015), thousands of studies have attempted to characterize specific suicide risk and protective factors in an effort to improve prevention and intervention efforts. However, research supports the importance of implementing the same measures across studies to allow for collaborative comparisons, secondary data analyses, and meta-analyses (Maas et al., 2010, 2011). In response to these obstacles, the Military Suicide Research Consortium (MSRC) was established to enhance the military's ability to quickly identify and to provide effective interventions to service members in need (MSRC, 2016). The MSRC's goals include creating standards across studies; improving data quality; reducing the burden on investigators and participants through the use of empirically validated, brief measures; and, ultimately, accelerating dissemination and implementation of research findings to impact change. The MSRC developed a standard set of questions to be used in all funded studies that assess a broad range of relevant factors, referred to as the Common Data Elements (CDEs). The CDEs are composed of full and shortened versions of validated measures assessing current and past suicidal ideation and planning, lethality and intent of past suicide attempts, hopelessness, thwarted belongingness, aspects of anxiety sensitivity, symptoms of PTSD related to military experiences, TBI, insomnia, and alcohol abuse.

As previously stated, the goals of the MSRC include improving data quality, creating standards across funded studies, and improving access to empirically validated and brief measures in hopes of facilitating the dissemination and implementation of findings. The objective of the current study was to empirically evaluate the psychometric properties and validity of the CDE items drawn from existing measures, in order to aid in the refinement of these shortened CDE scales and understanding of the performance of these scales in research and clinical settings. The items included in the CDEs target suicide risk factors; therefore, the current study sought to understand the interrelations between these risk factors and a range of suicide-related behaviors, by examining the utility of the CDEs drawn from existing measures in assessing these constructs. We also sought to compare and contrast the performance of the shortened CDE scales with the full measures in the context of closely related constructs.

Specifically, we conducted an exploratory factor analysis (EFA) to examine the structure of the items making up the CDEs drawn from existing scales and to evaluate how items from different

scales assessing similar constructs are associated. Additionally, this EFA was conducted to establish divergent validity among constructs closely associated with suicide risk. Next, we conducted confirmatory factor analyses (CFAs) in which a specific shortened CDE measure of interest was referenced to two other constructs, namely, suicidality and TBI. These models using a particular abbreviated CDE measure of interest were compared with models including the full-measure version when data were available for this comparison. This analytic strategy allowed us to compare how the abbreviated measures performed compared with full measures within the same factorial space. Finally, we examined the psychometric properties of each shortened measure of the CDE and the magnitude of the correlation between each shortened measure and its corresponding full measure. Specifically, we predicted that the shortened CDE measures would be strongly correlated with the corresponding full-measure versions and would exhibit acceptable reliability. We also predicted that the shortened CDE measures would exhibit comparable model fit similar to the full-measure versions. In brief, the primary objective of the current study was to scrutinize the psychometrics and validity of the MSRC CDEs.

Method

Procedure and Participants

The MSRC CDEs were designed with the goal of broadly assessing suicide-related behavior and established suicide risk factors—constructs that have been consistently and empirically linked to suicide-related behaviors. The items making up the MSRC CDEs were selected and developed by the directors of the MSRC in consultation with MSRC's senior advisors and experts from the field of suicide research. The CDEs are composed of 57 items assessing key suicide-relevant constructs, and include items that were created specifically for the MSRC CDE (10 items) and those drawn from existing, validated measures (47 items). The current study examined the 47 items drawn from previously validated measures. The 10 items excluded were not drawn from any existing scales, and many (e.g., a qualitative description of a previous suicide attempt) were not amenable to the current data-analytic approach. Permission to select individual items from existing measures was obtained from the copyright holders of all full measures, and permission to use existing aggregated data was obtained from contributing study principal investigators.

The MSRC CDE measure was included in all 26 studies funded by the MSRC to date; however, at the time of this article's writing, data were only available for 19 studies (see Table 1 of the online supplemental materials for a summary of studies used in this article). Administration of the CDE items varied by study site and included administration of the items over the phone, in person, or online. Likewise, sample characteristics varied by site, and studies targeted the following populations for recruitment: veterans and active duty service members, suicide survivors, veteran inpatients, and civilians. For studies with longitudinal designs, baseline CDE data were used. Abbreviated forms of full measures were developed by the MSRC directors, using two main heuristics—namely, factor loading in past research and content coverage. Items were selected that, in past research, displayed high factor loadings on the overall construct in question, with consideration to covering the full content of the overall construct. Some individual studies

also included the full versions of the abbreviated CDE scales, which allowed for comparisons between both versions. Approval was acquired for all study protocols by each site's institutional review board and the United States Army Medical Research and Materiel Command Human Research Protection Office. Protocols varied across research studies, but administration time for the CDE was approximately 20 min.

As shown in Table 1, this sample was primarily male, non-Hispanic, and White/Caucasian. It should be noted that the majority of participants were currently or had previously served in the military; however, some participants had no history of military service. In this sample, 53.9% ($n = 1,698$) reported currently serving in the military, 34.4% ($n = 1,084$) reported previously serving in the military, and 11.7% ($n = 368$) reported never serving in the military. In this sample, 53.9% ($n = 1,698$) reported currently serving in the military, 34.4% ($n = 1,084$) reported previously serving in the military, and 11.7% ($n = 368$) reported never serving in the military. Based on the data available regarding military branch of individuals currently serving in the military ($n = 1,696$), the most commonly reported was the Army National Guard ($n = 792$; 43.9%). Based

on available data among veterans ($n = 906$), the most common reported was Active Duty Army ($n = 411$; 37.5%). Because there was no common demographics form across studies, the demographic data were aggregated, and new variables were created in order to accurately present demographic and military history variables. As a result, some demographic and military history variables have a large amount of missing data, but information on these variables is reported when known. Also of note, several studies included in this article collected data from civilian participants who were recruited for various reasons depending on the objective of the individual study (e.g., family members of veterans were recruited for a primary study examining bereavement).

Measures

Alcohol Use Disorders Identification Test (AUDIT; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). The AUDIT is a brief, 10-item screening measure for risky drinking and alcohol abuse and dependence (alcohol misuse). This measure was initially described as a screen for risky drinking or alcohol use disorders in male Veterans Affairs (VA) patients; however, it has since been validated in non-VA primary care settings and United States general population samples. Higher scores on the AUDIT reflect less safe drinking habits. Alcohol use disorders have been associated with increased risk for death by suicide across several studies (Schneider, 2009). The AUDIT has previously demonstrated overall good reliability and appears to be a valid measure of alcohol use problems (de Meneses-Gaya, Zuairi, Loureiro, & Crippa, 2009). Three items measuring alcohol consumption were included in the CDE and exhibited good internal consistency in our sample (Cronbach's $\alpha = .86$).

Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). The ASI-3 is an 18-item measure of concerns regarding symptoms of anxiety (i.e., anxiety about having anxiety). Three domains of concerns are assessed, including physical (six items), cognitive (six items), and social concerns (six items). Items are rated on a 5-point Likert scale ranging from 0 (*very little*) to 4 (*very much*), with subscale scores ranging from 0 to 24 and total scores ranging from 0 to 72. The ASI-3 has been shown to be adequately reliable across the three subscales, and has demonstrated adequate convergent, divergent, and criterion validity (Taylor et al., 2007). Five items from the cognitive concerns subscale were included in the CDEs, as previous research has indicated that this subscale is significantly associated with elevated suicide risk (Oglesby, Capron, Raines, & Schmidt, 2015). Internal consistency in our sample was excellent for this subscale (Cronbach's $\alpha = .90$).

Beck Scale for Suicidal Ideation (BSS; A. T. Beck & Steer, 1991). The BSS is a 21-item scale that assesses severity of suicidal ideation within the previous week. Total scores, which comprise the first 19 items (scored 0 to 2), range from 0 (i.e., no suicidal ideation) to 38. The last two items refer to past attempts and do not contribute to the overall score. High levels of internal consistency (Cronbach's $\alpha = .93$) and concurrent validity have been reported with the Beck Depression Inventory (A. T. Beck, Steer, & Ranieri, 1988). Two items, assessing wish to live and wish to die, were included in the CDEs; internal consistency was good in our sample (Cronbach's $\alpha = .80$).

Table 1
Demographic Information

Variable	N (%)
Sex ($n = 3,086$)	
Male	2,330 (75.5%)
Female	753 (24.4%)
Transgender	3 (.1%)
Undeclared	30
Race/ethnicity ($n = 3,035$)	
White/Caucasian	2,009 (66.2%)
Black/African American	598 (19.7%)
Native American/Native Alaskan	30 (1.0%)
Asian	67 (2.2%)
Pacific Islander	7 (.2%)
Multiracial	43 (1.4%)
Other	281 (9.3%)
Missing	81
Income ($n = 1,160$)	
\$0–\$10,000	145 (12.5%)
\$10,001–\$25,000	248 (21.4%)
\$25,001–\$50,000	412 (35.5%)
\$50,001–\$75,000	195 (16.8%)
\$75,001–\$100,000	96 (8.3%)
>\$100,000	64 (5.5%)
Undeclared	1956
Relationship status ($n = 2,871$)	
Married	882 (30.7%)
Single	1,311 (45.7%)
Cohabiting	16 (.6%)
Widowed	38 (1.3%)
Divorced/separated	617 (21.5%)
Other	7 (.2%)
Missing	245
Military service ($n = 3,060$)	
Currently serving	1,698 (53.9%)
Reported history of deployment ($n = 351$)	160 (45.6%)
Veteran	1,084 (34.4%)
Reported history of deployment ($n = 137$)	56 (40.9%)
No military service	368 (11.7%)
Missing	56

Note. Percentages were calculated based on data available.

Beck Hopelessness Scale (BHS; A. T. Beck & Steer, 1988).

The BHS is a 20-item, true-false, self-report scale that measures the level of negative expectations about the future held by respondents over the previous week. Scores range from 0 to 20 representing nil (0–3), mild (4–8), moderate (9–14), and severe (>14) levels of hopelessness. The scale has strong concurrent validity with clinical ratings of hopelessness ($r = .74$) and other measures of hopelessness ($r = .60$; A. T. Beck & Steer, 1988). Hopelessness confers increased risk for death by suicide (A. T. Beck, Brown, Berchick, Stewart, & Steer, 1990). The internal consistency for the three hopelessness items included in the CDEs in this sample fell into a range which is generally considered workable but nonoptimal (Cronbach's $\alpha = .69$).

Depressive Symptom Index—Suicidality Subscale (DSI-SS; Metalsky & Joiner, 1997). The DSI-SS is a four-item self-report measure designed to assess the frequency and intensity of suicidal ideation and impulses in the past 2 weeks. Items are rated on a 4-point Likert scale ranging from 0 to 3, with total scores ranging from 0 to 12 and higher scores reflecting greater severity of suicidal ideation. The DSI-SS has demonstrated strong psychometric properties (Joiner, Pfaff, & Acres, 2002; Ribeiro, Braithwaite, Pfaff, & Joiner, 2012). All items were included in the CDEs, and internal consistency was excellent in this sample (Cronbach's $\alpha = .91$). As the entire full measure was included in the CDE, this scale will be referred to as the DSI-SS throughout this article.

Insomnia Severity Index (ISI; Morin, 1993). The ISI is a seven-item measure that examines an individual's sleep difficulties and its effects on functioning. Symptoms of insomnia assessed include difficulty falling and staying asleep as well as waking up too early. In addition to assessing symptoms of insomnia, the scale also assesses satisfaction with sleep quality, distress over symptoms, and interference with daily functioning. Previous studies have indicated that the ISI exhibits good psychometric properties, including adequate internal consistency and concurrent validity. Furthermore, it appears to be sensitive to change over time and correlates with measures of insomnia (Bastien, Vallières, & Morin, 2001). Five items from the original scale were utilized in the CDE, and the internal consistency for the CDE version utilized in this sample was good (Cronbach's $\alpha = .87$).

Suicidal Behaviors Questionnaire—Revised (SBQ-R; Osman et al., 2001). The SBQ-R is a self-report measure of four constructs of suicidal behavior—lifetime ideation and attempt, recent frequency of ideation, suicide threats, and self-assessed likelihood of future suicidal behavior. The four items are rated on Likert scales of varying lengths, resulting in total scores between 3 and 18. It has been found to be valid and reliable across a range of clinical and nonclinical adolescent and adult samples. A cutoff score of 8 accurately discriminates between adult psychiatric inpatients with recent ideation or attempts and psychiatric controls (Osman et al., 2001). All four items were included in the CDEs; internal consistency was good in this sample (Cronbach's $\alpha = .84$). As the full scale was included in the CDE, this scale will be referred to as the SBQ-R throughout the article.

Suicide Intent Scale (SIS; A. T. Beck, Schuyler, & Herman, 1974). The SIS is a 15-item interviewer-administered instrument that assesses behavior before and during the most recent suicide attempt. Items 1 to 8 cover objective circumstances surrounding the attempt (e.g., preparation and execution of the attempt). Items

9 to 15 capture perceptions of potential lethality, expectations of rescue, purpose of the attempt, impulsivity, and reaction to the attempt. Each item is rated on a scale from 0 to 2, with the total score ranging from 0 to 30. A self-report version of this interview has been created and appears to be highly correlated with the original interview (Strosahl, Chiles, & Linehan, 1992). The SIS has high internal reliability (Cronbach's $\alpha = .95$; A. T. Beck et al., 1974), and high interrater reliability, ranging from .81 (Mieczkowski et al., 1993) to .95 (A. T. Beck et al., 1974). Support for the concurrent validity of this measure has also been established (R. W. Beck, Morris, & Beck, 1974). Four items were included in the CDEs and were administered in self-report format. The items included in the CDE were drawn from the subjective domains of suicidal intent and consisted of items assessing lethality of intent. Internal consistency was good in this sample (Cronbach's $\alpha = .89$).

Interpersonal Needs Questionnaire—Thwarted Belongingness subscale (INQ-TB; Van Orden, Cukrowicz, Witte, & Joiner, 2012). The INQ is a 15-item measure of two components of Joiner's (2005) interpersonal theory of suicide: Perceived Burdensomeness and Thwarted Belongingness. The Thwarted Belongingness subscale assesses the individual's perceived feelings of alienation from others. All statements are rated on a 7-point Likert scale from 1 (*not at all true for me*) to 7 (*very true for me*). Higher scores reflect a higher degree of thwarted belongingness (Van Orden et al., 2012). Van Orden, Witte, Gordon, Bender, and Joiner (2008) reported good estimates of internal consistency for the Thwarted Belongingness subscale (Cronbach's $\alpha = .85$). In addition, the INQ exhibits good concurrent, divergent, and criterion validity. Furthermore, thwarted belongingness is associated with increased odds of reporting current suicidal ideation and suicidal ideation at a 1-month follow-up (Van Orden et al., 2012). Five items assessing thwarted belongingness were included in the CDEs¹; internal consistency of the thwarted belongingness items was excellent in this sample (Cronbach's $\alpha = .90$).

Postratumatic Stress Disorder Checklist—Military Version (PCL-M; Weathers, Litz, Herman, Huska, & Keane, 1993). The PCL-M is a 17-item self-report measure of PTSD symptoms. Each of the 17 items corresponds to one of the 17 *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; American Psychiatric Association, 2000) PTSD symptom criteria. Respondents rate the degree to which they were "bothered" by the problem or symptom in the past month on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*extremely*). A total symptom severity score can be obtained by summing the scores from each of the 17 items and ranges from 17 to 85. Subscale scores representing each of the three PTSD symptom clusters (i.e., Reexperiencing, Avoidance, and Hyperarousal) can also be derived. Synthesis of the psychometric properties of the different versions of the PCL across a number of studies shows adequate total score internal consistency (Cronbach's $\alpha > .75$; Wilkins, Lang, & Norman, 2011). With respect to validity, the civilian version of the PCL demonstrated good convergence validity with the Clinician Administered PTSD Scale (CAPS), the gold standard in PTSD as-

¹ No items on perceived burdensomeness were included because, at the time of the development of the CDEs, no MSRC study was targeting the construct.

assessment ($r = 0.79$), and the Mississippi PTSD Scale ($r = 0.90$) in a sample of male Veterans with PTSD (Keen, Kutter, Niles, & Krinsley, 2008). PTSD is significantly associated with an elevated rate of death by suicide (Gradus et al., 2010). Eight questions were included in the CDEs on PTSD: four items on intrusions, two items on avoidance, and two items on hyperarousal. In this sample, the PCL-M was utilized, which focuses on symptoms associated with military experiences. The internal consistency of the eight item PCL-M was excellent (Cronbach's $\alpha = .94$).

The Traumatic Brain Injury-4 (TBI-4; Brenner et al., 2013).

The TBI-4 is a four-item screening tool that is included in the Eastern Colorado Health Care System (ECHCS) Mental Health Clinic (MHC) intake form. The four questions assess possible occurrences that may have led to TBI. Ongoing research is being conducted by the Rocky Mountain Mental Illness Research, Education, and Clinical Center (previously known as VISN 19 MI-RECC) to establish the concurrent validity of the TBI-4. Research examining veterans has shown that individuals who have experienced TBI are significantly more likely to die by suicide (Brenner et al., 2011). All four items were included in the CDEs, and internal consistency in this sample was good (Cronbach's $\alpha = .77$).

Data Analytic Strategy

Because of missing data on all CDE items, 122 cases were excluded. Before analyses were conducted, all shortened scales were examined for skewness and kurtosis, but neither were detected.² Pearson's r and Cronbach's α were computed for all shortened and full measures to examine convergent/discriminant validity and internal consistency, respectively. Correlations could not be examined between some full-scale measures, as the data were merged from multiple sites and not all sites administered all the full versions of the measures used in the study.

An EFA with a geomin rotation was conducted to examine the factor structure of all the items comprising the CDEs. Items that were developed specifically for the CDEs and were not drawn from a previously validated measure were not included in the factor analysis. The number of factors to retain was determined by examining model fit statistics including the chi-square test (χ^2), comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), residual variances, and eigenvalues. Previous recommendations for chi square have indicated that if a model exhibits good fit, this test should exhibit a low value and should not be significant; however, this test of model fit has been shown to have limitations when used in large samples (Hooper, Coughlan, & Mullen, 2008). As this study includes large samples sizes, we examined other fit indices in order to evaluate model fit, and followed the recommendations for cutoffs of greater than or equal to .95 for the CFI, .95 for TLI, and equal to or lower than .06 for the RMSEA (Hooper et al., 2008).

Finally, models were developed in which a specific shortened CDE measure of interest was referenced to two other constructs, namely, suicidality as assessed by the DSI-SS and TBI as assessed by the TBI-4. These two scales were selected as referents because the full measure of each was included in the CDE, they are well-characterized constructs, and they represented related but distinct constructs from one another and from those included in the CDEs. These models, including DSI-SS, TBI-4, and a particular

abbreviated CDE measure of interest, were compared with models including the DSI-SS, TBI-4, and the full version of the CDE measure of interest. This analytic strategy allowed us to compare how abbreviated measures performed, compared with full measures, within the same factorial space. CDE subscales were compared using CFA to the full scales if the full scales had enough completed data points (i.e., 100) to be included in a CFA. To the extent that the subscales acted as distinct constructs, they were expected to form distinct factors from the DSI-SS and the TBI-4 to a similar degree as their full-scale versions. After excluding the measures without enough data on the full scales, the scales selected for inclusion in these models were the AUDIT, BHS, BSS, PCL-M, and INQ-TB. Analyses were conducted in *Mplus* 6.11 (Muthén & Muthén, 2010). In addition to the fit statistics listed, in the CFAs, we examined the weighted root mean square residual (WRMR) and followed the recommendations of Yu (2002) for cutoffs of WRMR greater than or equal to 1.

Results

Correlations and Internal Consistency

Descriptive statistics, Cronbach's alphas, and correlations of CDE measures and full measures are shown in Table 2. Pairwise deletion was utilized for these analyses. Examination of Pearson's r correlations indicated that all shortened measures were significantly associated with the full measures. For correlations between the CDE and full-measure versions, adjusted Pearson's r was calculated based on Levy's (1967) formula to account for correlated errors.

Correlations between the measures illustrated convergent validity across several measures. CDE measures directly assessing suicide-related variables, including the DSI-SS, the SBQ-R, the SIS, and the BSS, were moderately to highly correlated with each other. CDE measures assessing risk factors associated with suicide, such as anxiety sensitivity or hopelessness, were moderately correlated with measures directly assessing suicide risk but less so when compared with the magnitude of correlations between other direct measures of suicide risk as expected. The magnitude of correlations between direct measures of suicide risk were larger than the magnitude of correlations between risk factors associated with suicide and direct measures of suicide risk, with the exception of thwarted belongingness, which exhibited slightly stronger correlations to the DSI-SS ($r = .50$) than the BSS ($r = .47$). Furthermore, all of the measures were significantly correlated with the parent measure, including the CDE versions of the BSS, PCL-M, AUDIT, ASI-3, BHS, and INQ-TB. These findings illustrate that the shortened measures are assessing similar constructs. Although the correlations provided largely positive results illustrating good convergent and discriminant validity across scales, there was one pattern that should be noted. The CDE BSS was more strongly correlated with the DSI-SS and the SBQ-R than was its full-version measure. This likely reflects that the BSS items included in the CDE are assessing current wish to live and wish to die, similar in content to the items on the DSI-SS and the SBQ-R.

² It should be noted that these distributions of responses may likely reflect that many study participants were individuals who reported previous or current suicidality.

Table 2
Intercorrelations and Descriptive Statistics of All Shortened and Full Scales

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. DSI-SS	—																
2. SBQ-R	.72**	—															
3. SIS	.47**	.66**	—														
4. BSS	.67**	.62**	.46**	—													
5. BHS	.18**	.14**	.07*	.15**	—												
6. INQ-TB	.50**	.51**	.41**	.48**	.11**	—											
7. ASI-3	.35**	.39**	.14**	.31**	.23**	.29**	—										
8. PCL-M	.38**	.41**	.34**	.29**	.03	.43**	.44**	—									
9. TBI-4	.20**	.26**	.30**	.16**	-.05**	.22**	.13**	.30**	—								
10. AUDIT	.13**	.11**	.08**	.09**	.01	.11**	.06**	.10**	.10**	—							
11. ISI	.42**	.46**	.42**	.40**	.02	.49**	.42**	.56**	.28**	.17**	—						
12. Full BSS	.53**	.42**	.27**	.40** (.39)	.23**	.20**	.17**	.18**	.11*	.06	.31**	—					
13. Full BHS	.12	.22**	.08	.15*	.29** (.29)	.28**	.22*	.27**	.04	.20**	.46**	.15**	—				
14. Full INQ-TB	.42**	.51**	.33**	.55**	-.17**	.64** (.55)	.43**	.34**	.12*	.10**	.30**	.15**	.01	—			
15. Full ASI-3	.29*	.39**	-.30	.32	.37**	.28*	.99** (.94)	.46**	.09	.05	.74**	.15*	.01	.01	—		
16. Full PCL-M	.68**	.75**	.61**	.76**	.37**	.72**	.58**	.83** (.81)	.30**	.15**	.74**	.15*	.01	.01	.01	—	
17. Full AUDIT	.22**	.25**	.17**	.19**	-.01	.20**	.11**	.22**	.21**	.79** (.76)	.24**	-.03	.01	.01	.01	.01	—
N	3,032	2,878	1,601	2,857	2,856	3,093	2,169	2,877	2,869	2,868	2,871	374	267	1,485	100	1,049	1,674
Mean	2.20	7.99	3.95	.89	1.90	16.13	12.62	17.74	1.40	3.00	9.24	19.47	7.46	22.49	10.77	21.58	5.69
SD	2.95	5.32	2.88	1.24	1.11	9.21	6.11	9.62	1.46	3.19	5.63	7.68	6.21	11.24	6.95	18.84	6.85
Minimum	0	0	0	0	0	2	1	1	0	0	0	0	0	3	0	1	0
Maximum	12	21	8	4	3	35	25	40	4	12	30	36	20	63	24	85	38
Skewness	1.12	.53	-.10	1.12	-.48	.30	.35	.70	.52	1.18	-.13	-.38	.54	1.03	.13	1.59	.189
Kurtosis	.15	-.88	-1.41	-.04	-1.19	-1.12	-1.02	-.74	-1.20	.66	-1.03	-.47	-1.03	1.03	-1.01	1.40	3.56

Note. Bolded correlations indicate correlations between the parent and Common Data Element (CDE) measures; Levy's (1967) corrected correlations are indicated in parentheses. DSI-SS = Depressive Symptom Inventory—Suicidality Subscale; SBQ-R = Suicidal Behaviors Questionnaire—Revised; SIS = Suicide Intent Scale (CDE); BSS = Beck Scale for Suicide Ideation (CDE); BHS = Beck Hopelessness Scale (CDE); INQ-TB = Interpersonal Needs Questionnaire—Thwarted Belongingness (CDE); ASI-3 = Anxiety Sensitivity Index—Cognitive Concerns Subscale (CDE); PCL-M = PTSD Checklist-Military Version (CDE); TBI-4 = Traumatic Brain Injury—4; AUDIT = Alcohol Use Disorder Identification Test (CDE); ISI = Insomnia Severity Index; Full BSS = Full Beck Scale for Suicide Ideation; Full BHS = Full Beck Hopelessness Scale; Full INQ-TB = Full Interpersonal Needs Questionnaire—Thwarted Belongingness; Full ASI-3 = Full Anxiety Sensitivity Index—Cognitive Concerns Subscale; Full PCL-M = Full PTSD Checklist-Military Version; Full AUDIT = Full Alcohol Use Disorder Identification Test; C = no subsample completed both measures.

* $p < .05$. ** $p < .001$.

Exploratory Factor Analysis

An EFA was conducted to examine the factor structure of the 47 CDE items drawn from existing measures. For this model, we utilized a weighted least squares means and variance adjusted (WLSMV) estimator. The CDE BHS and TBI-4 scales were modeled as categorical because of the rating scales of these items. Examination of eigenvalues and the scree plot indicated that after nine factors, eigenvalues dropped below 1.00. Model fit statistics for all models with eigenvalues greater than 1.00 are shown in Table 2 of the online

supplemental materials. Models with eight or fewer factors were shown to exhibit less than optimal fit ($\chi^2 \geq 4,204.969$, $df \geq 733$, $p < .001$, CFI $\leq .86$, TLI $\leq .80$, RMSEA $\geq .04$). Examination of model fit statistics indicated that a nine-factor solution provided the best model fit ($\chi^2 = 2,936.78$, $df = 694$, $p < .001$, CFI = .91, TLI = .86, RMSEA = .03). Factor loadings for the nine-factor solution are shown in Table 3.

The nine-factor solution was also interpretable. Items were considered to load onto a specific factor if the factor loading was

Table 3
Factor Loadings for Exploratory Factor Analysis of CDE Measures

CDE item	Scale	1	2	3	4	5	6	7	8	9
1	DSI-SS	.792	-.018	.035	-.002	.042	.020	-.014	.021	.002
2	DSI-SS	.910	-.001	-.025	-.051	.017	-.057	.010	.012	-.028
3	DSI-SS	.891	-.028	.016	-.014	.009	-.017	.012	.013	-.009
4	DSI-SS	.821	-.015	.047	-.008	.001	-.014	-.033	.009	.038
5	SBQ-R	.354	.436	.039	.093	.036	.034	.023	.006	-.103
6	SBQ-R	.535	.319	.020	.091	-.011	.036	.065	.000	-.065
7	SBQ-R	.427	.152	.056	.061	.055	-.010	-.032	-.044	-.019
8	SBQ-R	.569	.147	.017	.100	.045	.041	-.094	.014	.112
9	SIS	.003	.768	.034	-.012	.039	-.048	-.017	.016	-.047
10	SIS	-.014	.745	.014	-.042	.045	-.035	.012	.012	-.008
11	SIS	.030	.763	.020	-.008	.058	-.013	-.040	.008	.035
12	SIS	-.025	.585	.035	-.015	.060	.002	-.043	-.004	.004
19	BSS	.398	.520	-.053	.010	-.155	.078	.079	-.029	.089
20	BSS	.468	.541	-.082	.000	-.112	.048	.106	-.003	.068
21	BHS	.057	-.008	.024	-.042	.008	.032	-.009	-.034	.644
22	BHS	-.001	.064	.024	.004	.017	-.020	.000	.012	.854
23	BHS	.006	-.008	-.011	.079	-.042	.005	.031	.019	.845
24	INQ-TB	.008	.045	.021	-.045	-.021	.775	.007	-.022	-.001
25	INQ-TB	.132	.130	.050	.034	-.049	.638	.065	.008	.015
26	INQ-TB	.033	-.025	.013	-.010	.018	.845	.003	-.002	-.026
27	INQ-TB	.034	.037	.019	-.003	.003	.813	.057	.024	-.039
28	INQ-TB	-.095	-.059	-.032	.024	.054	.847	-.088	.000	.201
29	ASI-3	.01	.034	.044	.696	-.064	-.011	.076	-.004	.015
30	ASI-3	.006	-.031	.006	.731	.053	-.002	.026	-.027	.006
31	ASI-3	.025	.013	.003	.826	-.003	-.007	-.038	.002	-.016
32	ASI-3	.014	-.006	-.021	.851	.026	.003	.001	.014	.037
33	ASI-3	-.018	-.008	.012	.829	-.011	.033	.000	.007	.013
34	PCL-M	.008	.025	.900	-.043	-.004	-.005	.000	-.012	.013
35	PCL-M	.002	-.032	.860	-.052	.029	-.007	.025	-.010	.051
36	PCL-M	.022	-.024	.835	.029	-.012	-.009	-.008	-.047	.007
37	PCL-M	.003	.015	.858	.055	-.021	-.001	.013	-.006	-.004
38	PCL-M	.005	.002	.814	-.027	-.008	.033	.001	.020	-.011
39	PCL-M	.017	.008	.846	.011	-.026	.032	-.018	-.005	-.022
40	PCL-M	-.018	-.002	.556	.071	.095	.028	.122	.043	-.014
41	PCL-M	.004	.051	.554	.125	.048	.015	.128	.047	-.002
42	TBI-4	.060	-.048	-.021	.001	.884	-.026	.011	-.042	.038
43	TBI-4	-.010	.088	.050	.002	.823	.003	-.009	.029	-.001
44	TBI-4	.041	-.007	-.037	-.002	.767	.051	.033	-.037	-.028
45	TBI-4	-.043	.101	.018	.012	.717	.029	.053	.054	-.007
46	AUDIT	.006	-.046	.005	-.024	.002	.006	-.007	.757	.015
47	AUDIT	.041	.034	-.005	-.001	-.007	.012	.033	.723	-.023
48	AUDIT	-.016	.003	-.005	.016	.001	-.009	-.013	.988	.011
52	ISI	.016	-.034	.036	.006	.010	-.004	.796	.016	.003
53	ISI	.017	.013	.081	.013	.028	-.005	.761	.003	.007
54	ISI	.036	.002	.090	.058	-.001	.001	.369	.049	-.013
55	ISI	-.017	.020	-.081	-.020	.043	.041	.871	.002	.011
56	ISI	.019	.041	.055	.090	-.010	.002	.738	-.026	-.008

Note. Factor loadings over .30 appear in bold. CDE = Common Data Elements; DSI-SS = Depressive Symptom Inventory—Suicidality Subscale; SBQ-R = Suicidal Behaviors Questionnaire—Revised; SIS = Suicide Intent Scale (CDE); BSS = Beck Scale for Suicide Ideation (CDE); BHS = Beck Hopelessness Scale (CDE); INQ-TB = Interpersonal Needs Questionnaire—Thwarted Belongingness (CDE); ASI-3 = Anxiety Sensitivity Index—Cognitive Concerns Subscale (CDE); PCL-M = PTSD Checklist—Military Version (CDE); TBI-4 = Traumatic Brain Injury—4; AUDIT = Alcohol Use Disorder Identification Test; ISI = Insomnia Severity Index.

greater than 0.3. The first factor was the only factor comprising multiple scales, and included the DSI-SS and the last three items of the SBQ-R. Because these items appeared to encompass both characteristics of current suicidal ideation and behavior, this factor may be characterized as Current Suicidality. The second factor comprised items of the SIS, the BSS, and the first item of the SBQ-R, which assessed lifetime attempts and ideation. This factor was therefore characterized as Suicide Attempt Intent and Lethality, and may represent more longitudinal risk. Factors 3 through 9 were comprised of the following distinct subscales, which are presented in order: PCL-M items, ASI-3 items, TBI-4 items, INQ-TB items, ISI items, AUDIT items, and BHS items.

Regarding cross-loadings, the items that cross-loaded were limited to the first (Current Suicidality) and second (Suicide Attempt Intent and Lethality) factors. The first item of the SBQ-R, which assessed lifetime suicidal ideation and attempts, loaded marginally stronger on the second factor, characterized as Suicide Attempt Intent and Lethality, than on the first (Current Suicidality). The second item of the SBQ-R, which assessed suicidal ideation within the past year, loaded more strongly on the first factor, Current Suicidality. The BSS items, which assessed wish to live and wish to die, loaded much stronger onto the second factor than the first; therefore, these items were considered as part of the factor representing Suicide Attempt Intent and Lethality.

Confirmatory Factor Analyses

CFAs were conducted to compare the performance between the five full-scale measures and their respective shortened CDE measures, specifically examining the constructs of alcohol use, hopelessness, wish to live and wish to die (BSS), PTSD symptoms, and thwarted belongingness. In each of the CFAs, a three-factor model was specified: (a) either the selected CDE or full-length measure (e.g., CDE AUDIT vs. full-length AUDIT), (b) current suicidality as assessed by the DSI-SS, and (c) TBI positive screen as assessed by the TBI-4. In all, 10 CFAs were conducted across the five measures and their CDE counterparts. Fit indices for these 10

CFAs can be found in Table 4, and an example path diagram may also be found in Figure 1.

Overall, the shortened CDE measures exhibited good model fit; regarding four of the five variables, fit was at least as good for the shortened measure as for the full-measure model. Regarding the one exception, the CFA model examining the full measure of the BSS exhibited good model fit; however, the CFA model including the shortened CDE version of the BSS, which assessed wish to live and wish to die, did not exhibit comparable fit to this model. Alternatively, two CDE scales exhibited better model fit than the full versions. The CFA model examining the shortened CDE version, which assessed PTSD symptoms associated with military experiences, exhibited adequate model fit; however, the CFA model examining the full measure of the PCL-M did not exhibit comparable fit. Similarly, the model assessing the shortened CDE version of thwarted belongingness exhibited good model fit, but the model assessing the full-measure version of thwarted belongingness did not exhibit comparable fit. Conversely, the models examining alcohol misuse and hopelessness exhibited comparable fit across both models including the shortened CDE measure version and the full-measure version.

Discussion

The purpose of the present study was to examine the psychometric properties and validity of the shortened CDE measures in order to determine the utility of the CDEs in assessing various factors associated with suicidality. Results indicated that the shortened CDE measures exhibited adequate to good internal consistency, and correlations between the shortened CDE and full-measure versions were strong, which demonstrated that the shortened CDE measures are reliable and valid. Additionally, results of an EFA also showed that the shortened CDE measures comprised nine factors, which were consistent with distinct constructs associated with suicide risk: Current Suicidality, Suicide Attempt Lethality and Intent, PTSD Symptoms, Anxiety Sensitivity, Hopelessness, TBI, Insomnia, Thwarted Belongingness, and

Table 4

Comparison of Fit Statistics Between CDE and Full Measures When Included in Confirmatory Factor Analysis Model with DSI-SS and TBI

Scale	N	χ^2	df	p	CFI	TLI	RMSEA [90% CI]	WRMR
AUDIT	2,909	161.668	41	<.001	.982	.976	.032 [.027, .037]	1.184
Full AUDIT	2,909	642.940	132	<.001	.938	.928	.036 [.034, .039]	1.579
BHS	2,909	95.716	41	<.001	.993	.991	.021 [.016, .027]	.962
Full BHS	2,909	746.292	347	<.001	.964	.961	.020 [.018, .022]	1.359
BSS	3,115	573.782	31	<.001	.906	.867	.074 [.069, .079]	2.611
Full BSS	2,909	730.921	321	<.001	.953	.948	.021 [.019, .023]	1.325
PCL-M	2,954	439.521	101	<.001	.954	.945	.034 [.030, .037]	1.206
Full PCL-M	2,909	923.783	272	<.001	.885	.873	.029 [.027, .031]	1.979
INQ-TB	2,954	304.417	62	<.001	.968	.959	.036 [.032, .041]	1.333
Full INQ-TB	2,953	915.424	116	<.001	.882	.861	.048 [.045, .051]	1.915

Note. CDE = Common Data Elements; TBI = traumatic brain injury; DSI-SS = Depressive Symptom Inventory—Suicidality Subscale; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; WRMR = weighted root mean square residual; AUDIT = Alcohol Use Disorder Identification Test (CDE); Full AUDIT = Full Alcohol Use Disorder Identification Test; BHS = Beck Hopelessness Scale (CDE); Full BHS = Full Beck Hopelessness Scale; BSS = Beck Scale for Suicide Ideation (CDE); Full BSS = Full Beck Scale for Suicide Ideation; PCL-M = PTSD Checklist-Military Version (CDE); Full PCL-M = Full PTSD Checklist-Military Version; INQ-TB = Interpersonal Needs Questionnaire—Thwarted Belongingness (CDE); Full INQ-TB = Full Interpersonal Needs Questionnaire—Thwarted Belongingness.

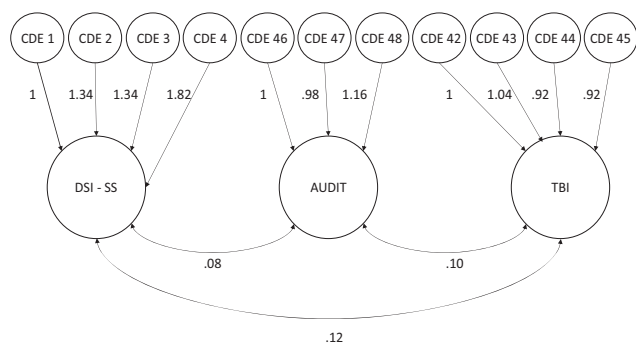


Figure 1. Path diagram of confirmatory factor analysis of CDE AUDIT, DSI-SS, and TBI. Unstandardized coefficients were reported. CDE = Common Data Element; AUDIT = Alcohol Use Disorder Identification Test (CDE); DSI-SS = Depressive Symptom Inventory-Suicidality Subscale; TBI = Traumatic Brain Injury-4.

Alcohol Misuse. Follow-up CFAs revealed that each of the shortened CDE scales demonstrated good fit in a three-factor model in which the shortened measure was referenced to two other constructs. In four of five cases, the fit for the shortened version models was at least as good as that for the full-measure models. The exception involved the BSS; even here, however, fit for the abbreviated CDE model was adequate.

Our findings supported the validity and reliability of all shortened CDE measures for use in future research. Compared with the full measures, the majority of the shortened CDE scales performed either comparably or better than the full-measure version. Despite these positive results, however, further research is needed to investigate two trends. Foremost, it should be noted that the CDE PCL-M does not assess numbing symptoms, which may limit its utility when assessing symptoms of PTSD. This shortened measure performed well in the current sample, but future research is needed in order to further clarify its sensitivity in detecting PTSD symptomatology in other clinical samples. Also of note, although the internal consistency of the shortened CDE version of the BHS was only adequate, analyses of model fit indicated that it performed in a manner comparable with the full-measure version. Likewise, in the EFA, the CDE BHS loaded separately onto its own factor. Therefore, results suggested that this subscale is an accurate measure of hopelessness in this sample. Future research to evaluate both the CDE BHS and CDE PCL-M would be informative; however, the current study supported the validity and utility of all of the CDE shortened measures for use in research. A considerable strength demonstrated by the CDEs in this study included the brief, reliable assessment of a comprehensive range of suicidality and related risk factors. The administration of all items included in the CDE would provide one basis for a thorough understanding of suicide risk and related psychopathology for research. Similarly, in the context of examining individual risk factors, administering specific shortened measures may provide a reliable and valid assessment without increasing burden on participants and researchers.

As noted previously, there are numerous advantages to using the shortened CDE scales, particularly through the implementation of the shortened CDE scales in research settings. Findings suggest that the CDEs are psychometrically valid, brief measures that may

be used to accurately assess suicide risk and related risk factors (e.g., hopelessness, thwarted belongingness). The brevity of the CDEs and its coverage of a broad range of constructs allow it to be easily incorporated into existing protocols without increasing the burden on researchers and participants. The CDE measures facilitate combination of data across individual studies, thereby providing opportunities for collaboration between researchers and decreasing the demands of data management. Additionally, the shortened CDE measures may facilitate comparisons of findings across individual studies, and may allow researchers to examine distinct populations with identical measures. The resulting improvement of data quality and facilitation of comparison across studies may accelerate the process of disseminating findings.

Furthermore, given the brevity and the strong psychometric properties of the CDE measures, the CDE measures may be useful for screening for suicide risk in clinical settings, particularly those serving military service members. The use of the shortened CDE scales can help to reduce the burden on the patients, and increase clinicians' ability to detect and manage suicide risk. In particular, the implementation of the CDEs in clinical settings not only allows the clinician to assess immediate suicide risk but also provides important information regarding risk factors and characteristics of suicidal thoughts and behaviors. Future research evaluating the use of the CDEs in clinical settings would inform the use of these measures outside of research. Importantly, emphasis on establishing clinical cutoff scores for the shortened CDE measures would be beneficial. Future studies may also seek to apply item response theory models, including Rasch analysis, to further refine suicidality measures by reducing redundancy as well as examining possible item bias among varying populations.

This study has many strengths, including the use of a large sample comprised of civilians, veterans, and active duty service members of multiple military branches located in diverse regions of the United States. Additionally, full versions of many of the shortened CDE measures were available to test the validity of scores acquired from these abbreviated scales. However, this study is not without limitations, including the inconsistent gathering of demographic data, the cross-sectional design, and the self-report nature of all measures. Demographics from each study were aggregated, and many variables, such as those examining a history of combat experience, had missing data. Future studies should incorporate identical demographic forms in order to facilitate accurate reporting of demographic variables across individual studies.

Additionally, it should be noted that the Pearson's r correlations between full-scale measures and shortened CDE scales were corrected for correlated errors. Utilizing the correction based on Levy's (1967) formula, the CDE and full-measure versions of the INQ-TB may have been inflated by .09; however, other corrected correlations between the CDE and full-measure versions were less inflated. Nevertheless, the adjusted correlations should be considered when interpreting the relationship between the full-scale measures and shortened CDE scales. Although the cross-sectional, self-report design allowed us to test our specific hypotheses and to compare the shortened CDE measures with the full versions, we are limited in our ability to determine the abbreviated measures' ability to predict future behavior, our eventual goal. Implementing a longitudinal design will also allow future studies to examine the test-retest reliability of the CDEs.

The results of this study represent an important first step in providing empirical support for the MSRC's shortened CDE scales as psychometrically valid measures. The incorporation of these abbreviated measures has the potential to greatly improve researchers' ability to analyze and collect data from multiple studies, which increases the ease, quality, and speed of data aggregation. Additionally, the brevity of the shortened CDE measures ensures that these measures can be incorporated into studies without significantly increasing the burden on participants. The comprehensive areas of suicide risk factors and related psychopathology assessed by the CDE measures further support the utility of these measures in research and suggest utility for screening purposes in clinical settings.

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Received November 15, 2016
 Revision received June 22, 2017
 Accepted June 22, 2017 ■

Non-Suicidal Self-Injury and Suicidal Thoughts and Behaviors: A Study of the Explanatory Roles of the Interpersonal Theory Variables Among Military Service Members and Veterans

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Objective: Research has identified non-suicidal self-injury (NSSI) as a robust correlate of suicidal thoughts and behaviors; however, little is known regarding why these constructs may be related. Consistent with the interpersonal theory of suicide, this study investigated thwarted belongingness (TB), perceived burdensomeness (PB), and capability for suicide (CS) as explanatory links in the association between NSSI, ideation, and suicide attempt history. **Method:** Military service members and veterans ($N = 973$; $age_{mean} = 29.9$ years, 78.8% male, 63.8% Caucasian/White) completed measures of lifetime NSSI and suicide attempts; current suicidal ideation; TB, PB, and CS; and related psychiatric symptoms. Bootstrap moderated mediation analyses were employed to examine whether (a) TB moderated the mediating effect of PB on NSSI and ideation, (b) PB moderated the mediating effect of TB on NSSI and ideation, and (c) CS moderated the mediating effect of TB and PB on NSSI and attempts. **Results:** TB and PB significantly accounted for the relationship between lifetime NSSI and current ideation. TB did not moderate the mediating effect of PB on NSSI and ideation, and PB did not moderate the mediating effect of TB. However, CS significantly moderated the mediating effects of TB and PB on NSSI and attempt history. **Conclusions:** The interpersonal theory of suicide hypotheses were partially supported. Consistent with the theory, the interaction of TB and PB only explained NSSI and attempt history among service members with high levels of CS. TB and PB only individually explained the association between

This article was published Online First November 27, 2017.

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This research was supported, in part, by a grant from the National Institute of Mental Health (T32 MH093311-04). This work was also supported, in part, by grants awarded to Florida State University (W81XWH-10-2-0181) and the Rocky Mountain Mental Illness Research, Education and Clinical Center (W81XWH-10-2-0178) by the Department of Defense. The Department of Defense had no further role in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication. The content of this paper is solely the responsibility of the authors and the views and opinions expressed do not necessarily represent those of

the Military Suicide Research Consortium, Department of Defense, or the United States Government. We thank the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs, for being the funding source of the provided data and we express our gratitude to the following principal investigators (PIs) for providing data used in this submission: Jesse R. Cougle, PI of the study “Controlled Evaluation of a Computerized Anger-Reduction Treatment for Suicide Prevention”; Michael D. Anestis, PI of the study “Identifying Factors Associated with Future Suicidal Self-Directed Violence within a Sample of Mississippi National Guard Personnel”; Katherine A. Comtois, PI of the study “Continuity Contacts via Text Message: Testing a Brief Intervention to Prevent Suicidal Ideation and Behavior”; Lori Johnson, PI of the study, “Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans.” These data are the property of the aforementioned PIs and cannot be used without prior written approval.

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lifetime NSSI and recent suicidal ideation. Prospective studies are warranted to replicate these findings across other military samples.

What is the public health significance of this article?

This study demonstrated the importance of assessing and addressing social disconnection and social burden to mitigate suicide risk among military service members and veterans engaging in non-suicidal self-injury.

Keywords: interpersonal theory of suicide, military, non-suicidal self-injury, suicidal ideation, suicide attempt

The suicide rate has increased in recent years among United States (U.S.) military service members (Ramchand, Acosta, Burns, Jaycox, & Pernin, 2011) and veterans (Department of Veterans Affairs Office of Public & Intergovernmental Affairs, 2016), highlighting the need to identify factors that explain suicide risk within these populations. Studies have found that approximately 12.3% to 30.3% of military service members and veterans report a lifetime history of non-suicidal self-injury (NSSI; Bryan, Bryan, et al., 2015; Bryan, Rudd, et al., 2015; Bryan & Bryan, 2014; Klonsky, 2011; Villatte et al., 2015), which exceeds NSSI rates in the general population (4.0%-5.9%; Klonsky, May, & Glenn, 2013; Klonsky, 2011; Nock & Prinstein, 2004, 2005; Prinstein, 2008). Further, 60.9% of military members are between ages 21 and 30 years (Military OneSource, 2015), an age bracket typically associated with higher rates of NSSI in the general population (7.0%-40.0%; Lloyd, Kelley, & Hope, 1997; Ross & Heath, 2002; Whitlock et al., 2009; Wilcox et al., 2012). These data suggest that NSSI rates may be higher among military and veteran samples. Further, in a sample of 152 active duty U.S. soldiers, those with a history of attempts were not significantly more likely to make a suicide attempt at 2-year follow-up; however, soldiers with a history of NSSI were more than two times more likely to attempt suicide within a 2-year period, even after controlling for baseline symptom severity (Bryan, Rudd, et al., 2015). These findings highlight the importance of understanding NSSI to inform military suicide prevention initiatives; however, to date, a paucity of research has been conducted in this domain.

NSSI is defined by the Centers for Disease Control and Prevention (CDC) as self-directed, deliberate behaviors that result in actual or potential injury to oneself without concomitant suicidal intent (Crosby, Ortega, & Melanson, 2011). NSSI is often conceptualized as a point on the broader spectrum of self-injurious thoughts and behaviors, including ideation and attempts (Klonsky et al., 2013; Nock et al., 2007). However, NSSI does not always co-occur with ideation, plans, and attempts (Bryan, Bryan, et al., 2015), suggesting that suicidality is a distinct phenomenon. Indeed, by definition, NSSI is not enacted with a desire or intent to die (Crosby et al., 2011). Further, NSSI demonstrates distinct etiological features that are consistent with existing theoretical frameworks for NSSI (Klonsky, 2007; Nock, 2009). Thus, there is a need to understand factors that explain the link between NSSI and suicidal thinking.

Although several studies have examined the prevalence and associated features of NSSI within military and veteran samples, few studies have examined factors that might account for the

association between (a) engaging in NSSI and (b) suicidal ideation and behavior. In this regard, it is useful to draw from theoretical frameworks that speak to this issue, such as the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010). The interpersonal theory conjectures that individuals will experience suicidal thoughts if they simultaneously experience feelings of *thwarted belongingness* (cf. loneliness; i.e., feelings that one does not belong to a social group) and *perceived burdensomeness* (i.e., the perception that one's death is worth more than one's life to others), and moreover, if they perceive these states as intractable. The theory explicitly differentiates between suicidal thoughts and lethal or near-lethal suicidal behaviors, hypothesizing that individuals who experience suicidal thoughts will only engage in life-threatening suicidal behaviors if they additionally have the *capability for suicide*. Dimensions of the capability for suicide include repeated exposure to painful and provocative events and a lowered fear of death (Smith et al., 2012; Van Orden et al., 2010). According to the interpersonal theory, thwarted belongingness, perceived burdensomeness, and capability for suicide are proximal and necessary predictors of near-lethal and/or lethal suicidal behavior (Van Orden et al., 2010). As such, the interpersonal theory hypothesizes that nontheory variables are distal correlates of suicide risk, and theory variables account in part for the relationship between distal risk factors and suicidal thoughts and behavior (Chu, Buchman-Schmitt, et al., in press; Van Orden et al., 2010). Studies across a variety of populations have found support for these hypotheses (e.g., Anestis et al., 2015; Batterham, Cleave, & Spijker, 2015; Chu, Buchman-Schmitt, et al., 2016; Chu, Buchman-Schmitt, et al., in press); however, only a few studies have examined and found support for the *explanatory* roles of the interpersonal theory variables between distal risk factors and suicide risk (e.g., Chu, Rogers, et al., 2016; Chu, Rogers, Gai, & Joiner, in press; Chu, Walker, et al., 2017; Forrest et al., 2016).

In the context of the interpersonal theory, the influence of NSSI on capability for suicide is believed to largely account for the link between NSSI and suicidal behavior (Joiner et al., 2012). Specifically, the interpersonal theory proposes that repeated engagement in NSSI leads to diminished fear of death and elevated pain tolerance, which subsequently increases capability for suicide and risk for suicidal behavior. Indeed, converging evidence supports these hypotheses. Research has indicated that NSSI history is associated with an increased tolerance of and decreased sensitivity to pain (e.g., Hooley et al., 2010; Schmahl et al., 2004), elevated capability for suicide (e.g., Franklin et al., 2011; Van Orden et al., 2008; Willoughby et al., 2015), and risk for suicide attempts (e.g.,

Smith et al., 2010; Van Orden et al., 2008). However, no research to our knowledge has statistically tested whether the interaction of all three interpersonal theory variables represents an explanation for the relationship between NSSI and suicide attempts—an important test of the interpersonal theory.

Little research has examined the link between NSSI and suicidal ideation in military samples from the perspective of the interpersonal theory, although the trajectory from NSSI to suicidal ideation has been characterized in adolescent samples (e.g., Glenn et al., 2017; Victor, Styer, & Washburn, 2015). The association between NSSI and ideation is particularly important given that 77% of military personnel and veterans engaging in NSSI also report suicidal ideation (Bryan, Bryan, et al., 2015), a rate much higher than that observed in older adolescents and young adult self-injurers (34–45%; Muehlenkamp & Kerr, 2010; Whitlock et al., 2009). According to the propositions of the interpersonal theory, thwarted belongingness and perceived burdensomeness—as proximal risk factors for suicidal desire—account for the relationship between NSSI and suicidal ideation. This clinically informative test of the interpersonal theory has also received little empirical attention (see Chu, Buchman-Schmitt, et al., *in press*, for a meta-analysis).

Broader research suggests that NSSI negatively affects interpersonal functioning. For example, prior research has indicated that individuals engaging in NSSI tend to exhibit poorer interpersonal effectiveness (Nock & Prinstein, 2004) and report limited social support networks (Heath, Ross, Toste, Charlebois, & Nedecheva, 2009). These factors may contribute to isolation, loneliness, and feelings of thwarted belongingness. Indeed, one prior study found that adolescents with a history of NSSI presenting at a hospital following a suicide attempt report more loneliness than those without a history of NSSI (Guertin et al., 2001). Additionally, individuals engaging in NSSI report fears of emotionally burdening close others (Rosenrot, 2015) and feelings of shame regarding their NSSI behaviors (Brown et al., 2009)—both of which may lead to greater perceptions of burdensomeness on others. Altogether, findings suggest potential links between NSSI, thwarted belongingness and perceived burdensomeness.

Of the two studies that have directly examined NSSI in the context of the interpersonal theory constructs, one study found that greater frequency of engaging in NSSI was significantly related to higher levels of thwarted belongingness but not perceived burdensomeness (Assavedo & Anestis, 2016). However, this study did not examine thwarted belongingness and perceived burdensomeness as mediators in the link between NSSI and suicidal ideation, consistent with theory predictions. We are only aware of one study of NSSI and ideation that examined the indirect effects of thwarted belongingness and perceived burdensomeness. This longitudinal study (Chu, Rogers, et al., 2016) found that at baseline, thwarted belongingness and perceived burdensomeness operated as statistical mediators of the relationship between lifetime NSSI and current ideation; however, at 2-month follow-up, only perceived burdensomeness mediated this association. These findings are consistent with emerging evidence suggesting that compared to thwarted belongingness, perceived burdensomeness may be a more potent indicator of suicidal ideation (Bryan et al., 2010; Chu, Hom, Rogers, Ringer, et al., 2016; Chu, Buchman-Schmitt, et al., 2016; Ma et al., 2016). Chu, Rogers, et al.'s (2016) study is noted for its strengths, particularly its utilization of longitudinal design, which allows for improved delineation of the temporal relationship

between variables. Nevertheless, the utility of their study's findings was hampered by its small sample size ($N = 49$) of undergraduate students with limited severity of suicidal symptoms. Replication across larger, high-risk samples, including military service members and veterans, is indicated.

The Present Study

Given the relatively high rates of NSSI and suicidal thoughts and behaviors among military service members and veterans, as well as the robust link between NSSI and suicide risk, the present study aimed to examine the explanatory roles of thwarted belongingness, perceived burdensomeness, and capability for suicide in the link between lifetime NSSI, current suicidal ideation, and suicide attempt history in a large sample of military service members and veterans. To test the predictions of the interpersonal theory of suicide, we examined (a) thwarted belongingness as a moderator of the mediating role of perceived burdensomeness in the association between lifetime NSSI and current suicidal ideation, and conversely, (b) perceived burdensomeness as a moderator of the mediating role of thwarted belongingness in the association between lifetime NSSI and current suicidal ideation. Given that the interpersonal theory proposes that suicidal desire emerges among individuals who simultaneously experience high levels of thwarted belongingness and perceived burdensomeness (Joiner, 2005; Van Orden et al., 2010), we expected that (a) the mediating effect of perceived burdensomeness would be stronger at higher levels of thwarted belongingness than at lower levels of thwarted belongingness, and likewise, (b) the mediating effect of thwarted belongingness would be stronger at higher levels of perceived burdensomeness than at lower levels of burdensomeness.

Next, consistent with the interpersonal theory, we examined the interaction of thwarted belongingness, perceived burdensomeness, and capability for suicide as an explanation for the relationship between NSSI and suicide attempt history. Because the theory indicates that risk for suicidal behavior is only elevated among those with the desire and capability for suicide, we expected that the mediating effect of the interaction between perceived burdensomeness and thwarted belongingness would be stronger at higher levels of capability for suicide.

To rule out the alternate explanation that lifetime NSSI is related to suicidal thoughts and behaviors because both are associated with the presence of other putative risk factors, we controlled for the effects of three psychiatric symptoms—insomnia, hopelessness, and depression—that may also confer risk for suicide and/or NSSI (Hamza et al., 2012). Insomnia has been implicated as a robust suicide risk factor across samples (Chu, Hom, Rogers, Ringer, et al., 2016; Pigeon et al., 2012) and appears to be an especially important risk indicator in military samples (Caldwell, Knapik, & Lieberman, 2017; Hom, Chu, et al., 2017; Peterson, Goodie, Satterfield, & Brim, 2008; Ribeiro, Pease, et al., 2012). Similarly, across samples, hopelessness and depressive symptoms were significant correlates of both NSSI and suicidal thoughts and behaviors (Asarnow et al., 2011; Claes et al., 2010; McMillan et al., 2007; Nock & Kessler, 2006). To test the specificity of the interpersonal theory hypotheses, we also tested these covariates as rival mediators in the relationship between NSSI and suicidal ideation and attempts.

Finally, given that multiple studies, including those of military samples (e.g., Bryan et al., 2010), have suggested that perceived

burdensomeness may be a more robust correlate of suicide risk (see Chu, Buchman-Schmitt, et al., in press, and Ma et al., 2016, for reviews), we conducted exploratory analyses examining (a) perceived burdensomeness as an individual mediator of the association between lifetime NSSI and current suicidal ideation, (b) thwarted belongingness as an individual mediator in the relationship between lifetime NSSI and current suicidal ideation, (c) perceived burdensomeness moderating capability for suicide as a mediator of lifetime NSSI and attempt history, and (d) thwarted belongingness moderating capability for suicide as a mediator of lifetime NSSI and attempt history. In the Methods and Results, *thwarted belongingness*, *perceived burdensomeness*, and *capability*

for suicide are abbreviated as TB, PB, and CS, respectively; *suicidal ideation* is abbreviated as SI; and *suicide attempt* is abbreviated as SA.

Method

Participants

This sample was composed of 973 military service members and veterans; see Table 1 for demographic details. The self-reported lifetime rate of NSSI was 18.7% ($n = 191$), which is in line with previously reported NSSI rates in military and

Table 1
Participant Demographics

Demographic variables	Total	No lifetime NSSI history	Lifetime NSSI history	<i>F(df)</i>
<i>N</i>	973	772 (79.3%)	201 (20.7%)	—
Age mean (<i>SD</i>)	29.94 (11.33)	30.25 (11.35)	28.75 (11.19)	2.80 (971)
Age range	18–71	18–71	18–59	—
Male	767 (78.8%)	622 (80.6%)	145 (72.1%)	—
Missing	3 (.3%)	3 (.4%)	—	—
Ethnicity				2.60 (959)
Hispanic/Latino	71 (7.3%)	51 (6.6%)	20 (10.0%)	—
Missing	12 (1.2%)	10 (1.3%)	2 (1.0%)	—
Race				1.59 (964)
Caucasian/White	621 (63.8%)	488 (63.2%)	133 (66.2%)	—
African American/Black	189 (19.4%)	171 (22.2%)	18 (9.0%)	—
Asian/Pacific Islander	23 (2.4%)	17 (2.1%)	6 (3.0%)	—
American Indian/Alaskan				—
Native	10 (1.0%)	5 (.6%)	5 (2.5%)	—
Multiracial/Other	123 (12.6%)	85 (11.0%)	38 (18.9%)	—
Missing	7 (.7%)	6 (.8%)	1 (.5%)	—
Marital status				1.63 (959)
Married	301 (30.9%)	252 (32.6%)	49 (24.4%)	—
Single	467 (48.0%)	361 (46.8%)	106 (52.7%)	—
Widowed	5 (.5%)	4 (.5%)	1 (.5%)	—
Divorced/Separated	188 (19.3%)	146 (18.9%)	42 (20.9%)	—
Missing	12 (1.2%)	9 (1.2%)	3 (1.5%)	—
Military status				
Veteran	211 (21.7%)	149 (19.3%)	62 (30.9%)	—
Currently serving	762 (78.3%)	623 (80.7%)	139 (69.2%)	—
Deployment (<i>n</i> /% Yes)	53 (5.4%)	37 (4.8%)	16 (8.0%)	1.51 (249)
Missing	722 (74.2%)	615 (79.7%)	107 (53.2%)	—
Combat experience (<i>n</i> /% Yes)	173 (17.8%)	130 (16.8%)	43 (21.4%)	9.72 (396)*
Missing	575 (59.1%)	506 (65.5%)	69 (34.3%)	—
Military branch				
Army, active duty	243 (25.0%)	190 (24.6%)	53 (26.4%)	—
Army, National Guard	3 (.3%)	—	3 (1.5%)	—
Army, Reserves	471 (48.4%)	422 (54.7%)	49 (24.4%)	—
Air Force, active duty	12 (1.2%)	8 (1.0%)	4 (2.0%)	—
Air Force, National Guard	1 (.1%)	1 (.1%)	—	—
Air Force, Reserves	2 (.2%)	2 (.3%)	—	—
Navy, active duty	22 (2.3%)	15 (1.9%)	7 (3.5%)	—
Marine, active duty	110 (11.3%)	49 (6.3%)	61 (30.3%)	—
Other	22 (2.3%)	21 (2.7%)	1 (.5%)	—
Missing	87 (8.9%)	64 (8.3%)	23 (11.4%)	—
Suicidal symptom history				
Lifetime suicide attempt (<i>n</i> /%)	231 (23.7%)	128 (16.6%)	103 (51.2%)	3.63 (958)
1 previous attempt	127 (13.1%)	80 (10.4%)	47 (23.4%)	—
2+ previous attempts	104 (10.7%)	48 (6.2%)	56 (27.9%)	—
# of attempts, mean (<i>SD</i>)	1.14 (11.75)	.77 (12.40)	2.56 (8.68)	—
Missing	13 (1.3%)	10 (1.3%)	3 (1.5%)	—

Note. *N* = sample size; *SD* = standard deviation.

* $p < .05$.

veteran samples (12.3%, Bryan, Bryan, et al., 2015; 14.0%, Bryan & Bryan, 2014; 27%, Villatte et al., 2015; 30.3%, Bryan, Rudd, et al., 2015).

Procedures

Data for this study were drawn from four of the 24 studies funded by the Military Suicide Research Consortium (MSRC). The MSRC-funded studies were each conducted independently and as such, the studies varied regarding design, approach, and data collection methods and sites. Nonetheless, participants in all MSRC-funded studies completed the same brief battery of surveys at baseline (cf. common data elements; Gutierrez & Joiner, 2016; Ringer et al., in press); administration time of this battery was approximately 30 min (see Table 2 for details on the included CDE studies). This brief assessment battery was composed of subsets of items from several full-length measures due to time and setting constraints. Recently, Ringer et al. (in press) demonstrated that the abbreviated measures exhibited adequate internal consistency (α s = 0.77–0.91) and moderate to strong correlations with corresponding full measures (r s = 0.40–0.99). Further, exploratory factor analyses revealed that the CDEs comprised nine factors, consistent with the suicide risk constructs that were assessed; fit was also at least as good as that of the full measures (see Ringer et al., in press, for details). In this manuscript, only four studies were included as these studies used full-length measures of the present study's key variables. For all included studies, approval was obtained from each site's institutional review board and the U.S. Army Medical Research and Materiel Command Human Research Protection Office.

Measures

Full-length measures of key study variables (TB, PB, CS, SI, depressive symptoms) and abbreviated measures of insomnia symptoms and hopelessness were used.

Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007). In line with the approaches of previous epidemiological studies (see Muehlenkamp et al., 2012 for review), one self-report item drawn from the SITBI was used to assess for the absence or presence of a lifetime history of NSSI. This item asked: "In your life, have you purposely hurt yourself *without wanting to die*?" Additionally, one self-report item drawn from the SITBI was used to assess participants' history of SAs (i.e., "How many times in your lifetime have you made an attempt to kill yourself during *which you had at least some intent to die*?").

Interpersonal Needs Questionnaire (INQ-15; Van Orden et al., 2012). The INQ-15 is a 15-item self-report measure of feelings of PB and TB. In the INQ-15, 6 items assess PB (INQ-PB) and 9

items assess TB (INQ-TB). Items are rated on a 7-point Likert scale ranging from 1 (*not at all true for me*) to 7 (*very true for me*), with higher total scores indicating greater feelings of PB and TB. Previous research has indicated that the INQ-TB and the INQ-PB exhibit good internal consistency and adequate validity (Van Orden et al., 2008, 2012). In this study, the internal consistencies of the INQ-TB (α = .88) and INQ-PB (α = .89) were good.

Acquired Capability for Suicide Scale (ACSS-20; Bender, Gordon, Bresin, & Joiner, 2011; Van Orden, Witte, Gordon, Bender, & Joiner, 2008). The ACSS-20 is a 20-item self-report measure of two components of CS: fearlessness about death and perceived tolerance of pain. Items are rated on a 5-point Likert scale that ranges from 0 (*not at all like me*) to 4 (*very much like me*) with higher total scores on the ACSS indicating greater CS. Consistent with prior research (Bender et al., 2011), this measure exhibited good internal consistency in this study (α = .80). The ACSS-20 was only administered in three of the four samples (n = 892).

Depressive Symptom Index-Suicidality Subscale (DSI-SS; Joiner, Pfaff, & Acres, 2002; Metalsky & Joiner, 1997). The DSI-SS is a 4-item measure used to evaluate the severity and frequency of SI in the past two weeks. Items are rated on a 4-point Likert-type scale ranging from 0 to 3. Previous research supports the validity (Joiner, Pfaff, & Acres, 2002) and internal consistency of this measure (Joiner, Pfaff, & Acres, 2002; Ribeiro, Braithwaite, Pfaff, & Joiner, 2012). This measure exhibited good internal consistency in the current study (α = .89). In this study, the DSI-SS total score was entered into analyses as the dependent variable.

Insomnia Severity Index (ISI; Bastien, Vallières, Morin, 2001; Ringer et al., in press). An abbreviated 5-item version of the original 7-item ISI was used to assess insomnia symptom severity in the past two weeks. Items are rated on a 5-point Likert scale ranging from 0 to 4, with higher total scores indicating more severe insomnia symptoms. Total scores ranged from 0 to 20 on the abbreviated ISI. In previous research, the ISI has demonstrated adequate reliability and validity (Bastien et al., 2001), particularly in military samples (Hom, Chu, et al., 2017). Internal consistency of the shortened measure was excellent (α = .90).

Beck Hopelessness Scale (BHS; Beck, Weissman, Lester, & Trexler, 1974; Ringer et al., in press). An abbreviated, 3-item version of the original 20-item BHS was used to measure feelings of general hopelessness. Items are rated on a true-false scale and total scores on the shortened BHS range from 0 to 3. Higher total scores reflect greater feelings of hopelessness. The original scale's reliability and validity have been supported (McMillan et al., 2007). Internal consistency of the abbreviated measure was adequate (α = .69).

Table 2

Summary of the Military Suicide Research Consortium–Funded Studies Using the Common Data Elements Measures in This Study

Study topic	Sites	Population	Administration	Current study N
CAMS SSF	Veterans Affairs Medical Center, Southern U.S.	Veterans	In person	134
Caring text messages	Marine Corps bases, Southern and Western U.S.	Army and Marine active duty	In person	235
Anger	University, Southern U.S.	Veterans, Reserves, and civilians ^a	Online, phone	81
Self-directed violence	National Guard Camp, Southern U.S.	Army and Air National Guards	In person	523

Note. CAMS SSF = Collaborative Assessment and Management of Suicidality Suicide Status Form; U.S. = United States.

^a Civilians in this sample were excluded from the present study.

Beck Depression Inventory-Second Edition (BDI-II; Beck et al., 1996). The BDI-II is a 21-item self-report measure of depressive symptoms in the previous two weeks. Items are rated on a 4-point Likert scale ranging from 0 to 3, with higher total scores indicating more severe depressive symptoms. The BDI-II has been widely used in prior research and has demonstrated consistently strong psychometric properties (Beck et al., 1996). In this study, item 9 of the BDI-II, which assesses suicidal thinking and desire, was removed to diminish redundancy with our dependent variable. Internal consistency of this measure was excellent in this study ($\alpha = .94$). The BDI-II was only administered in one of the four samples ($n = 81$).

Data Analytic Strategy

Preliminary analyses. First, we examined variable descriptive statistics and calculated bivariate Pearson's correlations (two continuous variables), point-biserial correlations (dichotomous and continuous variables), or phi coefficients (two dichotomous variables) to examine the relationship between all study variables. One-way ANOVAs were used to compare those with and without a history of NSSI on demographic variables. Additionally, given that these data were collected as part of four independent investigations, one-way ANOVAs were used to examine whether study variables differed across CDE investigations.

Main analyses. First, to test the interpersonal theory of suicide and evaluate whether the interaction of TB and PB (INQ-TB, INQ-PB) accounts for the association between lifetime NSSI history and SI (DSI-SS), we conducted bias-corrected bootstrap mediation analyses. Specifically, moderated mediation analyses were conducted to examine whether PB mediated the association between lifetime NSSI history and SI at low (1 standard deviation [SD] below mean), moderate (at the mean), and high levels (1 SD above mean) of TB, controlling for age, sex, insomnia symptoms, and hopelessness. Conversely, moderated mediation analyses were used to examine whether TB mediated the association between lifetime NSSI history and SI at low, moderate, and high levels of PB, controlling for the aforementioned covariates. In these two models, we subsequently included depressive symptoms as a covariate. This covariate was modeled separately as the measure of depressive symptoms (BDI-II) was only administered in one CDE study and analyses including this covariate were underpowered (see Power section).

Next, we evaluated whether the interaction of TB, PB, and CS (ACSS-20) mediated the association between lifetime NSSI history and number of SAs, controlling for all covariates. Again, moderated mediation analyses were conducted to examine whether the interaction of TB and PB mediated the association of NSSI and the number of prior SAs at low, moderate, and high levels of CS, controlling for covariates. Depressive symptoms were not evaluated as a covariate in this model as this variable was not assessed in the data sets that measured CS.

Finally, to evaluate the specificity of these aforementioned models, we tested whether symptoms of insomnia, hopelessness, and depression emerged as significant rival mediators, controlling for TB, PB, CS, age, and sex—each variable was entered as an individual mediator of the association between NSSI history and SI and all potential rival mediators, except depressive symptoms, were entered as mediators of NSSI and SA history.

Exploratory analyses. To examine whether PB may be a more robust suicide risk correlate than TB, we tested PB and TB as individual mediators of the relationship between NSSI history and SI, beyond covariates. Further, to determine whether the interaction between TB and CS and/or the interaction of PB and CS may also explain the effect of NSSI on SA history, we tested TB and PB as individual moderators of the mediating role of CS in the association between NSSI and SA history. Specifically, moderated mediation analyses were used to examine whether CS was a significant mediator at low, moderate, and high levels of PB and whether CS was a significant mediator at low, moderate, and high levels of TB.

All mediation analyses were conducted with the SPSS PROCESS macro, following procedures described by Hayes (2013): 10,000 bootstrapped samples were drawn from the data and bias-corrected 95% confidence intervals (BCCI) were computed to estimate the indirect effect for each of the resampled data sets. Mediation analyses were conducted using PROCESS Model 4 and moderated mediation analyses were conducted using Model 14. For moderated mediation analyses, BCCI were computed to estimate the index of moderated mediation. Missing data, which were minimal for key study variables (<1.0%), were addressed using listwise deletion, consistent with recommendations by Widaman (2006).

Power. A sample size of 115 is required to be adequately powered ($1-\beta \geq 0.80$) to detect small-to-moderate effect sizes for the α path and moderate effect sizes for the β path using a bias-corrected bootstrap mediation approach (Fritz & MacKinnon, 2007). Thus, with our sample size of 973, we were more than adequately powered for the proposed analyses. Further, as noted above, CS was only assessed in three of the four samples; nonetheless, with a sample size of 892, we remained adequately powered for analyses. With a sample size of 81, we were underpowered for analyses controlling for depressive symptoms—these analyses should be interpreted with caution.

Results

Preliminary Analyses

Descriptive statistics are reported in Table 1, details regarding the included MSRC-funded studies are provided in Table 2, and correlations between study variables are reported in Table 3. In comparison with individuals without a history of NSSI, individuals reporting a history of NSSI were more likely to report a history of combat experience, $F(396) = 9.72$, $\phi = 0.16$, $p = .002^1$ —a finding that is consistent with previous research (Bryan & Bryan, 2014). No other demographic differences emerged between those with and without lifetime NSSI (see Table 1). Between the included CDE studies, significant differences in NSSI history, $F(3, 970) = 31.56$, $p < .001$, TB, $F(3, 970) = 243.35$, $p < .001$, PB, $F(3, 970) = 71.14$, $p < .001$, CS, $F(3, 890) = 9.38$, $p < .001$, and

¹ Given significant group difference in combat experience, the main analyses were also conducted with combat experience as an added covariate. Of note, the pattern of findings remained unchanged, such that the indirect effect of NSSI history on SI through TB and PB, controlling for all covariates and combat history, was significant (95% CI [0.0991, 0.1756]; $b = 0.26$, $SE = 0.10$).

Table 3

All Study Variable Means, Standard Deviations and Correlations

Sample	1	2	3	4	5	6	7	8	9	10	N	Mean	SD	Range	Skew	α
Total, $N = 973$																
1. NSSI history (0 = no, 1 = yes)	—										973	.21	.41	0–1	1.45	—
2. INQ-15 thwarted belongingness	.28**	—									973	25.00	11.64	4–63	1.03	.88
3. INQ-15 perceived burdensomeness	.19**	.33**	—								973	17.16	7.04	5–42	.66	.89
4. ACSS-20 capability for suicide	.10*	.13**	.15**	—							892	51.37	12.44	12–80	–.18	.80
5. DSI-SS suicidal ideation	.25**	.39**	.37**	.16**	—						973	1.73	2.72	0–12	1.40	.89
6. Number of prior suicide attempts	.41**	.16**	.16**	.12**	.24**	—					957	1.14	11.75	0–74	—	—
7. ISI insomnia severity	.04	.06	.12**	.07*	–.12	.06	—				973	3.38	6.58	0–20	1.69	.90
8. BHS hopelessness	–.21**	–.26**	.05	–.04	–.09*	–.17**	–.06	—			973	1.93	1.03	0–3	–.42	.69
9. BDI-II depressive symptoms	.48**	.66**	.59**	—	.51**	–.34*	.72**	–.54**	—		81	19.19	12.93	0–52	.62	.94
10. Age	–.05	–.15**	.18**	–.04	.30**	–.06	–.02	.05	.07	—	973	29.94	11.33	18–71	1.33	—
11. Sex (1 = male, 2 = female)	.09*	.03	.01	–.19**	–.07*	.18**	.09*	–.06	.24*	.01	970	1.21	.41	1–2	1.43	—
Controls, $n = 772$																
1. NSSI history (0 = no, 1 = yes)	—										772	.00	.00	.00	—	—
2. INQ-15 thwarted belongingness	—	—									772	23.36	10.65	4–63	1.20	.87
3. INQ-15 perceived burdensomeness	—	.33**	—								772	16.47	6.58	5–42	.73	.87
4. ACSS-20 capability for suicide	—	.08*	.13*	—							725	50.72	12.42	12–80	–.19	.81
5. DSI-SS suicidal ideation	—	.42**	.34**	.10*	—						772	1.39	2.48	0–11	1.65	.89
6. Number of prior suicide attempts	—	.19**	.13*	.17**	.19**	—					762	.77	.62	0–2	—	—
7. ISI insomnia severity	—	.08*	.14**	.09*	–.09*	.11*	—				772	3.31	3.51	0–20	1.59	.90
8. BHS hopelessness	—	–.26**	.12**	–.001	–.13**	–.05	–.06	—			772	2.04	1.01	0–3	–.59	.66
9. BDI-II depressive symptoms	—	.56**	.28*	—	.27*	–.04	.70**	–.44**	—		58	15.34	10.33	0–46	.66	.91
10. Age	—	–.12**	.16**	–.03	.32**	–.06	.002	.01	.07	—	772	30.25	11.35	18–71	1.29	—
11. Sex (1 = male, 2 = female)	—	–.03	–.03	–.21**	–.09*	.06	.12**	–.03	.13	.02	769	1.19	.39	1–2	1.57	—
Lifetime NSSI History, $n = 201$																
1. NSSI history (0 = no, 1 = yes)	—										201	1.00	.00	1.00	—	—
2. INQ-15 thwarted belongingness	—	—									201	31.31	13.08	51–63	.43	.87
3. INQ-15 perceived burdensomeness	—	.22*	—								201	19.78	8.11	5–39	.25	.87
4. ACSS-20 capability for suicide	—	.18*	.16*	—							167	53.77	12.26	13–80	–.16	.79
5. DSI-SS suicidal ideation	—	.16*	.34**	.09	—						201	3.07	3.14	0–12	.71	.88
6. Number of prior suicide attempts	—	.09	.16*	.05	–.02	—					198	2.56	8.68	1–74	—	—
7. ISI insomnia severity	—	–.07	<.001	–.01	–.28**	–.24*	—				201	3.62	2.95	0–18	2.42	.83
8. BHS hopelessness	—	–.09	.04	–.12	.25**	–.11	–.02	—			201	1.50	1.01	0–3	.17	.62
9. BDI-II depressive symptoms	—	.69**	.69**	—	.50*	.15	.60*	–.50*	—		23	28.87	13.95	4–52	–.13	.95
10. Age	—	–.21*	.30**	–.05	.34**	.02	.10	.16*	.39	—	201	28.75	11.19	18–59	1.51	—
11. Sex (1 = male, 2 = female)	—	–.12	.04	–.15	–.10	.36*	–.02	–.09	.53*	–.02	201	1.28	.45	1–2	1.00	—

Note. NSSI history = lifetime history of non-suicidal self-injury (0 = no, 1 = yes); INQ-15 = Interpersonal Needs Questionnaire-15; ACSS-20 = Acquired Capability for Suicide Scale; DSI-SS = Depressive Symptom Index-Suicidality Subscale; ISI = Insomnia Severity Index (abbreviated, 5 items); BHS = Beck Hopelessness Scale (abbreviated, 3 items); BDI = Beck Depression Inventory-II (item 9, suicidal ideation, was removed from the total score). Sex (1 = male, 2 = female). Pearson's correlations are reported between continuous variables, point-biserial correlations are reported between dichotomous and continuous variables, and phi coefficients are reported between dichotomous variables.

* $p < .05$. ** $p \leq .001$.

SI severity, $F(3, 970) = 455.68$, $p < .001$ were observed.² However, there were no significant differences in SA history across CDE studies, $F(3, 957) = 3.62$, $p = .06$.

Main Analyses: TB and PB as Mediators Between NSSI History and SI

TB moderating PB as a mediator between NSSI history and SI. First, we examined whether TB moderated the mediating role of PB in the relationship between NSSI history and SI, controlling for age, sex, insomnia symptoms, and hopelessness. Although TB was not a significant moderator (index = -0.0012 , $SE = 0.006$; 95% CI [-0.0139 , 0.0112]), there was a significant indirect effect of PB at low ($b = 0.52$, $SE = 0.11$, 95% CI [0.3297 , 0.7528]), moderate ($b = 0.51$, $SE = 0.09$, 95% CI [0.3451 , 0.7096]), and high levels of TB ($b = 0.50$, $SE = 0.10$, 95% CI [0.3328 , 0.7138]). Unexpectedly, the

indirect effect of PB was slightly stronger at lower levels of TB than at higher TB, a point that we discuss below.

PB moderating TB as a mediator between NSSI history and SI. Next, we examined whether PB moderated the mediating role of TB in the relationship between NSSI history and SI, controlling for age, sex, insomnia symptoms, and hopelessness. PB was not a significant moderator (index = -0.0007 , $SE = 0.004$; 95% CI [-0.008 , 0.006]). Again, results indicated a significant indirect effect of TB at low ($b = 0.29$, $SE = 0.09$, 95% CI [0.1382 , 0.5044]), moderate ($b = 0.28$, $SE = 0.07$, 95% CI [0.1583 , 0.4558]), and high PB levels ($b = 0.27$, $SE = 0.08$,

² For each of the four studies, a new variable was created (coded yes/no) and entered as a covariate in all main analyses. Across all hypotheses, the pattern of findings remained the same even after accounting for potential differences across CDE studies.

95% CI [0.1404, 0.4519]). Again, the indirect effect of TB was slightly stronger at lower PB levels.³

When depressive symptoms were also covaried in these two models, the pattern remained unchanged—TB (index = 0.002, *SE* = 0.01; 95% CI [−0.0095, 0.0290]) and PB (index = −0.0182, *SE* = 0.03; 95% CI [−0.0946, 0.0149]) did not emerge as significant moderators and in both models, the indirect effects remained significant at all levels of the moderator.⁴

Specificity of TB and PB as mediators between NSSI history and SI. We examined whether insomnia symptoms, hopelessness, and depressive symptoms emerged as potential mediators, beyond TB, PB, age, and sex. Insomnia symptoms did not emerge as a significant mediator—the direct effect of NSSI history on SI remained significant after accounting for insomnia symptoms ($b = 0.99$, *SE* = 0.19, $p < .001$) and the indirect effect of NSSI history on SI through insomnia symptoms was not significant ($b = 0.004$, *SE* = 0.03, 95% CI [−0.06, 0.07]). Hopelessness also did not emerge as a significant mediator—the direct effect remained significant after accounting for hopelessness ($b = 0.99$, *SE* = 0.19, $p < .001$) and the indirect effect through hopelessness was also not significant ($b = 0.01$, *SE* = 0.03, 95% CI [−0.05, 0.08]). Similarly, depressive symptoms did not emerge as a significant mediator—the direct effect after accounting for depressive symptoms ($b = 0.31$, *SE* = 0.33, $p = .35$) and the indirect effect through depressive symptoms ($b = 0.11$, *SE* = 0.10, 95% CI [−0.01, 0.46]) were not significant. These findings support the specificity of TB and PB as mediators.

Main Analyses: CS Moderating PB and TB as Mediators Between NSSI and SA History

We examined whether CS moderated the mediating role of the interaction of PB and TB in the relationship between NSSI and the number of prior SAs, controlling for age, sex, insomnia symptoms, and hopelessness. CS emerged as a significant moderator (index = 0.0014, *SE* = 0.001; 95% CI [0.0002, 0.0048]). Results indicated that the indirect effect was not significant at low ($b = -0.02$, *SE* = 0.02, 95% CI [−0.0930, 0.0070]) and moderate ($b = -0.001$, *SE* = 0.01, 95% CI [−0.0329, 0.0252]) levels of CS. Consistent with the predictions of the interpersonal theory of suicide, the indirect effect of the interaction of TB and PB was only significant at high levels of CS ($b = 0.02$, *SE* = 0.01, 95% CI [0.002, 0.0551]).

Specificity of TB, PB, and CS as mediators between NSSI and SA history. We examined whether insomnia symptoms, hopelessness, and depressive symptoms emerged as mediators, beyond TB, PB, CS, age, and sex. Insomnia symptoms did not emerge as a significant mediator—the direct effect of NSSI history on SA history remained significant after accounting for insomnia symptoms ($b = 0.45$, *SE* = 0.06, $p < .001$) and the indirect effect of NSSI history on SA history through insomnia symptoms was not significant ($b = -0.009$, *SE* = 0.009, 95% CI [−0.04, 0.003]). Hopelessness was also not a significant mediator—the direct effect remained significant after accounting for hopelessness ($b = 0.45$, *SE* = 0.06, $p < .001$) and the indirect effect through hopelessness was not significant ($b = -0.006$, *SE* = 0.008, 95% CI [−0.03, 0.005]).

Exploratory Analyses: Comparing the Robustness of TB and PB as Suicide Risk Factors

PB and TB as individual mediators. Lastly, given prior research indicating that PB is a more potent correlate of suicidal thoughts and behaviors than TB (e.g., Bryan et al., 2010; Chu, Buchman-Schmitt, et al., 2016; Chu, Rogers, et al., 2016), we examined TB and PB as individual mediators of the relationship between NSSI history and SI, beyond age, sex, insomnia symptoms, and hopelessness. When PB was entered as an individual mediator, the direct effect of NSSI history on SI remained significant after accounting for PB ($b = 1.33$, *SE* = 0.19, $p < .001$). Additionally, the indirect effect of NSSI history on SI through PB, controlling for covariates, was significant and between 0.2912 and 1.7109 (95% CI; $b = 0.45$, *SE* = 0.19; $\kappa^2 = 0.07$; $R^2 = 0.03$); this indicates mediation. When depressive symptoms were covaried, the pattern remained the same; the direct effect was not significant ($b = 0.34$, *SE* = 0.33, $p = .31$) and the indirect effect of NSSI history on SI through PB was significant ($b = 0.32$, *SE* = 0.17; 95% CI [0.0789, 0.8459]).

When TB was entered as an individual mediator, the direct effect remained significant after accounting for TB ($b = 1.16$, *SE* = 0.19, $p < .001$) and the indirect effect of NSSI history on SI through TB, controlling for covariates, was also significant (95% CI [0.4274, 0.8369]; $b = 0.62$, *SE* = 0.10; $\kappa^2 = 0.10$; $R^2 = 0.04$). However, when depressive symptoms were included in this model, the indirect effect was no longer significant as the 95% CI crossed zero ($b = 0.004$, *SE* = 0.05; 95% CI [−0.0636, 0.1561]). Consistent with past research (Chu, Rogers, et al., 2016), this may suggest PB is a more robust correlate of SI than TB; however, given the limited sample size for these analyses, results should be interpreted with caution.

TB and PB moderating CS as mediator of NSSI and suicide attempt history. Lastly, we explored whether the interaction of CS and TB and the interaction of CS and PB would significantly mediate the relationship between NSSI and the number of prior SAs. Our results indicated that neither PB (index = 0.002, *SE* = 0.002; 95% CI [−0.0013, 0.0087]) nor TB (index = 0.004, *SE* = 0.001; 95% CI [−0.0005, 0.003]) individually moderated the mediating effect of CS on NSSI and SA history. In both cases, the mediating effect of CS was stronger at higher levels of PB (low PB: −0.005, moderate PB: 0.001, high PB: 0.06) and TB (low TB: −0.001, moderate TB: 0.001, high TB: 0.04).

³ Of note, hopelessness about feelings of TB and PB is a key component of the interpersonal theory (Van Orden et al., 2010). Previous studies have used general hopelessness (BHS) as a proxy for this component of the theory (Hagan et al., 2015). Thus, we also examined these two main models without the inclusion of hopelessness as a covariate and the pattern of findings remained unchanged. Given that general hopelessness is a robust predictor of ideation, we presented our main analyses with hopelessness as a covariate.

⁴ Given that depression is a robust suicide risk factor, we also conducted exploratory analyses to examine whether depression moderated the mediating effects of TB and PB on the relationship between NSSI history and SI. Depression did not emerge as a significant moderator of the mediating effects of TB (index = −0.0009, *SE* = 0.005; 95% CI [−0.0185, 0.0059]) or PB (index = 0.0088, *SE* = 0.01; 95% CI [−0.0157, 0.0440]).

Discussion

Consistent with the interpersonal theory's hypotheses (Joiner, 2005; Van Orden et al., 2010; see Chu et al., *in press* for review), our findings indicated that the interaction of thwarted belongingness and perceived burdensomeness only explained the relationship between NSSI and suicide attempt history among military service members and veterans with high levels of capability for suicide. Results also indicated that a history of NSSI was significantly associated with current thwarted belongingness, perceived burdensomeness, and suicidal ideation. Additionally, thwarted belongingness and perceived burdensomeness significantly accounted for the association between lifetime NSSI history and current suicidal ideation—a finding that suggests that these results may be applied to both young adult civilian (e.g., Assavedo & Anestis, 2016; Chu, Rogers, et al., 2016; Muehlenkamp & Gutierrez, 2007) and adult military and veteran populations. The present findings also highlight the specificity of the interpersonal theory variables as mediators since other notable suicide risk factors did not serve as significant explanatory mechanisms. Unexpectedly, and in contrast to the interpersonal theory's hypotheses, the mediating effect of perceived burdensomeness was not moderated by thwarted belongingness, and the mediating effect of thwarted belongingness was not moderated by perceived burdensomeness. Overall, our findings largely contribute to a mounting body of evidence indicating that the interpersonal theory may help explain the relationship between NSSI and suicide risk. Therefore, our results may have implications for research and clinical work among military service member and veteran populations.

First, the current findings indicate that NSSI serves to increase not only capability for suicide—likely by increasing familiarity with self-injury, pain, and death—but also thwarted belongingness and perceived burdensomeness. Moreover, our results indicated that the intersection of thwarted belongingness and perceived burdensomeness did not explain the relationship between NSSI and suicide attempt history among those with low levels of capability for suicide. This finding is in line with the interpersonal theory's conjectures that individuals who attempt near-lethal self-injurious behavior not only desire suicide but also possess the capability for suicide. This finding also suggests that among military service members and veterans, NSSI may be a distal risk factor for suicidal behavior. Specifically, NSSI may be explained by the simultaneous presence of the three interpersonal theory variables. As this is the first study to our knowledge to statistically examine the interpersonal theory variables as explanatory mechanisms between distal risk factors and suicidal behavior, it will be important for future studies to employ this approach across other populations to examine the roles of the interpersonal theory variables as proximal suicide risk correlates.

The connection between NSSI and capability for suicide has been examined regularly in the literature (e.g., Franklin et al., 2011). However, the associations between lifetime NSSI history and elevated thwarted belongingness and perceived burdensomeness are not well understood. Although the present study did not examine the mechanisms linking NSSI and interpersonal difficulties, several factors may explain these observed associations. For example, as mentioned previously, one function of NSSI is to obtain social reinforcement, and individuals engaging in NSSI may lack interpersonal effectiveness (Nock & Mendes, 2008; Nock &

Prinstein, 2004). Given that individuals with a history of NSSI report limited social support networks (Heath et al., 2009), NSSI may be related to diminished social functioning and subsequent increases in feelings of isolation and thwarted belongingness. Additionally, research has indicated that individuals engaging in NSSI are fearful of burdening close others (Rosenrot, 2015) and experience shame regarding their behavior (Brown et al., 2009). Feelings of shame are also associated with an increased likelihood of concealing mental illness from others (MacDonald & Morley, 2001) and may ultimately contribute to feelings of perceived burdensomeness. How NSSI increases thwarted belongingness and perceived burdensomeness will be an important topic for future research.

Contrary to expectations, neither perceived burdensomeness nor thwarted belongingness emerged as a significant moderator. The mediating role of perceived burdensomeness was significant at high and low levels of thwarted belongingness. Similarly, the mediating role of thwarted belongingness was also significant at high and low levels of perceived burdensomeness. In contrast to the propositions of the interpersonal theory, this finding suggests that the interaction of thwarted belongingness and perceived burdensomeness does not play a significant explanatory role. Rather, that both interpersonal theory of suicide variables emerged as mediators suggests that they do not significantly influence one another and that both feelings comparably explain the relationship between lifetime NSSI and suicidal ideation (cf. parallel mediation; Hayes, 2012).

Interestingly, this finding is consistent with other studies that have similarly investigated the mediating roles of thwarted belongingness and perceived burdensomeness in conferring suicide risk. For example, in a recent study of the relationship between sleep problems and suicidal ideation in three military service member and veteran samples, Hom, Chu, et al. (2017) found that thwarted belongingness and perceived burdensomeness emerged as significant parallel mediators. However, moderated mediation analyses indicated that perceived burdensomeness did not moderate the mediating role of thwarted belongingness (the study did not examine whether thwarted belongingness moderated the mediating role of perceived burdensomeness; Hom, Hames, et al., 2017). Apart from their study and ours, no other studies of which we are aware have employed moderated mediation analyses to examine the association between the interpersonal theory of suicide variables and other distal risk factors.

Importantly, our pattern of findings remained significant even after accounting for demographic variables and robust suicide risk factors. As noted above, insomnia symptoms and hopelessness are both robustly associated with increased feelings of thwarted belongingness and suicidal risk across populations (Acosta et al., 2012; Chu et al., 2015; Chu, Hom, Rogers, Ringer, et al., 2016; Nadorff et al., 2011), including samples of service members (Caldwell, Knapik, & Lieberman, 2017; Ribeiro, Pease, et al., 2012). That our results remained significant even after controlling for insomnia and hopelessness highlights the robustness of the interpersonal theory variables as mediators. Furthermore, our results also remained significant after controlling for depressive symptoms and symptoms of depression were not a significant mediator. These results are notable given the robust relationship between depressive symptoms and both NSSI and suicide risk (e.g., Asarnow et al., 2011; Hamza et al., 2012). However, as discussed earlier, the inclu-

sion of depressive symptoms significantly diminished power to detect effects and we were unable to covary for depressive symptoms in our model evaluating the relationship between NSSI and suicide attempt history—these factors limit results that include depression as a covariate. Thus, further work using larger samples is needed to examine the role of depressive symptoms in NSSI and suicidal symptoms.

Finally, in exploring whether perceived burdensomeness may be more robustly related to suicide risk than thwarted belongingness, our findings indicated that neither variable interacted with capability for suicide to significantly explain the relationship between NSSI and suicide attempt history. This finding does not support the hypothesis that perceived burdensomeness is a more robust risk correlate than thwarted belongingness. Nevertheless, we did find that thwarted belongingness was no longer a significant individual mediator beyond depressive symptoms, whereas the mediating effect of perceived burdensomeness remained a significant mediator. This latter result may indicate support for perceived burdensomeness as a more prominent explanatory link between NSSI and suicide risk among military and veteran populations. These mixed findings are further complicated by recent studies finding that thwarted belongingness may be an important explanatory factor in the relationship between insomnia severity and suicidal ideation in undergraduate (Chu, Hom, Rogers, Stanley, et al., 2017; Chu, Hom, Rogers, Ringer, et al., 2016) and military (Hom, Chu, et al., 2017) samples. Other studies testing the interpersonal theory have found support for thwarted belongingness and perceived burdensomeness as interactive indicators of suicidal desire (e.g., Anestis et al., 2015). Thus, it will be important to examine the source of these inconsistent findings through continued research testing the interpersonal theory across varying samples.

Clinical Implications

Our findings also have implications for clinical practice. The significant association found between lifetime NSSI and current severity of suicidal ideation emphasizes the potential importance of identifying and treating military service members and veterans with a history of NSSI, as they appear to be at increased risk of suicidal behavior. As revealed by our study and consistent with prior work (Chu et al., 2015), thwarted belongingness and perceived burdensomeness, specifically, may be useful to assess and monitor as signals of risk. They may also be key treatment targets for service members with an NSSI history (see Joiner et al., 2009, for a guide). Fortunately, evidence-based interventions exist that may help to address feelings of thwarted belongingness, including behavioral activation (Martell et al., 2001), interpersonal psychotherapy (Klerman & Weissman, 1994), and the cognitive-behavioral analysis system of psychotherapy (McCullough, 2003). Several empirically supported interventions may also be useful in targeting misperceptions that one's death is worth more than one's life (cf. perceived burdensomeness), including cognitive therapy (Brown et al., 2005) and dialectical behavior therapy (Linehan, 1993). By therapeutically impacting these significant mediators, risk for suicidal thoughts may then be mitigated in this population—the less that individuals are thinking about suicide, the less likely they are to engage in potentially lethal self-harm behaviors.

Limitations and Future Directions

This study is not without its limitations. First, data were collected exclusively via self-report measures. Given that military service members may be reluctant to disclose thoughts of suicide (Anestis & Green, 2015), the use of implicit measures of suicidality (e.g., Nock et al., 2010) should be considered for similar future studies.⁵ Second, as noted above, study data were aggregated across four independent investigations with distinct study designs, assessment methods, and sample populations, yielding a demographically and clinically heterogeneous study sample. Nonetheless, most samples were collected from the Southern U.S.; thus, our findings may not be broadly generalizable and require replication in representative military and veteran samples. Third, as noted previously, though we aimed to probe the temporal relationship between NSSI and subsequent suicidal ideation by examining lifetime NSSI as a predictor of past two weeks suicidal ideation, we were unable to account for suicidal ideation history (prior to the preceding two weeks) in our analyses. Therefore, detailed assessment of which construct temporally preceded the other will be important in enhancing our understanding of risk trajectories—and thus, intervention points—in this population (Bryan, Bryan, et al., 2015). Relatedly, our assessment of NSSI and suicide attempt history were limited to the single questions included in the MSRC's brief CDE assessment battery (Hom, Joiner Jr, & Bernert, 2016). Future studies may benefit from assessment of military members' onset, frequency, duration, and severity of NSSI because these factors may influence the degree of suicide risk (Nock et al., 2006). Finally, to fully test for mediation effects, additional assessment time points are required. This is particularly important given that the interpersonal theory specifically predicts that the intersection of the three interpersonal theory variables explains future suicidal behavior (Van Orden et al., 2010).

Despite a robust literature supporting the interpersonal theory of suicide and the association between NSSI and suicidal ideation and attempts, this investigation was the first to examine thwarted belongingness, perceived burdensomeness, and capability for suicide as explanatory links in this association. Although further investigation of these constructs using longitudinal study designs is needed, our results highlight important links between NSSI and suicide risk in service member and veteran populations and areas for further investigation.

⁵ A recent study found that there is no significant association between participants' history of suicidal ideation and implicit association tests of suicide and death in a large military sample (Chiurliza et al., 2016). However, given that Chiurliza et al.'s (2016) study was limited by the low severity of suicidal symptoms and the specificity of the sample (i.e., Army recruiters), more research is needed to determine the utility of implicit measures of suicide risk for a broader military service member and veteran population.

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Received February 2, 2017

Revision received September 12, 2017

Accepted September 14, 2017 ■

Risk Factors for the Transition from Suicide Ideation to Suicide Attempt: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS)

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Prior research has shown that most known risk factors for suicide attempts in the general population actually predict suicide ideation rather than attempts among ideators. Yet clinical interest in predicting suicide attempts often involves the evaluation of risk among patients with ideation. We examined a

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Army STARRS was sponsored by the Department of the Army and funded under cooperative agreement U01MH087981 (2009–2015) with the United States Department of Health and Human Services, National Institutes of Health, National Institute of Mental Health (NIH/NIMH). Subsequently, STARRS-LS was sponsored and funded by the Department of Defense (Uniformed Services University of the Health Sciences Grant HU0001-15-2-0004). The contents are solely the responsibility of the authors and do not necessarily represent the views of the Department of Health and Human Services, NIMH, the Department of the Army, the Department of Veterans Affairs, or the Department of Defense. A complete list of Army STARRS publications can be found at <http://www.STARRS-LS.org>. This work also was supported in part by funding from the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs (Award W81XWH-10-2-0181). Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the MSRC, the Department of Veterans Affairs, or the Department of Defense.

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number of characteristics of suicidal thoughts hypothesized to predict incident attempts in a retrospective analysis of lifetime ideators ($N = 3,916$) drawn from a large ($N = 29,982$), representative sample of United States Army soldiers. The most powerful predictors of first nonfatal lifetime suicide attempt in a multivariate model controlling for previously known predictors (e.g., demographics, mental disorders) were: recent onset of ideation, presence and recent onset of a suicide plan, low controllability of suicidal thoughts, extreme risk-taking or “tempting fate,” and failure to answer questions about the characteristics of one’s suicidal thoughts. A predictive model using these risk factors had strong accuracy (area under the curve [AUC] = .93), with 66.2% of all incident suicide attempts occurring among the 5% of soldiers with highest composite predicted risk. This high concentration of risk in this retrospective study suggests that a useful clinical decision support model could be constructed from prospective data to identify those with highest risk of subsequent suicide attempt.

General Scientific Summary

Suicide is a leading cause of death worldwide. One of the greatest challenges in this area is predicting which people who think about suicide will act on those thoughts and make a suicide attempt. In this study, we documented several characteristics of suicide-related thoughts that predict incident nonfatal suicide attempts with good accuracy.

Keywords: suicide, suicidal, Army, military, prediction

Suicide is among the leading causes of death worldwide (World Health Organization, 2017). In the United States, the suicide rate is especially high among military service members and veterans (Bossarte, Claassen, & Knox, 2010; Nock et al., 2013). Although the number of studies aimed at improving the understanding and prediction of suicidal behavior has increased dramatically over the past several decades (Franklin et al., 2017), the majority of studies seeking to predict suicidal behaviors have repeatedly examined the same, relatively small, set of risk factors (e.g., sociodemographics, mental disorders) in samples of the general population (Franklin et al., 2017). Recent research has shown that the majority of these risk factors are actually risk factors for suicide ideation in the total population rather than for suicide attempts among ideators (Nock, Borges, & Ono, 2012; Nock, Kessler, & Franklin, 2016). This is an important limitation, given that most suicide prevention efforts focus on the prevention of attempts among ideators.

The small amount of research that has been carried out on the prediction of suicide attempts among ideators suggests that a number of characteristics of suicidal thoughts are important (Ribeiro et al., 2016). Most notably, recent onset of suicidal thoughts, duration and uncontrollability of these thoughts, severity of ideation at its worst point, and presence of a suicide plan have all been found to predict increased risk of subsequent suicide attempts (Beck, Brown, Steer, Dahlsgaard, & Grisham, 1999; Joiner et al., 2003; Nock, Borges, Bromet, Alonso, et al., 2008). However, these findings have been mixed, perhaps due to the small and selected nature of the samples used in those studies (e.g., pediatric emergency patients, bipolar patients; Horwitz, Czyz, & King, 2015; Jiménez et al., 2016). It also has been proposed that engaging in dangerous and intentionally self-injurious behaviors is associated with increased risk of suicidal behaviors by removing the natural fear and aversion toward self-harm (Joiner, 2005). However, there is also a view that intentional nonsuicidal self-injury (NSSI) might be protective in that it can serve as an emotion regulation strategy that decreases a person’s risk for suicide (Suyemoto, 1998). Consistent with this view, a recent study of temporal sequences and trajectories of suicide-related thoughts and behaviors in a sample

of military personnel and veterans enrolled in college courses found that the transition time from suicide ideation to suicide attempt was significantly longer for those who engaged in NSSI compared with ideators without NSSI (Bryan, Bryan, May, & Klonsky, 2015).

The primary purpose of the current study was to examine the associations of these proposed predictors of first lifetime attempts among ideators in a much larger sample than in previous studies. Notably, most prior studies in this area have examined predictors of lifetime suicide attempt among clinical samples, rather than onset of a first suicide attempt in some general population, such as a large representative sample of Army soldiers. Our focus on the latter was intentional and designed to provide new information that could inform suicide prediction and prevention efforts.

The analysis was carried out in a representative sample of United States Army soldiers participating in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS; <http://starrs-ls.org>). In the interest of focusing on associations of self-injurious thoughts and behaviors (SITBs) with subsequent incident nonfatal suicide attempts beyond known risk factors, we controlled for sociodemographics, mental disorders, and other factors shown in a prior analysis of this sample to predict this outcome (Millner et al., in press, 2017). This allowed us to rule out the possibility that any observed association between SITBs and subsequent suicide attempts were due to these other predictors, such as the possibility that SITBs predict suicide attempt because both are caused by mental disorders. Given that different types of SITBs may be related, we examined associations of each SITB considered in the analysis both in isolation and in a multivariate model to determine unique associations involving each SITB type. Importantly, the data analyzed here were retrospective, which means that results need to be considered provisional due to the possibility of recall bias. However, the sample is the baseline for an in-progress follow-up survey that will make it possible subsequently to evaluate the replicability of the results found here in a prospective analysis.

Method

Sample

Data are from the Army STARRS Consolidated All-Army Survey (AAS), a study that combines three large survey samples, each administered to a large and representative sample of active duty soldiers. The first of these three surveys was the AAS, in which a sample of active duty soldiers (excluding those in basic combat training or deployed to a combat theater) completed a self-administered questionnaire (SAQ). The AAS sample was drawn in quarterly replicates during the years 2011–2012, with the addition of activated National Guard and Army Reserve (G/R) units in 2013. The AAS sample was stratified by Army Command-location. The survey was administered to all soldiers in units or subunits selected with probabilities proportional to authorized unit strength (excluding units with <30, which was the case for <2% of Army personnel). All soldiers in selected units were asked to attend an informed consent session (20.2% could not attend because of conflicting duty assignments) covering the study purpose, confidentiality, and voluntary participation before requesting: informed consent, linkage with administrative records (not used in the current study/report), and participation in future/longitudinal data collection. Most attendees at the consent sessions (95.0%) agreed to participate, 97.3% of consenters completed the survey, and 63.1% of completers consented to record linkage. In total, 17,462 AAS soldiers completed the survey and consented to administrative data linkage.

As noted in the previous paragraph, the main AAS excluded soldiers deployed to a combat theater. The second survey included in the Consolidated AAS was designed to fill that gap by administering the AAS questionnaire to soldiers in Kuwait waiting to be processed for transit to and from their middeployment leave to Afghanistan. In addition to the difference in location of the survey, the sampling differed in that the sample selected individual soldiers rather than units. Each day during the field period, a sample of soldiers either transitioning out of or back into Afghanistan was selected at the airport and recruited in a group session to participate in the survey using the same procedures as in the main AAS. As in the main AAS, most soldiers (80.9%) provided informed consent, 86.5% of consenters completed the survey, and 55.6% of completers provided record linkage. In total, 3,987 soldiers completed the survey and provided consent for administrative data linkage.

The third survey included in the Consolidated AAS was the baseline wave of the longitudinal STARRS Pre-Post Deployment Survey (PPDS) of soldiers in three Brigade Combat Teams who were assessed before deploying to Afghanistan and then again three times after returning from deployment. Recruitment, consent, and data collection procedures were the same as in the other two surveys. Most soldiers invited to participate in the baseline PPDS attended the consent session (96.7%), 98.7% of those attending provided informed consent, 99.2% of consenters completed the survey, and 90.9% of completers providing record linkage. In total, 8,558 soldiers completed the baseline PPDS survey and providing consent for administrative data linkage.

Study procedures were approved by all collaborating organizations involved in this research. Survey responses of soldiers agreeing to administrative data linkage were doubly weighted before

combining to adjust for discrepancies between the sample and population. The first weight (W1) adjusted for differences in survey responses between the respondents who agreed to record linkage and those who did not. The second weight (W2) adjusted for differences in administrative record profiles of weighted (W1) survey completers with record linkage and the target population. The latter weight adjusted the sample to be representative of all active duty soldiers during the years 2011–2012 on the cross-classification of sociodemographics (age, sex, race-ethnicity, education, marital status), command (e.g., Forces Command, Training and Doctrine Command, Reserve Command, Component Commands), occupation (Combat Arms, Combat Support, Combat Service Support), rank (E1-E4, E5-E9, W1-W4, O1-O10), and deployment status history (never-deployed, currently deployed, previously deployed). The doubly weighted ($W1 \times W2$) data were combined to create the Consolidated AAS. A more detailed description of AAS weighting is presented elsewhere (Kessler, Heeringa, et al., 2013). Finally, participants ($n = 25$) with unknown survey dates were omitted from the final analytic sample.

Measures

SITB. SITBs were measured using a modified version of the Columbia Suicidal Severity Rating Scale (Posner et al., 2011). The assessment began by asking about lifetime occurrence and age-of-onset (AOO) of suicide ideation (Did you ever in your life have thoughts of killing yourself? Did you ever wish you were dead or would go to sleep and never wake up?), suicide plans (Did you ever think of how you might kill yourself [e.g., taking pill, shooting yourself] or work out a plan of how to kill yourself?), and suicide attempts (Did you ever make a suicide attempt; that is, purposefully hurt yourself with at least some intention to die?). Suicide plan and attempt were only assessed among those who reported lifetime suicide ideation. We also assessed several characteristics of suicide ideation hypothesized to predict subsequent suicide attempt: worst-week duration of suicide ideation (i.e., “Think of the one week in your life when you thought most about killing yourself or wanting to be dead. How many days during that worst week did you have those thoughts?” and “How long during that worst week did those thoughts usually last on the days you had them?” which were combined to produce one duration variable) and worst-week controllability of suicide ideation (i.e., “During that worst week, how easy was it for you to control those thoughts or push them out of your mind when you wanted to?”). We also assessed two forms of self-harm behavior that we hypothesized would predict suicide attempts: extreme risk-taking or tempting fate (i.e., “People who wish they were dead or think about killing themselves sometimes do dangerous things as a way to tempt fate (e.g., take a lot of drugs, drive too fast, volunteer for dangerous missions, or act recklessly). How often in your life did you ever do dangerous things related to wishing you were dead?”) and NSSI (i.e., “Did you ever do something to hurt yourself on purpose, but without wanting to die [e.g., cutting yourself, hitting yourself, or burning yourself]?”).

Mental disorders. We assessed lifetime prevalence and age of onset of five internalizing disorders (major depressive episode, bipolar disorder [BPD], panic disorder [PD], generalized anxiety disorder, posttraumatic stress disorder [PTSD]) and three externalizing disorders (attention-deficit/hyperactivity disorder [ADHD],

intermittent explosive disorder [IED], and substance use disorders [SUDs]). The Composite International Diagnostic Interview (CIDI; Kessler & Üstün, 2004) screening scales were used to assess BPD, PD, and IED, along with ADHD in the 6 months before SAQ completion. All other disorders were assessed with a modified self-report version of the Family History Screen (FHS; Weissman et al., 2000). The CIDI screening scales have good concordance with independent clinical diagnoses ($AUC = .69-.79$ across diagnoses; Kessler, Santiago, et al., 2013). The FHS also has been shown to have good concordance with clinical diagnoses (Weissman et al., 2000); however, the modified version used here yielded implausibly high prevalence estimates and so the diagnoses based on the FHS should be considered combinations of threshold and subthreshold disorders.

Army career variables. We examined three Army career variables: component (Regular Army vs. Reserve component [i.e., activated G/R]), Military Occupational Specialty (MOS) collapsed into the broad categories of combat arms, combat support, and combat service support, rank (junior enlisted E1-E4, senior enlisted E5-E9, and officers [combining Warrant officers and Commissioned officers]), and deployment status history (never deployed to a combat theater, currently deployed, previously deployed). Consistent with prior research on differences in health across different occupations (Gubata, Piccirillo, Packnett, & Cowan, 2013; Lindstrom et al., 2006; Niebuhr et al., 2011), we grouped soldiers into three types of occupations: combat arms (involved directly in ground combat), combat support (provide operational assistance to combat arms), and combat service support (all other occupations; Kirin & Winkler, 1992; Layne, Naftel, Thie, & Kawata, 2001).

Analysis Methods

We first examined the probability and speed of transitioning from suicide ideation to subsequent suicide attempt among all soldiers. We then used discrete-time survival analysis with person-year the unit of analysis, time-varying predictors, and a logistic link function (Efron, 1988) to examine associations of predictors with first lifetime onset of suicide attempt ($n = 803$) among those with suicide ideation ($N = 3,916$). Notably, we assessed AOO for all predictor variables examined and they were considered to have been present only if their AOO occurred before the outcome being predicted in each model, with the exception of ideation duration, controllability, and tempting fate. Therefore, these last three variables can only be considered correlates of (not risk factors for) the outcomes of interest. We estimated a series of multivariate models that included the hypothesized risk factors (i.e., mental disorders, characteristics of suicide ideation, and self-harm behaviors) after statistically controlling for a number of known risk factors including: time since onset of ideation, presence of a suicide plan, time since onset of the plan, and a range of sociodemographic (i.e., sex, race, marital status) and Army history (i.e., timing of enlistment, years of service, Army component, rank, MOS, and deployment history) factors documented to be significant predictors of suicidal behavior in our prior work (Millner et al., in press, 2017). We examined the association between each hypothesized risk factor and the presence of suicide attempts: (a) after controlling for these previously studied factors (gross models), and (b) all together in a final multivariate model including all putative risk factors (net

model) in order to examine the unique association between each factor and the occurrence of suicide attempts.

Survival coefficients in all models were exponentiated to create odds ratios (ORs) with 95% confidence intervals. As the survey data are both clustered and weighted, the design-based Taylor series linearization method was used to produce standard errors (Wolter, 1985). Design-based F tests were used to evaluate the significance of predictor sets, with numerator degrees of freedom equal to the number of variables in the set and denominator degrees of freedom equal to the number of sampling error calculation units (SECUs; $n = 395$) with observed attempted suicides minus the sum of primary sample units from which these SECUs were selected ($n = 208$) and one less than the number of variables in the predictor set (Reed, 2007), resulting in 188 denominator degrees of freedom in evaluating univariate associations and fewer in evaluating multivariate associations.

The ORs from the multivariate models described above provide information about the magnitude of the individual-level associations between risk factors and suicide attempts, but do not take into account the prevalence of each predictor or overlap among these predictors. We did this by calculating population attributable risk proportions (PARPs), which represent the proportions of suicide attempts that would be prevented if each set of risk factors were prevented assuming a causal association between risk factor and outcome.

Finally a predicted probability of making a nonfatal attempt among ideators was generated for each respondent from Net model coefficients. A receiver-operating characteristic (ROC) curve was estimated from these predicted probabilities and an area under the ROC curve (AUC) was calculated to quantify the accuracy of the model predictions. We evaluated the sensitivity and positive predictive values at the 1%, 5%, and 10% threshold of respondents with highest predicted probabilities to determine how well the model performs in identifying cases of suicide attempt among ideators. Sensitivity was the proportion of observed attempts found among the 1%, 5%, and 10% of respondents with highest predicted probabilities. Positive predictive value was the prevalence of suicide attempt among these respondents. We used replicated ten-fold cross-validation with 20 replicates (i.e., 200 separate estimates of model coefficients) to correct for the overestimation of prediction accuracy when both estimating and evaluating model fit (Smith, Seaman, Wood, Royston, & White, 2014).

Results

Descriptive Statistics

As we noted in a previous report, a weighted 13.7% ($N = 3,916$) of consolidated AAS respondents had a lifetime history of suicide ideation and 20.5% ($n = 803$) of lifetime ideators made one or more lifetime suicide attempts subsequent to the onset of ideation (Millner et al., 2017). Median (interquartile range) AOO was 17 (15–23) in the total sample ($N = 3,916$), 17 (14–22) among ideators who later made a suicide attempt ($n = 803$), and 17 (15–23) among ideators who did not. Median duration (in years) between onset of ideation and first attempt was 0 (0–2) years. Median duration between onset of a plan and first attempt was 0 (0–0) years. Median AOO of suicide attempt was 18 (15–23). The

distribution of demographic and Army career variables at the AOO of all suicide ideators is presented in the [Appendix \(Table A1\)](#).

Probability and Speed of Transition From Ideation to First Lifetime Attempt

More than half (68.2%) of the observed transitions from suicide ideation to first suicide attempt occur in the year of onset of ideation and more than three quarters (91.1%) occur in the first five years after onset of ideation. Notably, these trends differ depending on whether or not the ideation is accompanied by a plan and whether the plan began in the same year as the ideation or only after the ideation ([Figure 1](#)). Among ideators who develop a plan in the same year as the onset of their ideation, 28.4% make an attempt at the AOO of the plan and 35.3% within five years of onset of the plan. Among ideators who develop a plan in a year after the AOO of their ideation, 19.9% make an attempt at the AOO of the plan and 25.2 within five years of onset of the plan. Among ideators without a plan, 6.9% make an attempt at the AOO of ideation and 9.3% do so within five years of onset of ideation.

Evaluation of the joint predictive effects of these factors along with AOO of ideation shows that AOO of ideation is not a significant predictor of a subsequent attempt ($F_{2,186} = 1.0, p = .36$) and that information about the presence and timing of AOO of a plan relative to AOO of ideation is significant ($F_{5,183} = 138.3, p < .001$). The year of highest odds of onset of a first attempt is the year of onset of a plan among soldiers whose plan began at the AOO of ideation ($OR = 5.6$) followed by the year of onset of a plan among soldiers whose plan began at a later year than their AOO of ideation ($OR = 3.6$), followed by the year of onset of ideation among soldiers without a plan ($OR = 1.0$). Conditional odds of making a first attempt in later years are dramatically lower both among soldiers with ($OR = 0.6$ – 0.6) and without ($OR = 0.1$)

a plan. In addition, there is a meaningfully negative time trend in odds of incident attempts in the years after onset of ideation and plans ($F_{3,185} = 12.7, p < .001$).

Predictors of the Transition From Ideation to Attempt

The associations between each set of the putative risk factors and the transition from suicide ideation to first suicide attempt are presented in [Table 1](#). In the gross models, we examined the association between each set of risk factors shown (entered one set at a time) after adjusting for sociodemographic and Army history factors documented in our prior work ([Millner et al., in press, 2017](#)) as well as for time-since-onset of ideation and plan. In the net model we entered all of these variables simultaneously in one multivariate model to examine the unique association between each predictor and the transition from ideation to attempt.

Several important predictive associations are observed in the gross models. Five of the eight mental disorders examined are significantly associated with the onset of a suicide attempt, with effect sizes ranging from $OR = 1.3$ for PTSD to $OR = 2.1$ for substance use disorder. In the case of worst-week suicide ideation, associations are small and insignificant for shorter durations of ideation, but become larger and statistically significant if lasting more than five hours, with OR s increasing monotonically as the number of days with ideation increase from 1–3 days/week ($OR = 2.6$), to 4–6 days/week ($OR = 2.9$), to 7 days/week ($OR = 3.6$). There also is a significant association between not answering this survey item and odds of suicide attempt ($OR = 5.9$). A similar pattern is observed in the case of worst-week controllability of suicidal thoughts, such that there are small and nonsignificant OR s among those who do not find it difficult to control their suicidal thoughts, but larger, significant, and increasing OR s for those who report it is “very difficult” ($OR = 2.4$) or “impossible” ($OR = 3.4$)

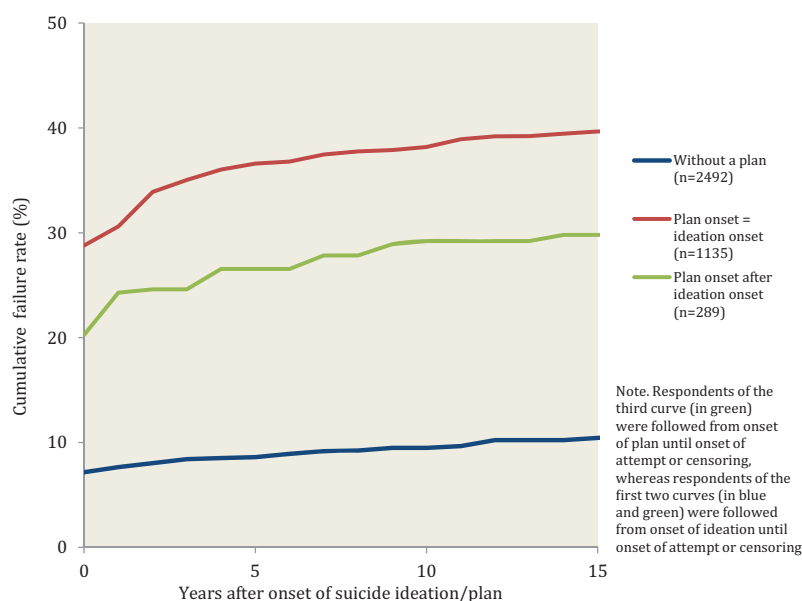


Figure 1. Probability and timing of transition to first suicide attempt among lifetime ideators ($N = 3,916$). See the online article for the color version of this figure.

Table 1
Predictors of Suicide Attempt Among Ideators

Predictors	Gross models		Net model	
	OR	95% CI	OR	95% CI
Mental disorders				
Major depressive episode (SC)	1.5*	[1.2, 1.9]	1.4*	[1.1, 1.8]
Generalized anxiety disorder (SC)	1.0	[.8, 1.3]	1.0	[.8, 1.2]
Posttraumatic stress disorder (SC)	1.3*	[1.1, 1.7]	1.3*	[1.0, 1.7]
Bipolar disorder	1.2	[.9, 1.8]	1.1	[.7, 1.6]
Panic disorder	1.7*	[1.2, 2.5]	1.4	[1.0, 2.0]
Intermittent explosive disorder	1.4*	[1.1, 1.8]	1.4*	[1.1, 1.8]
Attention deficit hyperactivity disorder	.8	[.6, 1.1]	.6*	[.5, .9]
Substance use disorder (SC)	2.1*	[1.5, 2.9]	1.7	[1.2, 2.3]
$F_{8,180}$	11.3*	<.001	6.3*	<.001
Worst week ideation duration (reference: just a few minutes, during 1 day)				
Just a few min, during 2–3 days	1.3	[.4, 3.6]	1.0	[.4, 2.5]
Just a few min, during 4+ days	.9	[.3, 2.6]	.6	[.2, 1.6]
Less than 1 to 4 hr, during 1 day	1.7	[.7, 4.1]	1.5	[.7, 3.0]
Less than 1 to 4 hr, during 2–3 days	1.3	[.4, 3.9]	.9	[.3, 2.5]
Less than 1 to 4 hr, during 4–6 days	1.7	[.7, 3.8]	1.0	[.5, 2.2]
Less than 1 to 4 hr, during 7 days	1.8	[.6, 5.3]	.8	[.3, 2.3]
More than 5 hr, during 1–3 days	2.6*	[1.1, 6.3]	1.4	[.6, 3.1]
More than 5 hr, during 4–6 days	2.9	[1.0, 8.6]	1.1	[.4, 3.3]
More than 5 hr, during 7 days	3.6*	[1.3, 10.4]	1.1	[.4, 2.9]
Missing	5.9*	[1.9, 18.6]	6.7*	[2.5, 18.3]
$F_{10,178}$	12.0*	<.001	8.3*	<.001
Controllability of thoughts during worst week (reference: easy)				
A little difficult	.9	[.6, 1.3]	1.1	[.7, 1.6]
Somewhat difficult	1.3	[.9, 1.9]	1.4	[.9, 2.2]
Very difficult	2.4*	[1.6, 3.7]	2.3*	[1.4, 3.5]
Impossible	3.4*	[2.0, 5.8]	3.0*	[1.9, 4.9]
$F_{4,184}$	15.4*	<.001	7.1*	<.001
Frequency of tempting fate (reference: never)				
Rarely	1.5*	[1.2, 2.0]	1.6*	[1.2, 2.1]
Sometimes	2.1*	[1.6, 2.8]	1.7*	[1.2, 2.5]
Often	3.3*	[2.3, 4.9]	2.7*	[1.7, 4.1]
$F_{3,185}$	6.0*	<.001	6.4*	<.001
Nonsuicidal self-injury	1.5*	[1.2, 1.9]	1.0	[.8, 1.3]

Note. $N = 3,916$. There are 395 sampling error calculation units and 208 primary sampling units (i.e. a net difference of 187). OR = odds ratio; CI = confidence interval; SC = disorders assessed with screening questions.

* < .05.

to control their thoughts of suicide. Engaging in behavior that tempted fate ($ORs = 1.5$ – 3.3) and engaging in NSSI ($OR = 1.5$) also are associated with significantly increased odds of transitioning from suicide ideation to attempt.

In the net model that includes all risk factors simultaneously, most ORs are slightly attenuated compared with in the gross models, whereas others decrease substantially and are no longer significantly predictive of suicide attempts. ORs are largely unchanged for mental disorders, with three of the initial five disorders being significantly associated with suicide attempt, and now the (negative) association between ADHD and suicide attempt is significant ($OR = 0.6$). The effects of worst-week ideation duration are largely gone (with the only remaining significant effect for having missing data on this item), as are the association between NSSI and suicide attempt. In contrast, the ORs are only slightly attenuated for controllability of ideation and tempting fate. This pattern of findings suggests that mental disorders, controllability of suicidal thoughts, and engaging in behavior that tempts fate all contribute uniquely (relative to the other variables in the model) to the transition from suicide ideation to suicide attempt. Duration of

suicide ideation (which is strongly correlated with controllability; $r = .48$) and NSSI (which is significantly associated with tempting fate; $r = .17$) are not predictive when these other variables are taken into account.

PARPs

As noted above in the Analysis Methods section, PARPs represent the proportions of observed cases of suicide attempt among ideators that would be prevented if specific predictor variables were prevented based on the assumption that the ORs for these predictors represent causal effects. Focusing first on the PARPs for the gross models, we estimate that approximately 54% of suicide attempts among ideators are associated with having a suicide plan, 43% are associated with prior mental disorders, 61% with ideation duration, 40% with ideation controllability, 42% with tempting fate, and 11% with NSSI (Table 2). As in the predictive models described above, these effects are attenuated in the net model, with the strongest effects observed for suicide plan (47%), ideation controllability (39%), and tempting fate (38%). Assuming that

Table 2
PARP for Suicide Attempt Among Ideators

Risk factor	Gross models PARP (%)	Net model PARP (%)
Suicide plan	53.5	47.2
Mental disorders	42.8	27.5
Ideation duration	60.5	8.8
Controllability	39.6	38.6
Tempting fate	42.0	37.8
Nonsuicidal self-injury	10.6	1.0
All of the above		86.2

Note. $n = 803$ observed suicide attempts in this sample of $N = 3,916$ ideators. PARP = population attributable risk proportion.

these are causal associations, preventing these predictors from occurring or blocking their effects would prevent 86% of suicide attempts among ideators.

Prediction Accuracy in the Net Model

We evaluated the predictive accuracy of our final net model by calculating individual-level predicted probabilities with 20 replicates of ten-fold cross-validation and then estimating ROC curves and AUC based on these predictive probabilities. The overall estimated AUC was .93, meaning that if we used the results of this model to classify two randomly selected respondents, one ideator who made an attempt and one who did not, we would classify them correctly 93% of the time (Figure 2). The 1% of respondents with the highest predicted probability of suicide attempt (according to our model) include 30.0% of all attempters (sensitivity; Table 3). The 5% of respondents with the highest probability include 66.2% of all attempters, and the top 10% include 80.2% of all attempters. Positive predictive value (the proportion of predicted positives

Table 3
Concentration of Risk of Suicide Attempt Among Ideators: Weighted Analysis

Percentile	Simulated sample ($N = 690,500$)			
	Sensitivity		Positive predictive value	
	% of suicide attempts	SE	% with suicide attempt	SE
Top 99th percentile	30.0	2.9	39.5	3.1
Top 98th percentile	44.2	2.9	32.5	2.2
Top 97th percentile	55.8	3.1	28.8	1.7
Top 96th percentile	61.4	3.0	25.1	1.4
Top 95th percentile	66.2	3.1	22.4	1.3
Top 90th percentile	80.2	2.2	14.9	.8

Note. Estimates calculated from 20 replicates of 10-fold cross-validation of the final model.

who made an attempt) for the top 1%, 5%, and 10% are 39.5%, 22.4%, and 14.9%, respectively.

Discussion

There are three key findings from this study. First, we identified several different characteristics of suicidal thinking that are associated with increased risk of suicide ideators making incident suicide attempts: recency of ideation onset, presence of a suicide plan, and worst-week duration and controllability of suicidal thoughts. Second, we found that two self-harm-related behaviors, tempting fate and NSSI, were associated with increased risk of incident suicide attempts among ideators. Third, we found that, as a group, all the risk factors studied here predicted which people with suicide ideation went on to make a suicide attempt with a

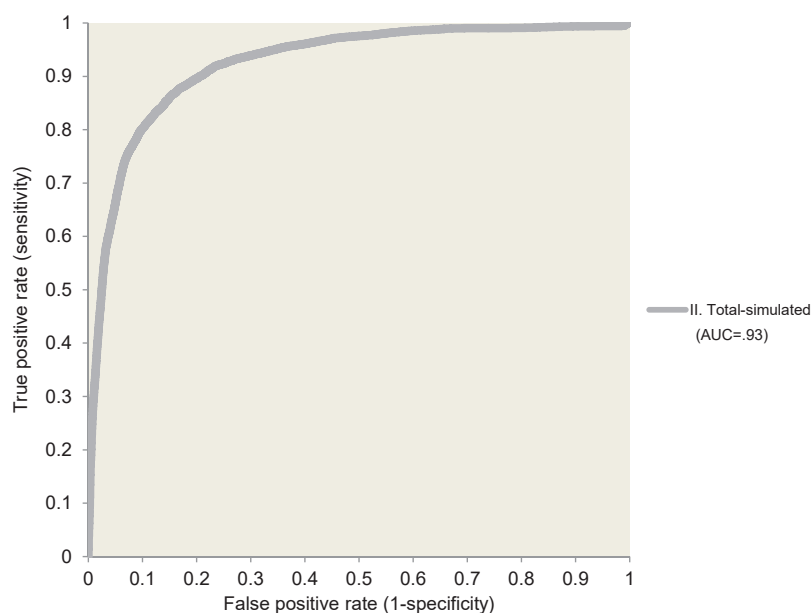


Figure 2. ROC curve for final model predicting suicide attempts among ideators, simulated sample of full person-year file, weighted analysis ($n = 690,500$). See the online article for the color version of this figure.

fairly high degree of accuracy ($AUC = .93$). Each of these findings warrants additional comment.

For decades, theories of suicidal behavior have proposed that the risk factors for suicide ideation differ from those for suicide attempt (Joiner, 2005; Mann, Waternaux, Haas, & Malone, 1999; Shaffer, Pfeffer, & the American Academy of Child and Adolescent Psychiatry, 2001). Prior research has supported this idea by showing that most risk factors for suicide attempt and death actually predict suicide ideation, but *not* the transition from suicidal thought and behavior (Nock, Borges, Bromet, Cha, et al., 2008; Nock et al., 2016). Factors predicting the latter transition have been much more difficult to identify. As such, the identification in this study of several characteristics of suicidal thinking that predict this transition is an important finding. The findings that recent onset of suicide ideation and the presence of a suicide plan predict suicide attempts among ideators is consistent with results from prior studies (Nock, Borges, Bromet, Alonso, et al., 2008; Nock et al., 2012). New findings in this study are that worst-point duration and controllability of suicide ideation statistically predict the transition to suicide attempt. Specifically, relatively brief periods of suicidal thinking lasting <5 hr are not associated with an increased risk of going on to make a suicide attempt, whereas longer periods of time are. If replicated in a prospective study, this finding would have important clinical implications regarding the prediction of suicide attempts. It is perhaps not surprising that greater duration of suicide ideation also is strongly associated with greater difficulty controlling suicidal thoughts, but less intuitive is the finding that when examined together, it is controllability that is the significant predictor of suicide attempts—even after controlling for mental disorders—suggesting that controllability is an especially important clinical predictor of suicidal behavior.

It also is noteworthy that a refusal to answer the question about duration of suicidal thinking had an especially strong association with subsequent risk of suicidal behavior. This finding is in line with those from a recent study showing that those who choose not to answer questions about suicide show elevated scores on other measures of suicide risk (Podlogar et al., 2016). These findings suggest that nonresponse to questions about suicidal thinking may provide useful information in the prediction of suicidal behavior. This important finding should be followed up in future studies and, if replicated, should factor into clinical risk assessments.

Researchers and clinicians have long sought to understand what psychological or behavioral factors might increase the risk of acting on one's suicidal thoughts. It has been suggested that the tendency or willingness to intentionally hurt oneself (in the form of NSSI) or engage in potentially harmful behaviors (in the form of risk-taking) may increase the risk of suicide attempt (Ammerman, Steinberg, & McCloskey, 2016; Ribeiro et al., 2016). The current study suggests that extreme risk-taking, or tempting fate, and NSSI are significant predictors of the transition from suicidal thought to suicidal action. Importantly, tempting fate was an especially strong predictor of this transition and was one of the few significant predictors in the final multivariate model, whereas NSSI was not. Indeed, the single-item assessment of tempting fate used in this study was more strongly associated with suicide attempt among ideators than each of the mental disorders examined in this study and had a larger association with suicide attempt in the PARP calculations than did all mental disorders combined. To our knowledge, this is the first study to examine the role of tempting fate in

predicting suicidal behavior. As such, additional studies are needed to test the reliability and generality of this association, and if supported, to better understand how and why tempting fate is associated with this risk.

The ultimate goal of this line of work is to improve the prediction and prevention of suicidal behavior. Toward this end, the finding in this study that nearly nine out of 10 (86%) suicide attempts among ideators are attributable to this relatively small handful of risk factors suggests that they may be useful in improving the prediction of suicide attempts. Moreover, the finding that an algorithm using these factors identified a small proportion of soldiers with suicide ideation who account for the majority of subsequent suicide attempts suggests that these risk factors can help with clinical prediction of such behavior. On balance, however, only 39.5% of the soldiers in the highest-risk group identified by the model (top 1% of risk scores) went on to make a suicide attempt, a false positive rate that presents a significant challenge to the current feasibility of using such an algorithm in actual clinical settings (Nielssen, Wallace, & Large, 2017; Quinlivan et al., 2017). Although the results of the current study represent a significant advance in the understanding and prediction of suicidal behavior, we need much greater understanding and accuracy to aid prediction and prevention efforts.

The results of this study should be interpreted in the context of six important limitations. The most obvious of these is that the analysis was based on retrospective data. Recall error and differential survivorship could have biased results. Moreover, several key predictors (ideation duration, controllability, and tempting fate) were not time stamped and could have occurred after respondents' first lifetime suicide attempt—in which case they would represent correlates of making a suicide attempt, but not necessarily predictors of that outcome. As a result, it will be important to evaluate the consistency of these results in future prospective studies that carefully document the time of onset of each predictor and outcome. Second, the response and linkage rates were relatively low, limiting inferences that can be made about the external validity of these findings to other Army soldiers. Poststratification was used to adjust for differences between the sample and the population; however, this limitation remains a concern. Third, it is likely that respondents underreported suicidal thoughts and behaviors due to concerns about confidentiality or stigma (Zinzow et al., 2013) and/or displayed errors or bias in their recollections of the timing of the AOO of suicidal thoughts and behaviors. Both concerns would introduce imprecision into our predictive models. Fourth, although we included a large number of covariates in our models, we included a relatively small set of types of SITBs that might predict the transition from suicide ideation to suicide attempt. Therefore, it will be important to test the associations between other SITBs (e.g., preparatory behavior, interrupted/aborted suicide attempt) and suicide attempts in future studies. Fifth, we used screeners rather than full diagnostic interviews to assess mental disorders. Although several of these screeners showed acceptable-to-good concordance with full diagnostic interviews, some had lower concordance rates (with implausibly high prevalence estimates) and so should be considered combinations of threshold and subthreshold disorders. Sixth, because the focus of this study was on Army soldiers, the generality of these findings to other populations also is not known. Prior studies have revealed that there is much overlap between the risk factors for

suicidal behavior between service members and civilians (Nock et al., 2013); nevertheless, the replication of these results in other populations represents an important goal for future research, as some differences in risk factors between service members and civilians have been observed (Nock et al., 2014; Ursano et al., 2016).

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Appendix

Table A1

Distribution of Demographic and Army Career Characteristics at the Age of Onset, Among Ideators in the Full AAS Consolidated Sample: Weighted Analysis

	Total sample (<i>N</i> = 3,916)		No attempt (<i>n</i> = 3,113)		Attempt (<i>n</i> = 803)	
	%	<i>SE</i>	%	<i>SE</i>	%	<i>SE</i>
Demographics						
Age						
≤14	22.8	.9	21.7	1.2	27.1	2.7
15–17	29.9	1.4	29.4	1.3	31.9	3.0
≥18	47.3	1.2	48.9	1.4	41.0	2.6
Sex: Female	19.7	1.1	18.5	1.0	24.2	2.4
Race						
White	66.8	1.3	67.5	1.6	64.4	2.3
Black	15.2	.7	15.1	.9	15.8	2.0
Hispanic	10.9	1.1	10.9	1.4	10.8	1.6
Other	7.0	.6	6.5	.6	9.1	1.5
Army characteristics						
Preenlistment	63.8	1.1	63.3	1.4	66.0	2.3
Postenlistment: Before 2000	2.9	.4	3.3	.5	1.6	.6
Postenlistment: After 2000	33.2	1.0	33.5	1.2	32.4	2.2
Component: RA vs. G-R						
MOS ^a						
Combat arms	33.2	2.2	33.2	2.1	33.2	6.1
Combat support	23.8	1.9	23.6	1.9	24.9	4.5
Combat service support	42.9	2.2	43.2	2.1	41.9	4.8
Rank ^a						
Junior	54.3	1.8	52.2	2.3	63.1	5.5
Senior	31.9	1.6	33.0	2.1	27.4	5.5
Officer	13.8	1.5	14.8	1.6	9.5	2.4
Deployment ^a						
Currently	8.0	1.1	8.9	1.2	4.8	1.8
Previously	36.9	2.3	38.3	2.7	31.3	2.7
Never	21.4	1.8	20.3	1.9	26.1	4.7
Unknown (before 2000)	33.5	2.4	32.5	2.4	37.7	5.4

Note. AAS = All Army Survey; RA = Regular Army; G-R = National Guard and Army Reserve; MOS = Military Occupational Specialty.

^a There were *N* = 1,332 respondents who had enlisted in the Army by the age of their ideation onset. Of enlisted ideators, there were *n* = 1,101 who did not make a subsequent suicide attempt and *n* = 231 who made a suicide attempt.

Received May 15, 2017

Revision received August 15, 2017

Accepted August 17, 2017 ■

RESEARCH ARTICLE

Open Access



Improving risk prediction accuracy for new soldiers in the U.S. Army by adding self-report survey data to administrative data

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Abstract

Background: High rates of mental disorders, suicidality, and interpersonal violence early in the military career have raised interest in implementing preventive interventions with high-risk new enlistees. The Army Study to Assess Risk and Resilience in Servicemembers (STARRS) developed risk-targeting systems for these outcomes based on machine learning methods using administrative data predictors. However, administrative data omit many risk factors, raising the question whether risk targeting could be improved by adding self-report survey data to prediction models. If so, the Army may gain from routinely administering surveys that assess additional risk factors.

Methods: The STARRS New Soldier Survey was administered to 21,790 Regular Army soldiers who agreed to have survey data linked to administrative records. As reported previously, machine learning models using administrative data as predictors found that small proportions of high-risk soldiers accounted for high proportions of negative outcomes. Other machine learning models using self-report survey data as predictors were developed previously for three of these outcomes: major physical violence and sexual violence perpetration among men and sexual violence victimization among women. Here we examined the extent to which this survey information increases prediction accuracy, over models based solely on administrative data, for those three outcomes. We used discrete-time survival analysis to estimate a series of models predicting first occurrence, assessing how model fit improved and concentration of risk increased when adding the predicted risk score based on survey data to the predicted risk score based on administrative data.

Results: The addition of survey data improved prediction significantly for all outcomes. In the most extreme case, the percentage of reported sexual violence victimization among the 5% of female soldiers with highest predicted risk increased from 17.5% using only administrative predictors to 29.4% adding survey predictors, a 67.9% proportional increase in prediction accuracy. Other proportional increases in concentration of risk ranged from 4.8% to 49.5% (median = 26.0%).

Conclusions: Data from an ongoing New Soldier Survey could substantially improve accuracy of risk models compared to models based exclusively on administrative predictors. Depending upon the characteristics of interventions used, the increase in targeting accuracy from survey data might offset survey administration costs.

Keywords: Army, Military, Predictive modeling, Risk assessment, Violence, Sexual assault

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Background

Concerns exist about high rates of interpersonal violence, mental disorders, and suicidality among U.S. Army soldiers [1–4]. Although intensive preventive interventions have been developed in the civilian population and shown to reduce risk of some of these outcomes, including those involving physical and sexual violence (e.g., [5, 6]), cost-effective implementation of these interventions would require that they be delivered only to soldiers judged to be high-risk. It has been shown that useful risk targeting systems can be developed for these outcomes based on administrative data available for all U.S. Army soldiers using machine learning methods, with the small proportions of soldiers predicted to be at high risk by these systems accounting for substantial proportions of subsequently observed instances of the outcomes [7–13]. However, many known risk factors for these outcomes are not assessed in Army administrative records, raising the possibility that risk targeting could be improved by expanding the predictor sets to include information from such additional data sources as self-report surveys [13] and social media postings [14].

Given that the risk of many negative outcomes, including involvement in physical and sexual violence [4, 15, 16], is especially high in the early years of Army service, a survey carried out at the beginning of service might be especially useful in providing information that would help increase the accuracy of risk-targeting beyond the accuracy achieved by exclusively using administrative data as predictors. A New Soldier Survey (NSS) of this sort was administered as part of the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS) [17]. As reported previously [13], prediction models derived from NSS data found that the small proportions of new soldiers judged to be at high risk based on NSS predictors accounted for relatively high proportions of attempted suicides, psychiatric hospitalizations, positive drug screens, and several types of violent crime perpetration and victimization. For example, the 10% of new male soldiers estimated in cross-validated models to have highest risk of major physical violence perpetration in the early years of service accounted for 45.8% of actual acts of major physical violence in the sample.

To date, no results have been reported about the extent to which information obtained in the NSS could be used to increase the accuracy of predictions based exclusively on administrative data. Such increases might be especially large early in the Army career, when administrative data are sparse, with the predictive power of NSS data decreasing relative to that of administrative predictors over time. The current report presents the results of the first attempt to add data from the NSS survey to previously-developed predicted risk scores based on

administrative data. We focus on predicting physical and sexual violence perpetration among males and sexual violence victimization among females during the early years of Army service because these are the three outcomes for which separate risk models based on NSS and administrative data were previously developed.

Methods

Sample

The NSS was administered to representative samples of new U.S. Army soldiers beginning Basic Combat Training (BCT) at Fort Benning, GA, Fort Jackson, SC, and Fort Leonard Wood, MO between April 2011 and November 2012. Recruitment began by selecting weekly samples of 200–300 new soldiers at each BCT installation to attend an informed consent presentation within 48 h of reporting for duty. The presenter explained study purposes, confidentiality, and voluntary participation, then answered all attendee questions before seeking written informed consent to give a self-administered computerized questionnaire (SAQ) and neurocognitive tests and to link these data prospectively to the soldier's administrative records. These study recruitment and consent procedures were approved by the Human Subjects Committees of all Army STARRS collaborating organizations. The 21,790 NSS respondents considered here represent all Regular Army soldiers who completed the SAQ and agreed to administrative data linkage (77.1% response rate). Data were doubly-weighted to adjust for differences in survey responses among the respondents who did versus did not agree to administrative record linkage and differences in administrative data profiles between the latter subsample and the population of all new soldiers. More details on NSS weighting are reported elsewhere [18]. The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3729 by 36 months) and 2952 women (decreasing to 2300 by 12 months, 2094 by 24 months, and 687 by 36 months).

Measures

Outcomes

Outcome data were abstracted from Department of Defense criminal justice databases through December 2014 (25–44 follow-up months after NSS completion). Dependent variables were defined as first occurrences of each of the three outcomes for which predictive models had previously been developed from both administrative data and NSS data: major physical violence (i.e., murder-manslaughter, kidnapping, aggravated arson, aggravated violence, or robbery) perpetration by men, sexual

violence perpetration by men, and sexual violence victimization of women, each coded according to the Bureau of Justice Statistics National Corrections Reporting Program classification system [19]. The perpetration outcomes were defined from records of “founded” offenses (i.e., where the Army found sufficient evidence to warrant full investigation). The victimization outcome was defined using *any* officially reported victimization regardless of evidence.

Predictors

As reported in previous publications, separate composite risk scores for each outcome were developed based on models from either the STARRS Historical Administrative Data System (HADS) [8, 9, 12] or the NSS [13]. The details of building the models that generated these scores are reported in the original papers and will not be repeated here other than to say that they involved the use of iterative machine learning methods [20] with internal cross-validation to predict the outcomes over a one-month risk horizon in a discrete-time person-month data array [21]. The HADS models were developed using all the nearly 1 million soldiers on active duty during the years 2004–2009 and were estimated for all years of service rather than only for the first few years of service, whereas the NSS models were developed using the NSS sample. We then applied the coefficients from these models to the data from the soldiers in the present samples to generate composite prediction scores. Thus, each person-month had a single score from each model representing the predicted log odds of the outcome occurring (note that this score changed each month for the HADS models, but remained the same within each person for the NSS models because the NSS was administered only once). Each score was then standardized by a mean of 0 and variance of 1 in the total sample. These composite prediction scores were used as the input in the current analysis. In other words, for each of the models reported here, there were two possible two independent variables (plus their transformations and interactions): the standardized log odds of the event occurring according to the HADS model and the standardized log odds of the event occurring according to the NSS model.

The potential predictors selected for inclusion in the iterative model-building process for the HADS and NSS models operationalized 8 classes of variables found in prior studies to predict the outcomes: socio-demographics (e.g., age, sex, race-ethnicity), mental disorders (self-reported Diagnostic and Statistical Manual of Mental Disorders, 4th edition [DSM-IV] disorders in the NSS and medically recorded International Classification of Diseases [ICD] disorders in the HADS models), suicidality/non-suicidal self-injury (self-reported in the

NSS and medically recorded in the HADS models), exposure to stressors (assessed in detail in the NSS models with questions about childhood adversities, other lifetime traumatic stressors, and past-year stressful life events and difficulties; assessed in the HADS models with a small number of available markers of financial, legal, and marital problems, information about deployment and stressful career experiences, and military criminal justice records of prior experiences with crime perpetration and victimization), military career information (for new soldiers, Armed Forces Qualification Test [AFQT] scores; physical profile system [PULHES] scores used to indicate medical, physical, or psychiatric limitations; enlistment military occupational specialty classifications; and a series of indicators of enlistment waivers; and for the HADS models, increasing information over the follow-up period about promotions, demotions, deployments, and other career experiences), personality (only in the NSS models), and social networks (only in the NSS models). Results of performance-based neurocognitive tests administered in conjunction with the NSS were also included in the NSS models [22]. More detailed descriptions of the HADS and NSS predictors, the final form of each model (i.e., the variables that were ultimately selected for inclusion by the algorithms), and predictive performance are presented in the original reports [8, 9, 12, 13].

Analysis methods

Analysis was carried out remotely by Harvard Medical School analysts on the secure University of Michigan Army STARRS Data Coordination Center server. Given that respondents differed in number of months of follow-up, we began by inspecting observed outcome distributions by calculating survival curves using the actuarial method [23] implemented in SAS PROC LIFETEST [24]. We projected morbid risk to 36 months even though some new soldiers were followed for as long as 44 months because the number followed beyond 36 months was too small for stable projection. Discrete-time survival analysis with person-month the unit of analysis and a logistic link function [21] was then used to estimate a series of nested prediction models for first occurrence of each outcome. Models were estimated using SAS PROC LOGISTIC [24].

The model-testing process involved two steps: first, determining the best model using the HADS risk score only, and then finding the optimal strategy for combining NSS data with the best model from the first step. Specifically, we began with a model including only the composite predicted risk score based on the HADS (expressed as a predicted log odds standardized to have a mean of 0 and a variance of 1), controlling (as in all subsequent models) for time in service; we then

estimated models including a quadratic effect of HADS risk score, an interaction of the risk score with time, and their combination. In the second step, we tested the effect of adding the NSS composite predicted risk score to the best HADS model, followed by combinations of a quadratic NSS term, an interaction of NSS score with HADS score, and an interaction of NSS risk score with historical time. Importantly, whereas the values of the NSS composite risk score did not change with time in service because the NSS was administered only once, the values of the HADS composite risk score did change due to the addition of new administrative data each month. We tested the significance of interactions between the composite risk scores and time in service to evaluate the assumption that the HADS composite risk score might become more important over time and the NSS composite risk score less important. Design-based Wald χ^2 tests based on the Taylor series method [25] were used to select the best-fitting model for each outcome. This method took into consideration the weighting and clustering of the NSS data in calculating significance tests.

Once the best-fitting model for each outcome was selected, we exponentiated the logistic regression coefficients and their design-based standard errors for that model to create odds-ratios (ORs) and 95% confidence intervals (95% CIs). We then divided the sample into 20 separate groups (ventiles), each representing 5% of respondents ranked in terms of their risk scores in the best-fitting models, and calculated concentration of risk for each ventile: the proportions of observed cases of the outcome in each ventile. If the models were strong predictors, we would expect high concentration of risk in the upper ventiles. Concentration of risk was calculated and compared not only for the best-fitting models but also for the HADS-only models to determine the improvement in prediction strength achieved by adding information from the NSS rather than relying exclusively on HADS risk scores. We also calculated concentration of risk for the NSS-only models for comparative purposes. Finally, we calculated positive predictive value: the proportion of soldiers in each ventile that had the outcome over the follow-up period. As with morbid risk, positive predictive value was projected to 36 months using the actuarial method to adjust for the fact that the follow-up period varied across soldiers.

Results

Outcome distributions

A total of 186 male NSS respondents were accused of founded major physical violence perpetration and 132 of sexual violence perpetration by the end of the follow-up period, and 135 female NSS respondents reported sexual violence victimization over the same time period. These

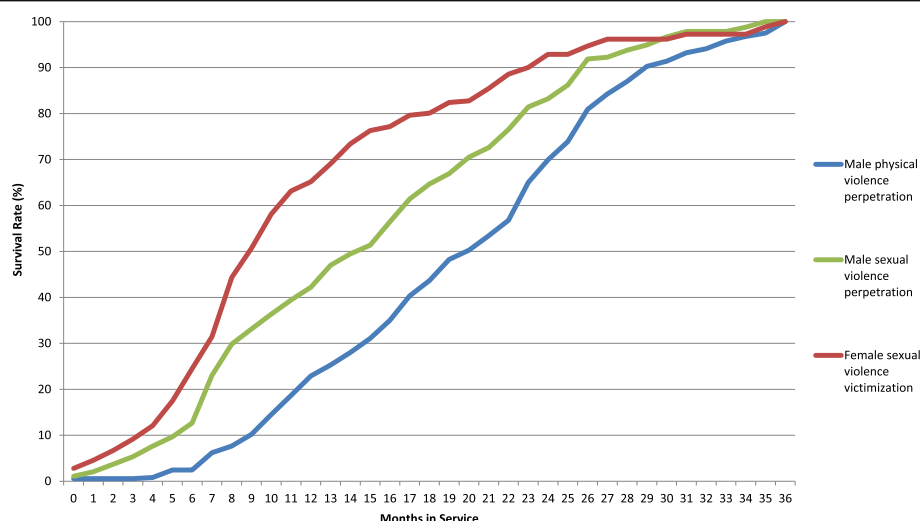
numbers correspond to incidence estimates per 1000 person-years of 4.5 for male physical violence perpetration, 3.1 for male sexual violence perpetration, and 19.5 for female sexual violence victimization. 36-month morbid risks per 1000 soldiers are 10.8 for male physical violence perpetration, 7.7 for male sexual violence perpetration, and 42.6 for female sexual violence victimization (computed using the actuarial method [23] implemented in SAS PROC LIFETEST [24]). Survival curves show that all outcomes were much less likely to occur in the first months of service, when new soldiers are in training, than later in the follow-up period (Fig. 1). Median (interquartile range) months-to-occurrence were 20 (13–25) for male physical violence perpetration, 14 (7–22) for male sexual violence perpetration, and 9 (6–15) for female sexual violence victimization.

Correlations between predictions based on the separate NSS and HADS models

The correlations between HADS and NSS composite risk scores varied over time because of monthly changes in the administrative variables used to generate the HADS predictions. Median (interquartile range) within-month Pearson correlations between the two scores were .36 (.34–.38) for major physical violence perpetration among men, .06 (.05–.07) for sexual violence perpetration among men, and .26 (.24–.27) for sexual violence victimization among women (Table 1). The magnitudes of the associations between the two composite risk scores decreased over time for physical violence perpetration and sexual violence victimization, with Pearson correlations of $-.78$ and $-.84$ between number of months in service and magnitude of the within-month association between the two scores. The associations increased over time, in comparison, for sexual violence perpetration, $r = .84$ (Fig. 2).

Relative fit of the base models and extensions

In the first analytic step, none of the expansions of the base HADS models for nonlinearities or interactions improved model fit in predicting either physical violence perpetration among men or sexual violence victimization among women. However, the addition of the NSS risk score improved model fit in both cases. We consequently focused on the additive model (i.e., HADS plus NSS composite risk score) for these outcomes. For sexual violence perpetration among men, however, model fit was improved by inclusion of the interaction between the NSS composite risk score and time since survey administration ($\chi^2_2 = 6.8$, $p = .034$) relative to the additive model (Table 2). (See Additional file 1: Table S1, for odds ratios and chi-square values for all models tested.)



The NSS respondents considered here were surveyed between April 2011 and November 2012. Administrative data were available through December 2014 (25–44 months after the survey). The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3729 by 36 months) and 2952 women (decreasing to 2300 by 12 months, 2094 by 24 months, and 687 by 36 months)

Fig. 1 Survival curves for the outcomes over the 36-month follow-up period ($n = 18,838$ men and 2952 women)

Coefficients in the best-fitting models

Inspection of the odds ratios (ORs) of univariate models with either the NSS or HADS composite risk scores as the only predictors shows that each score is associated with significantly increased odds of each outcome, with ORs relatively comparable in magnitude for NSS (OR = 1.9–2.1) and HADS (OR = 1.5–2.5). Due to their collinearity, individual predictors' ORs are lower but remain significant in the two additive models that include both composite risk scores as predictors (HADS OR = 2.1 for physical violence perpetration and 1.3 for sexual violence victimization; NSS OR = 1.6 for physical violence perpetration and 1.8 for sexual violence victimization). In the model for sexual violence perpetration, the HADS composite risk score is significant (OR = 1.4) and stable over the follow-up period, whereas the NSS composite risk score is a significant predictor in the first 12 months of service (OR = 2.3), decreases but remains significant during the second year of service (months 13–24; OR = 1.7), and becomes nonsignificant beyond the second year of service (months 25+; OR = 1.3) (Table 3).

Concentration of risk and positive predictive value in the best-fitting models

Concentration of risk was strongly elevated compared to the 5% of observed cases expected by chance in the top 3 predicted risk ventiles of all three best-fitting models (Fig. 3). 39.5% of observed physical violence perpetration, 26.1% of sexual violence perpetration, and 29.4% of sexual violence victimization occurred among the 5% of soldiers in the top risk ventiles for those outcomes

(Table 4). Between 49.8% (sexual violence victimization) and 56.3% (physical violence perpetration) of observed cases of the outcomes occurred among the 15% of soldiers in the top three risk ventiles.

These proportions were for the most part meaningfully higher than those achieved by using only the HADS predicted risk score (Table 4). For example, the 39.5% concentration of risk of physical violence perpetration among soldiers in the top risk ventile of the best-fitting model was proportionally 16.6% greater than the 33.9% concentration of risk among soldiers in the top risk ventile of the model based only on the HADS predicted risk score (i.e., 39.5/33.9). Three of these 9 proportional improvements (i.e., the top 3 ventiles for each of 3 outcomes) were less than 15% (4.8–11.2%). Four others were 15–30% (16.6–29.6%). The largest two were 45.9% and 67.9%.

Despite the high concentrations of risk in the top predicted risk ventiles, positive predictive value was low even in the highest risk ventiles due to the rarity of the outcomes. In any given month, 3.4/1000 male soldiers in the highest predicted risk ventile of physical violence perpetration were accused of that outcome, 1.5/1000 male soldiers in the highest predicted risk ventile of sexual violence perpetration were accused of that outcome, and 11.5/1000 female soldiers in the highest predicted risk ventile of sexual violence victimization experienced that outcome. However, cumulative positive predictive value projected over the first 36 months of service was considerably higher, between 34.6 and 241.7/1000 soldiers in the highest risk ventile across the outcomes.

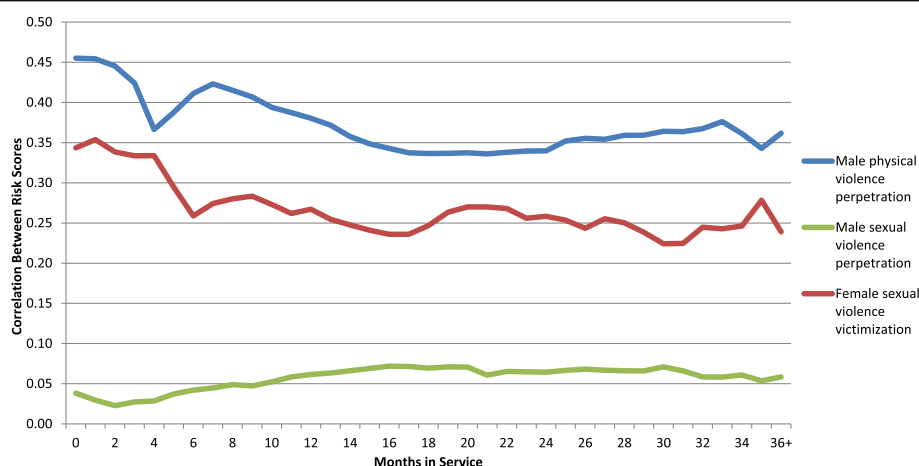
Table 1 Pearson correlations between composite risk scores based on the HADS and the NSS by month in the NSS sample ($n = 18,838$ men and 2952 women)^a

Month	Physical violence perpetration ^b <i>r</i>	Sexual violence perpetration ^b <i>r</i>	Sexual violence victimization ^c <i>r</i>
0	0.46	0.04	0.34
1	0.45	0.03	0.35
2	0.44	0.02	0.34
3	0.42	0.03	0.33
4	0.37	0.03	0.33
5	0.39	0.04	0.30
6	0.41	0.04	0.26
7	0.42	0.04	0.27
8	0.42	0.05	0.28
9	0.41	0.05	0.28
10	0.39	0.05	0.27
11	0.39	0.06	0.26
12	0.38	0.06	0.27
13	0.37	0.06	0.26
14	0.36	0.07	0.25
15	0.35	0.07	0.24
16	0.34	0.07	0.24
17	0.34	0.07	0.24
18	0.34	0.07	0.25
19	0.34	0.07	0.26
20	0.34	0.07	0.27
21	0.34	0.06	0.27
22	0.34	0.06	0.27
23	0.34	0.06	0.26
24	0.34	0.06	0.26
25	0.35	0.07	0.25
26	0.36	0.07	0.24
27	0.35	0.07	0.26
28	0.36	0.07	0.25
29	0.36	0.07	0.24
30	0.36	0.07	0.22
31	0.36	0.07	0.22
32	0.37	0.06	0.24
33	0.38	0.06	0.24
34	0.36	0.06	0.25
35	0.34	0.05	0.28
36+	0.36	0.06	0.24
25% Quartile	0.34	0.05	0.24
Median	0.36	0.06	0.26
75% Quartile	0.39	0.07	0.27

^aThe NSS respondents considered here were surveyed between April 2011 and November 2012. Administrative data were available through December 2014 (25–44 months after the survey). The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3,729 by 36 months) and 2,952 women (decreasing to 2,300 by 12 months, 2,094 by 24 months, and 687 by 36 months)

^bMales only

^cFemales only



The NSS respondents considered here were surveyed between April 2011 and November 2012. Administrative data were available through December 2014 (25–44 months after the survey). The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3729 by 36 months) and 2952 women (decreasing to 2300 by 12 months, 2094 by 24 months, and 687 by 36 months)

Fig. 2 Pearson correlations between composite risk scores based on the HADS and the NSS by month in the NSS sample ($n = 18,838$ men and 2952 women)

Discussion

Prediction of all three outcomes considered here was improved, in some cases substantially so, by adding information from the NSS predicted risk score to information from the HADS predicted risk score. One would expect this improvement to shrink somewhat in out-of-sample performance due to the fact that the NSS predicted risk score was developed in the same sample as it was applied. However, a counter-balancing consideration is that incremental prediction accuracy might increase beyond the level found here if an NSS survey became a routine part of Army accession, as the sample available for analysis would then be large enough for disaggregated analyses of individual predictors from both administrative and survey data rather than requiring the use of the composite predicted risk scores we were forced to use here because of the small NSS sample size.

We found unexpectedly that the strength of the NSS predicted risk scores remained stable over the time period of the study for physical violence perpetration and sexual violence victimization. This suggests that the NSS tapped into relatively stable individual differences in risk factors for these two outcomes rather than situational risk factors that became less relevant over time. A review of the most important predictors making up the NSS predicted risk scores showed, consistent with this interpretation, that these variables are dominated by measures of personality, history of pre-enlistment lifetime psychopathology, and history of pre-enlistment lifetime trauma exposures, most notably prior sexual violence victimization among women and prior involvement in violence among men [13]. For sexual violence

perpetration, however, the NSS risk score was no longer a significant predictor after the end of the second year in service (i.e., in months 25 and beyond). This could simply be a function of greater uncertainty in the model as time progresses (as the confidence interval for the odds ratio at months 25+ still contains relatively large values), or it could reflect a true decrease in the predictive strength over time. Regardless, the NSS data were valuable for predicting the majority of sexual violence perpetration outcomes, because 83.2% of reported assaults occurred within the first two years of service.

It is less clear why the HADS predicted risk scores did not increase in strength over time, as administrative information about soldiers became richer over time. One plausible interpretation is that the early months of service, when administrative records are sparse, are also characterized by lower prevalence of the outcomes considered here, as new soldiers are more closely supervised during Basic Combat Training (BCT; the first 10–16 weeks in service) and Advanced Individual Training (2–12 months after completion of BCT) so that opportunities for violence are lower. Administrative records become richer after the end of training, at which time prevalence of violence outcomes also increases. The extent to which the temporal consistencies in prediction accuracy continue beyond the early years of service studied here is unclear, although it seems unlikely that the prediction accuracy of survey reports obtained from 18-year-old new soldiers will maintain constant strength over many years in service. This question will be the focus of ongoing analyses of the STARRS data as the NSS cohort ages.

Table 2 Model fit statistics and model comparison tests ($n = 18,838$ men and 2952 women)^{a,b}

		Male physical violence perpetration			Male sexual violence perpetration			Female sexual violence victimization		
		df	χ^2	p	df	χ^2	p	df	χ^2	p
I. Models ^c										
M1	T	32	93.4	<.0001	34	47.7	0.059	29	498.1	<.0001
M2	T + A	33	638.4	<.0001	35	152.8	<.0001	30	521.7	<.0001
M3	T + A + T*A	35	711.0	<.0001	37	185.5	<.0001	32	851.3	<.0001
M4	T + A + A ²	34	497.2	<.0001	36	99.5	<.0001	31	549.7	<.0001
M5	T + A + T*A + A ²	36	524.9	<.0001	38	138.4	<.0001	33	866.1	<.0001
M6	Best model for A (Ba) + S	34	578.5	<.0001	36	268.9	<.0001	31	473.4	<.0001
M7	Ba + S + T*S	36	597.2	<.0001	38	308.8	<.0001	33	574.7	<.0001
M8	Ba + S + S ²	35	576.5	<.0001	37	253.3	<.0001	32	635.5	<.0001
M9	Ba + S + T*S + S ²	37	604.7	<.0001	39	268.9	<.0001	34	678.9	<.0001
M10	Ba + S + A*S	–	–	–	37	238.1	<.0001	–	–	–
M11	Ba + S + A*S + T*S	–	–	–	39	291.5	<.0001	–	–	–
II. Model Differences										
M2-M1	A	1	259.2	<.0001	1	42.8	0.000	1	15.3	0.000
M3-M2	T*A	2	1.5	0.469	2	2.2	0.339	2	0.6	0.744
M5-M4	T*A	1	3.0	0.085	1	2.9	0.089	1	0.2	0.690
M4-M2	A ²	2	2.1	0.351	2	2.3	0.324	2	0.3	0.848
M5-M3	A ²	1	3.9	0.050	1	3.2	0.073	1	0.0	0.959
M6-Ba	S	1	24.2	0.000	1	54.1	0.000	1	43.3	<.0001
M7-M6	T*S	2	0.5	0.797	2	6.8	0.034	2	0.3	0.871
M9-M8	T*S	1	0.4	0.543	1	0.4	0.530	1	0.2	0.629
M8-M6	S ²	2	0.5	0.796	2	6.0	0.050	2	0.3	0.877
M9-M7	S ²	1	0.4	0.527	1	1.3	0.253	1	0.3	0.616
M11-M10	T*S	–	–	–	2	5.9	0.053	–	–	–
M11-M7	A*S	–	–	–	1	3.6	0.059	–	–	–

Abbreviations: Time (T) time since survey administration (main effects of T dummy coded with each month), S predicted log odds from New Soldier Survey (NSS), A predicted log odds from Historical Administrative Data System (HADS), A² the square of A, T*A the interaction between T and A (where T is dummy coded with indicator variables for 13–24 months and 25+ months), Ba predictors from best model among models 1 through 5, T*S interaction between T and S (T dummy coded with indicator variables for 13–24 months and 25+ months), S² S-squared, S*A interaction of S and A

^aThe NSS respondents considered here were surveyed between April 2011 and November 2012. Administrative data were available through December 2014 (25–44 months after the survey). The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3,729 by 36 months) and 2,952 women (decreasing to 2,300 by 12 months, 2,094 by 24 months, and 687 by 36 months).

^bAlthough the same sample of soldiers was used for both male outcomes, the number of person-months differed because we predicted first occurrence of each outcome, and each soldier was censored after the month when the outcome first occurred, termination of service, or December 2014, whichever came first. Number of person-months was 543,603 for male physical assault perpetration, 543,636 for male sexual assault perpetration, and 75,772 for female sexual assault victimization.

^cOut of M1–M5, M2 was the best model for each outcome; M6–M11 add NSS predicted log odds to the best model (Ba) from HADS data alone. The final best models were M6 for physical violence perpetration and sexual violence victimization and M7 for sexual violence perpetration

Even though the addition of NSS data improved prediction of all outcomes beyond the HADS predictions, the question remains whether the magnitudes of these improvements are large enough to justify implementing an ongoing NSS for all new soldiers. The answer depends on the number of interventions the Army might want to implement (which could involve many more than the three outcomes considered in this report), the proportional increases in concentration of risk of a composite risk score using the NSS as well as the HADS

compared to the HADS alone at the thresholds selected by the Army for intervention implementation, and the costs, benefits, and competing risks of those interventions in relation to the costs of implementing an ongoing NSS. Uncertainties about these values make it impossible to calculate these cost-benefit ratios here, but these are the calculations the Army needs to make if it is interested in using evidence-based standards for targeting preventive interventions for high-risk new soldiers. If so, future research might also consider other

Table 3 Odds ratios for univariate and best-fitting models ($n = 18,838$ men and 2,952 women)^{a,b}

	Male physical violence perpetration		Male sexual violence perpetration		Female sexual violence victimization	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. NSS univariate model	2.1	(1.8–2.5)	1.9	(1.6–2.3)	1.9	(1.6–2.1)
II. HADS univariate model	2.5	(2.2–2.8)	1.5	(1.3–1.7)	1.7	(1.3–2.2)
III. Best-fitting model						
NSS	1.6	(1.3–1.9)	–	–	1.8	(1.5–2.1)
HADS	2.1	(1.9–2.5)	1.4	(1.2–1.6)	1.3	(1.0–1.8)
NSS*Time (0–12 Mo)	–	–	2.3	(1.8–2.9)	–	–
NSS*Time (13–24 Mo)	–	–	1.7	(1.3–2.1)	–	–
NSS*Time (25+ Mo)	–	–	1.3	(0.8–2.2)	–	–

Abbreviations: OR odds ratio, CI confidence interval, NSS standardized predicted log odds from model based on survey data, HADS standardized predicted log odds from model based on administrative data

^aThe NSS respondents considered here were surveyed between April 2011 and November 2012. Administrative data were available through December 2014 (25–44 months after the survey). The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3,729 by 36 months) and 2,952 women (decreasing to 2,300 by 12 months, 2,094 by 24 months, and 687 by 36 months).

^bAll coefficients were estimated controlling for time (number of months in service)

data sources that could be added beyond an ongoing NSS to improve prediction accuracy even further over the accuracy of models based exclusively on administrative predictors.

The performance of these models is on par with, or better than, other attempts to use machine learning or more traditional methods to predict risk of crime (e.g., [26, 27]), but the accuracy is nonetheless intermediate in strength. Consequently, using these predictions as a basis for decision-making (whether with or without NSS predictor) requires that the benefits of the action taken for those accurately classified as high-risk outweigh the

costs to those misclassified as high-risk. For instance, it would certainly be beneficial to deliver a reasonably low-cost intervention that does no harm to those to whom it is administered, but has some effect on reducing interpersonal violence, to a group of soldiers identified as high risk using these models. However, classification might not be accurate enough to deliver an intervention with high per-person expense, or one that causes some kind of harm (e.g., stigma, limiting career advancement) to those who are misclassified.

In addition to their implications for informing U.S. Army decision-making regarding data collection and

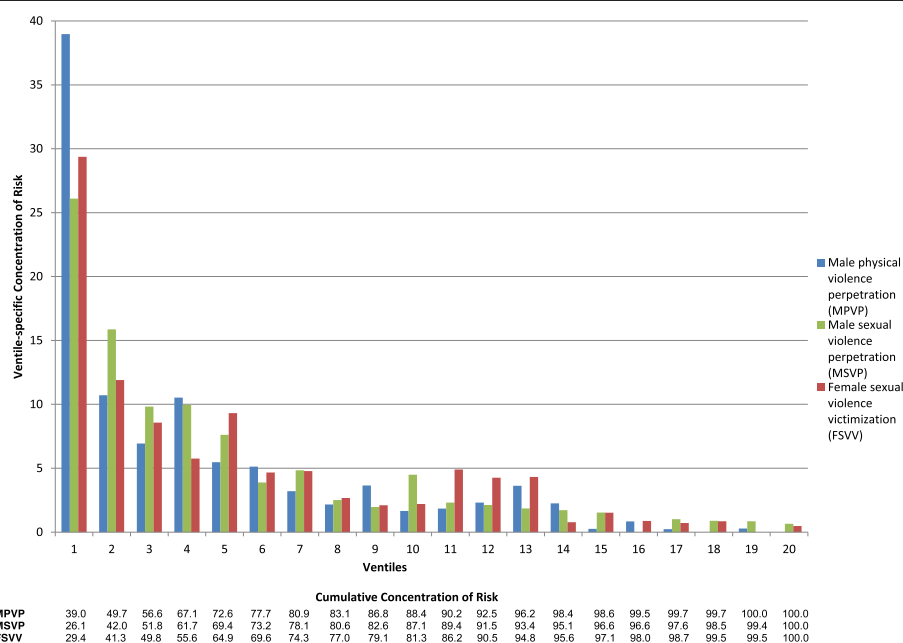
**Fig. 3** Concentration of risk by ventiles for best model of each outcome

Table 4 Performance of univariate and best-fitting models ($n = 18,838$ men and 2952 women)^a

	Top ventile (5%)				Top two ventiles (10%)				Top three ventiles (15%)			
	HADS-only	NSS-only	Best ^b	Proportional Improvement Best/HADS ^c	HADS-only	NSS-only	Best ^b	Proportional Improvement Best/HADS ^c	HADS-only	NSS-only	Best ^b	Proportional Improvement Best/HADS ^c
I. Concentration of Risk (%)												
Male physical violence perpetration	33.9	24.8	39.5	16.6	45.2	38.4	50.2	11.2	52.3	48.7	56.3	7.8
Male sexual violence perpetration	20.7	21.8	26.1	26.0	32.4	33.8	42.0	29.6	35.5	46.5	51.8	45.9
Female sexual violence victimization	17.5	27.6	29.4	67.9	32.1	38.3	41.3	28.7	47.6	47.9	49.8	4.8
II. Observed Positive Predictive Value ^d												
Male physical violence perpetration	2.9	2.2	3.4	17.2	2.0	1.7	2.2	10.0	1.5	1.4	1.6	6.7
Male sexual violence perpetration	1.2	1.2	1.5	25.0	0.9	1.0	1.2	33.3	0.7	0.9	1.0	42.9
Female sexual violence victimization	6.8	10.6	11.5	69.1	6.3	7.4	8.1	28.6	6.2	6.2	6.5	4.8
III. Projected Positive Predictive Value ^e												
Male physical violence perpetration	68.2	50.4	79.1	16.0	46.0	39.2	51.0	10.9	35.5	33.1	38.4	8.2
Male sexual violence perpetration	27.6	29.0	34.6	25.4	21.6	22.6	27.9	29.2	15.8	20.7	23.0	45.6
Female sexual violence victimization	151.6	225.9	241.7	59.4	139.8	163.8	176.4	26.2	138.3	139.0	144.6	4.6

Abbreviations: *NSS-only* prediction from model based on survey data alone, *HADS-only* prediction from model based on administrative data alone

^aThe NSS respondents considered here were surveyed between April 2011 and November 2012. Administrative data were available through December 2014 (25–44 months after the survey). The sample size decreased with duration both because of attrition and because of variation in time between survey and end of the follow-up period. The sample included 18,838 men (decreasing to 16,479 by 12 months, 15,306 by 24 months, and 3729 by 36 months) and 2952 women (decreasing to 2300 by 12 months, 2094 by 24 months, and 687 by 36 months)

^bAdditive model for physical violence perpetration and sexual violence victimization; model including interaction with time for sexual violence perpetration

^cProportional increase in concentration of risk or positive predictive value of the best model relative to the HADS-only model

^dObserved cases per 1000 person-months

^eNumber of cases per 1000 soldiers projected to 36 months

use, these findings may be relevant to other researchers using machine learning methods to predict various outcomes for individual humans. In this study, even an extremely rich passively-collected administrative data set was no substitute for querying individuals directly about psychologically relevant variables. Administrative/institutional data are often abundant and incur relatively low additional cost to collect, so they are have formed the typical feature sets used in machine learning algorithms. However, prediction may be considerably improved through the addition of self-report data, especially (1) when an outcome is partly psychologically driven, and consequently, subjective information may be a powerful predictor, and/or (2) when important predictors in administrative data sets may be noisy or inaccurate because they are not fully captured by institutional systems (e.g., health events when no medical care was sought, covert antisocial behaviors). The control conferred when administering self-report questionnaires is an additional advantage; researchers can select the variables they consider to be most essential, and questionnaires can

be designed in such a way that data require little processing prior to use in algorithms.

Conclusions

Self-report information can substantially improve prediction of risk for interpersonal violence beyond the information available in administrative databases for Regular Army soldiers early in their careers. The U. S. Army may benefit from ongoing administration of self-administered questionnaires to new soldiers. Other researchers may want to consider collecting self-report data to augment administrative/institutional data sets when developing machine learning algorithms, especially to predict psychologically driven outcomes.

Additional file

Additional file 1: Table S1. Odds ratios and chi-square values for all models ($n = 18,838$ men and 2952 women). Results of all models tested and indices of fit. (DOCX 23 kb)

Abbreviations

AFQT: Armed Forces Qualification Test; BCT: Basic Combat Training; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th edition; HADS: Historical Administrative Data System; ICD: International Classification of Diseases; NSS: New Soldier Survey; OR: Odds ratio; PUHLES: Physical profile system; SAQ: Self-administered questionnaire; STARRS: Study to Assess Risk and Resilience in Service members

Acknowledgements

The Army STARRS Team consists of Co-Principal Investigators: Robert J. Ursano, MD (Uniformed Services University of the Health Sciences) and Murray B. Stein, MD, MPH (University of California San Diego and VA San Diego Healthcare System). Site Principal Investigators: Steven Heeringa, PhD (University of Michigan), James Wagner, PhD (University of Michigan) and Ronald C. Kessler, PhD (Harvard Medical School). Army liaison/consultant: Kenneth Cox, MD, MPH (USAPHC (Provisional)). Other team members: Pablo A. Aliaga, MA (Uniformed Services University of the Health Sciences); COL David M. Benedek, MD (Uniformed Services University of the Health Sciences); Laura Campbell-Sills, PhD (University of California San Diego); Carol S. Fullerton, PhD (Uniformed Services University of the Health Sciences); Nancy Gebler, MA (University of Michigan); Robert K. Gifford, PhD (Uniformed Services University of the Health Sciences); Paul E. Hurwitz, MPH (Uniformed Services University of the Health Sciences); Sonia Jain, PhD (University of California San Diego); Tzu-Cheng Kao, PhD (Uniformed Services University of the Health Sciences); Lisa Lewandowski-Romps, PhD (University of Michigan); Holly Herberman Mash, PhD (Uniformed Services University of the Health Sciences); James E. McCarroll, PhD, MPH (Uniformed Services University of the Health Sciences); James A. Naifeh, PhD (Uniformed Services University of the Health Sciences); Tsz Hin Hinz Ng, MPH (Uniformed Services University of the Health Sciences); Matthew K. Nock, PhD (Harvard University); Nancy A. Sampson, BA (Harvard Medical School); CDR Patcho Santiago, MD, MPH (Uniformed Services University of the Health Sciences); LTC Gary H. Wynn, MD (Uniformed Services University of the Health Sciences); and Alan M. Zaslavsky, PhD (Harvard Medical School).

Funding

Army STARRS was sponsored by the Department of the Army and funded under cooperative agreement number U01MH087981 (2009–2015) with the U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Mental Health (NIH/NIMH). Subsequently, STARRS-LS was sponsored and funded by the Department of Defense (USUHS grant number HU0001–15–2–0004). This research was conducted by Harvard Medical School and is funded by the Department of Defense, Office of the Assistant Secretary for Defense for Health Affairs, Defense Health Program (OASD/HA), awarded and administered by the U.S. Army Medical Research & Materiel Command (USAMRMC), at Fort Detrick, MD, under Contract Number: (Award # W81XWH-12-2-0113 and W81XWH-13-1-0037). The contents are solely the responsibility of the authors and do not necessarily represent the views of the Department of Health and Human Services, NIMH, the Department of the Army, or the Department of Defense. Although a draft of this manuscript was submitted to the Army and NIMH for review and comment prior to submission, this was with the understanding that comments would be no more than advisory.

Availability of data and materials

The Army STARRS datasets, including the NSS, generated and analyzed during the current study are available in the Inter-University Consortium for Political and Social Research (ICPSR) repository at the University of Michigan, <http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/35197>. The administrative data in the HADS data system that support the findings of this study are available from the Department of the Army but restrictions apply to the availability of these data, which were used under a special restricted access agreement for the current study, and so are not publicly available. Requests for access to HADS data should be directed to the Office of the Deputy Under Secretary of the Army at usarmy.pentagon.hqda-dusa.mbx.starrs-ls@mail.mil.

Authors' contributions

RCK and SLB interpreted the results and wrote the manuscript. AJR, IH, and WTC contributed to statistical analysis. AMZ, JAN, MBS, MKN, NAS, PMG, RCK, RJU, and TEJ were involved in administrative, technical, or material support.

RCK and RJU were responsible for obtaining funding. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. These recruitment, consent, and data protection procedures were approved by the Human Subjects Committees of the Uniformed Services University Institutional Review Board, the Institutional Review Boards (IRB/MED) at the University of Michigan (the organization collecting the data), the Harvard Longwood Medical Area Office of Human Research Administration, and the University of California San Diego Human Research Protections Program. All study participants gave written informed consent.

Consent for publication

Not applicable

Competing interests

Stein has been a consultant for Healthcare Management Technologies and had research support for pharmacological imaging studies from Janssen. In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, and Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. The remaining authors report no conflict of interest.

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Received: 20 October 2017 Accepted: 8 March 2018

Published online: 03 April 2018

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Military Suicide Research Consortium: Extensions to New Opportunities and Challenges

13172001; 13172002

W81XWH-16-2-0003; W81XWH-16-2-0004

PIs: Thomas Joiner, Ph.D. & Peter M. Gutierrez, Ph.D

Org: Florida State University & Denver Research Institute

Award Amount: \$14,850,247 FSU

\$14,850,247 DRI



Study/Product Aim(s)

- Maintain situational readiness, research infrastructure, intellectual capacity, and institutional memory to ensure that the resources exist to meet future military suicide research needs as they change and develop.
- Continuing to produce new scientific knowledge about suicidal behavior in the military.
- Use high quality research methods and analyses to extend significant findings from studies completed in the first five years of MSRC.
- Conduct after-action analyses of null findings from initial MSRC studies to determine whether interventions significantly affected other outcomes (e.g., mechanism variables covered by the Common Data Elements [CDE]).
- Capitalize on the CDE (variables collected by all currently funded studies) to encourage rigorous secondary analyses, exploring rival mediators and mechanisms, and moving toward making the data available to the broader research community.
- Build on the first five years of research conducted by the MSRC, by continuing to disseminate Consortium knowledge, information, and findings through a variety of methods appropriate for decision makers, practitioners, and others who are accountable for ensuring the mental health of military personnel.
- Train future leaders in military suicide research.

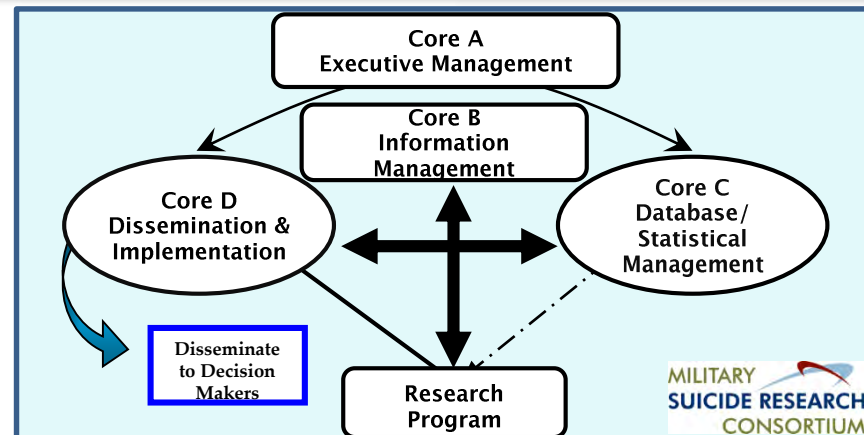
Approach

The MSRC's ultimate impact is on suicide prevention in the military through research. Findings will be used to influence policy, best practices, and programmatic changes.

Timeline and Cost

Activities	CY16	CY17	CY18	CY19	CY20
Revise infrastructure and refine and develop research priorities					
Fund and oversee funded studies					
Perform analyses on findings from years 1-5 and after-action analyses					
Capitalize on CDE secondary analyses					
Development of D&I plans					
Organized dissemination					
Continue training experiences					
FSU Estimated Budget (\$Million)	\$5.4	\$5.9	\$1.2	\$1.2	\$1.2
DRI Estimated Budget (\$Million)	\$3.9	\$4.8	\$2.4	\$2.0	\$1.8

Updated: (04/10/2018)



Accomplishments: Two clinical trials were funded in Year 1. In Year 2, the MEAB recommended funding 3 clinical trials, 4 secondary data analyses of the MSRC CDEs, and 4 long-term follow-up studies of MSRC 1.0 projects.

Goals/Milestones

Year 1 Goal:

- ☒ Infrastructure updated and review functions defined and in place
- ☒ Research priorities updated and research studies funded
- ☒ Establish dissemination & implementation (D&I) relationships and create D&I plans for funded studies

Year 2 Goal:

- ☒ Maintain defined schedule of data uploads and meetings
- ☐ Analyses completed on previous studies
- ☒ Start dissemination of research findings
- ☒ Career development and training experiences established

Year 3 Goal:

- ☐ Refine research priorities and continue research projects

Year 4 Goal:

- ☐ Continued dissemination of research findings
- ☐ Present at relevant conferences and develop manuscripts

Year 5 Goal:

- ☐ Communication of MSRC deliverables achieved

Budget Expenditure to Date

FSU Actual Expenditure: \$1,327,249

DRI Actual Expenditure: \$1,914,487

Efficacy of a Computerized Cognitive Behavioral Treatment for Insomnia: Increasing Access to Insomnia Treatment to Decrease Suicide Risk

Award Number: W81XWH-16-2-0004



PI: Sarra Nazem, Ph.D.

Org: Rocky Mountain MIRECC

Award Amount: \$1,155,292

Study Aim & Hypotheses

Specific Aim: Determine the efficacy of Sleep Healthy Using the Internet (SHUTi), a potential upstream suicide prevention intervention, for treatment of insomnia in OEF/OIF/OND Veterans.

Hypothesis 1.1: Participants randomized to SHUTi will report a significant pre-intervention to post-intervention decrease in insomnia symptoms, and improvement in functioning compared to participants who are randomized to the educational website control.

Hypothesis 1.2 & 1.3: Participants randomized to SHUTi will report a significant pre-intervention to six-months and one-year post-intervention decrease in insomnia symptoms, and improvement in functioning compared to participants who are randomized to the educational website control.

Exploratory Objective: Determine whether SHUTi is associated with significant reductions in sleep parameters and key suicide risk variables (e.g., suicidal ideation, depressive symptoms).

Approach

Efficacy will be evaluated using a two group (SHUTi vs. educational website control) longitudinal (four time points: baseline, post-intervention, 6-month and 1-year follow-up) RCT design.



Accomplishments: Completed extensive QA testing of the study platform (e.g., data entry and export, email content and firing, randomization, intervention content). Launched recruitment and began screening.

Timeline and Cost: Project Period: 04/10/17-04/09/20

Activities	04/17-04/18	04/18-04/19	04/19-04/20
Study Start Up			
Conduct RCT: Baseline & Post-Intervention Assessments			
Conduct RCT: 6-Month and 1-Year Follow-Up Assessments			
Evaluate and Disseminate RCT			
Estimated Budget (\$1,155,292)	\$409,913	\$367,116	\$378,263

Updated: March 2018

Goals/Milestones

Year 1 Goals

- Research staff hired and trained (completed)
- Regulatory approvals obtained (completed)
- Begin RCT recruitment and enrollment (completed)

Year 2 Goals

- 226 participants randomized to RCT (in progress)
- Begin 6-month and 1-year assessments

Year 3 Goals

- 6-month and 1-year assessments completed
- Manage and analyze data
- Disseminate findings
- Submit final research progress and fiscal reports

Comments/Challenges/Issues/Concerns

- Recruitment and enrollment did not begin until late in this quarter due to BeHealth project mismanagement; accelerated recruitment strategies will be employed to optimize Y2Q1, Y2Q2, and Y2Q3 enrollment.

Budget Expenditure to Date

- Projected Expenditure: \$409,912.80
- Actual Expenditure: \$296,783.87

Interoceptive Deficits and Suicidality

Award Number: W81XWH-16-2-0004



PI: April Smith, Ph.D.

Org: Miami University

Award Amount: \$149,966

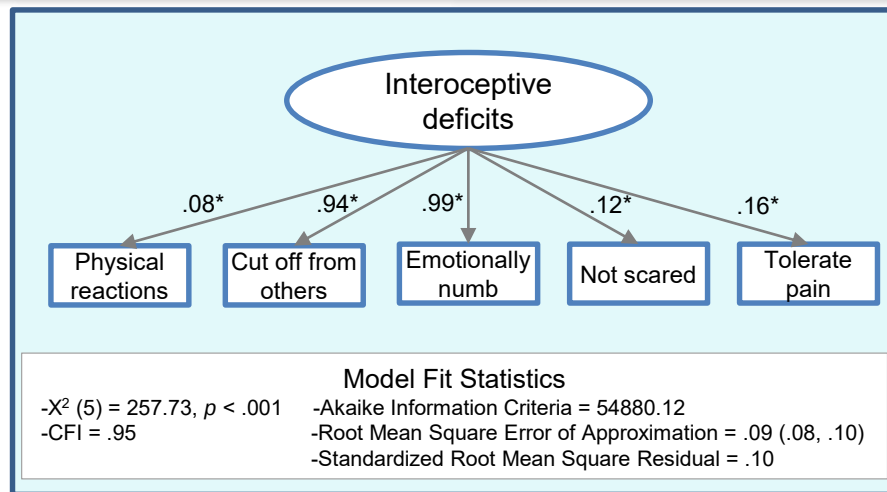
Study/Product Aim(s)

- Interoceptive deficits (i.e., being disconnected from one's body) differentiate those who think about suicide from those who engage in suicidal behavior, and may tell us who is at imminent risk for suicidal behavior.
- Aim 1: Test whether interoceptive deficits differentiate people based on their lifetime suicidal behavior.
- Aim 2: Test whether interoceptive deficits will associate with suicidal behavior severity, over and above established risk factors.
- Aim 3: Test whether Service members have higher interoceptive deficits than civilians.

Approach

Items from the MSRC Common Data Elements (CDE) will be used to create a latent interoceptive deficits variable.

Multiple group confirmatory factor analysis will test Aims 1 and 3, while regression models will test Aim 2.



Measurement model for Aim 1 and Aim 3 analyses.

Accomplishment: The measurement model has good model fit and five of the six indicators load positively and significantly onto the *interoceptive deficits* latent variable.

Timeline and Cost

Activities	CY	17	18	19	20
Obtain Institutional Review Board (IRB) approval					
Prepare CDE dataset					
Complete analyses for Aims 1–3					
Disseminate study findings					
Estimated Budget (\$K)		\$0	\$106	\$43	\$0

Goals/Milestones

CY17 Goal – Obtain IRB approval

☒ Miami University IRB approval granted 12/5/2017

CY18 Goals – Prepare CDE dataset and complete analyses

☒ Create syntax and complete measurement models

☐ Use multiple group confirmatory factor analysis for Aims 1 and 3

☐ Use structural equation regression models for Aim 2

CY19 Goal – Disseminate study findings

☐ Prepare and submit manuscripts

☐ Submit abstract to American Association for Suicidology conference

Comments/Challenges/Issues/Concerns

- Project personnel Forrest started being funded in February, rather than January as initially anticipated.

Budget Expenditure to Date

Projected Expenditure: \$8,043

Actual Expenditure: \$2959.86

Updated: 4/1/2018

Three Year Follow-Up on Study on Suicide Risk Assessments within Suicide Specific Group Therapy Treatment for Veterans



Award Number: W81XWH-16-2-0004

PI: Johnson & O'Connor

Org: Clinical Research Foundation (Dept. of VA)

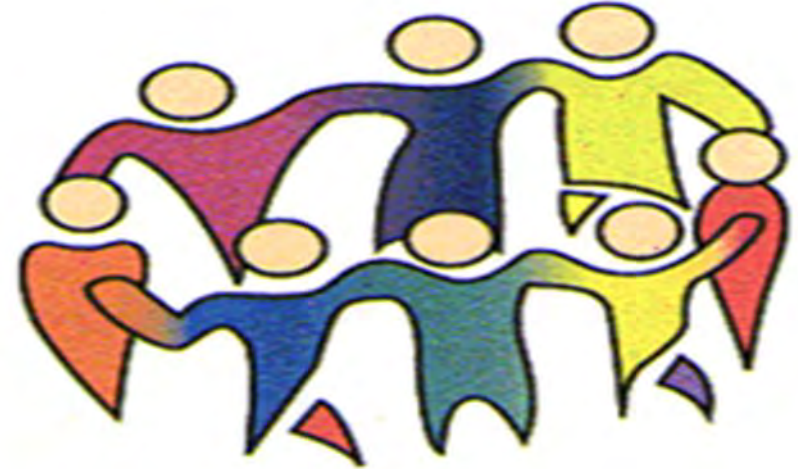
Award Amount: \$148,982

Study/Product Aim(s)

The intent of conducting this three year follow-up study is to gather data that may demonstrate the long-term safety of a suicide-specific group therapy, while also investigating the extent to which mechanisms found to be significant correlates of clinical symptoms in our original study are associated with long-term pragmatic outcomes, such as suicide attempts, hospitalizations and outpatient behavioral health treatment.

Approach

The quantitative aspects of the study involve data collection through abstraction of electronic health record. The qualitative aspects of the study involve conducting semi-structured interviews with 15 participants from each original study condition (total N = 30) in order to better understand how the group therapy experience impacted the Veterans' trajectories after inpatient psychiatric hospitalization.



Accomplishment: Obtained IRB approval. In HRPO approval process.

Timeline and Cost

Activities	CY	17	18	19	20
Finalize procedures and train					
Data collection					
Data Analysis/Dissemination					
Estimated Budget (\$K)			\$23,477	\$12,091	

Goals/Milestones (Example)

CY18 Goals – Finalize Procedures and Train

- ☐ Complete process planning and obtain necessary approvals
- ☐ Fully train all staff on data extraction and coding procedures

CY19 Goal – Data Analysis and Dissemination

- ☐ Conduct analyses and interpret for publication submission and sharing at scientific conferences
- ☐ Share any applicable findings with CAMS-G development team to inform ongoing development and investigation into the utility of a CAMS Group approach.

Budget Expenditure to Date

Projected Expenditure: \$6,539.25

Actual Expenditure: \$6,539.25

Updated: April 6, 2018

Establishing Measurement Equivalence of MRSC Database Assessments Across Demographic Groups

Award Number: W81XWH-16-2-0004



PI: David Vogel, PhD

Org: Iowa State University

Award Amount: \$149,761

Study/Product Aim(s)

- **Specific Aim 1:** Test the ME/I of the suicide and related risk factor measures
- **Specific Aim 2:** Examine latent mean differences of the measures across groups
- **Specific Aim 3:** Establish the validity of the brief screening measures

Approach

The objective of this project is to examine the psychometric properties of the assessments included in the MSRC database. ME/I and latent mean analyses will be conducted using the sequential constraint imposition approach on 14 suicide and related risk factor measures. For the five measures in which both the brief and full measure was collected, we will examine the convergent validity of the two versions by examining how the measures predict other scales included in the MSRC database.

Planned Invariance Tests Across Demographic Categories

Scale	Gender	Race	Hispanic/Latino	Education	Relational Status	Deployed	Military Branch	Active Duty	Military Service	Combat Experience
CDE - DSI	x	x	x	x	x	x	x	x	x	x
CDE - SBQ	x	x	x	x	x	x	x	x	x	x
CDE - SIS	x	x	x	x	x	x	x	x	x	x
CDE - BHS	x	x	x	x	x	x	x	x	x	x
CDE - INQ	x	x	x	x	x	x	x	x	x	x
CDE - ASI (5)	x	x	x	x	x	x	x	x	x	x
CDE - ASI (7)	x	x	x	x	x	x	x	x	x	x
CDE - PCLM	x	x	x	x	x	x	x	x	x	x
CDE - PCLC	x	x	x	x	x	x	x	x	x	x
CDE - AUDIT	x	x	x	x	x	x	x	x	x	x
CDE - ISI	x	x	x	x	x	x	x	x	x	x
BSS	x	x	x	x	x	x	x	x	x	x
SSI	x	x	x	x	x	x	x	x	x	x
BDI	x	x	x	x	x	x	x	x	x	x
BHS	x	x	x	x	x	x	x	x	x	x
INQ	x	x	x	x	x	x	x	x	x	x
ACSS	x	x	x	x	x	x	x	x	x	x
AUDIT	x	x	x	x	x	x	x	x	x	x
PCLC	x	x	x	x	x	x	x	x	x	x
PCLM	x	x	x	x	x	x	x	x	x	x

Accomplishment: Obtained IRB approval from both ISU and ORP/HRPO, and received data from MSRC. Examined demographic features of the sample and refined the data analytic plan (see above Table). Preparing to perform ME/I analyses.

Timeline and Cost

Activities	CY	17	18	19	20
Major Task: Prepare Documents & Research Protocols					
Major Task: Data Analysis and Reporting					
Subtask 1: Analyze Data & Report Findings					
Subtask 2: Dissemination of Findings					
Estimated Budget (\$149,761)	\$000	\$104,919	\$44,842	\$000	\$000

Goals/Milestones

CY18 Goal 1 – Prepare Documents and Research Protocols

- ☒ HRPO and University IRB approvals for all protocols
- ☒ Refine Data Analytic Plan

CY18 Goal 2 – Data Analysis and Reporting (Subtask 1)

- ☐ Perform ME/I analyses and share findings with MSRC

CY19 Goal 2 – Data Analysis and Reporting (Subtask 1)

- ☐ Perform mean invariance and validity analyses and share findings with MSRC

CY19 Goal 2 – Dissemination of Findings (Subtask 2)

- ☐ Work with MSRC data core and disseminate findings

Comments/Challenges/Issues/Concerns

- No changes in timeline or expenditures.

Budget Expenditure to Date

Projected Expenditure: \$9,746

Actual Expenditure: \$9,746

Updated: NA



Profiles of Behavioral Warning Signs (BWS) for Suicide Attempts in the Prediction of Future Suicidality

Award #: W81XWH-16-2-0004

PI: Courtney L. Bagge, PhD; Org: Univ. Mississippi Medical Center; Amount: \$149,355

Study/Product Aims: Start date (3/15/18)

Key Question: Can BWS predict future suicidal thoughts and behaviors during a period of pronounced risk (w/in 12 mo. of hospitalization)?

Aims: Determine if BWS groups can predict presence of, and onset to, reattempt and worst suicidal ideation

- Over and above traditional risk factors

Specific Hypothesis: No extant data to inform this question

Military Relevance: Inform more precise discharge decisions, innovative treatments, and longer-term prevention efforts to reducing the burden of suicide among service members.

Follow-Up Methodology:

Participants: N=181 adults hospitalized after a suicide attempt

Procedure: Phone follow-up. Use of well-established follow-up measures

- SASI-Count: Presence of reattempt; # days to first attempt within 12 mo
- SSI-Worst: Level of worst SI within 12 mo

Accomplishment: This project has just been initiated; Submitted local IRB and approved 4/4/18

Timeline and Cost (Direct and Indirect)

Activities	Months 1-6	Months 6-12
Build Infrastructure for the project		
Recruit/Consent 144 Participants; Enter Data		
Variables Created/Data Cleaned/Analyzed		
Disseminate Findings		
Submit Final Research/Fiscal Report		
Estimated Total Budget (\$K)	\$71,157	\$78,198

Goals/Milestones (3/15/2018 to 3/14/2019)

Build Infrastructure for Project–

- ☐ Hire and train assessor (hired; training in progress)
- ☐ Regulatory approval (local IRB approved; preparing HRPO submission)
- ☐ Creation of databases (in progress)

Recruit and Collect Data; Enter Data

- ☐ Enroll 144 participants
- ☐ Data double-entered

Manage and Analyze Data; Disseminate Findings

- ☐ Variables created
- ☐ Data cleaned and analyzed
- ☐ Manuscript and report writing; Disseminate findings

Comments/Concerns: None

Projected Budget: \$149,355; Expenditures: \$11,562.10

Couples Crisis Response Planning to Reduce Post-Discharge Suicide Risk



Award Number: W81XWH-16-2-0004

PI: Alexis May, PhD

Org: University of Utah

Award Amount: \$1,481,100

Study/Product Aim(s)

Objective: To develop and test the C-CRP, a single-session suicide-specific couples intervention, among post-9/11 military service members, veterans, and their partners.

Aims:

- To compare the effect of C-CRP to TAU on suicide ideation in the 6 months following treatment service members hospitalized for suicide risk.
- To determine how use of the C-CRP impacts suicide ideation and identify the role of partners in use of the plan and managing risk.
- To determine the needs and preferences of service members, veterans and their partners for suicide prevention interventions.

Approach

During Phase 1, 50 military couples will complete an online survey to determine the needs and preferences of service members and their partners for suicide prevention interventions. During Phase 2, 78 service members hospitalized for suicidal thoughts and/or behaviors and their partners will be randomized to C-CRP or TAU. Follow up assessments will occur at discharge, 1, 3, and 6 months.

Timeline and Cost

Activities	CY	18	19	20	21
IRB approvals, database construction, staff hiring & training					
Participant enrollment (P1 and P2), completion of baseline assessments					
Follow up interviews					
Data analyses, manuscript and report writing, dissemination of results					
Estimated Budget (\$K)		\$345	\$526	\$496	\$115

Updated: March 30, 2018

Sample Crisis Response Plan

① crying ③ wanting to hit things
 ② getting angry ④ argument w/ wife
 ① play videogames ⑤ photography
 ② woodwork in garage ⑥ writing
 ③ go for walk ⑦ games on phone
 ④ breathing 10 mins ⑧ listen to ^{uplifting} music
 ⑤ talk to Bill
 ⑥ Dr. Smith: 555-555-5555 (voicemail)
 ⑦ Hot line: 1-800-273-2755
 ⑧ Hospital or 911

Reasons to live:
 Mom photography
 wife Motorcycle rides
 kids (Matt, Katie)

Accomplishment: In Q1 (which represents Month 1 of the study) the IRB proposal for Phase 1 (P1) of the study was submitted to the Utah IRB and 2 potential staff members for the study were identified.

Goals/Milestones

CY18 Goal – IRB approvals and Hiring

- ☐ Obtain IRB and HRPO approval
- ☐ Begin P1 data collection

CY19 Goals – Begin P2 Data Collection

- ☐ Begin P2 Enrollment
- ☐ Begin P2 Follow up assessments
- ☐ P1 Data analysis and dissemination

CY20 Goal – Continue P2 Data collection

- ☐ Continue P2 enrollment
- ☐ Continue P2 follow up assessments

CY21 Goal – Conclude follow up assessments

- ☐ Complete P2 follow up assessments
- ☐ P2 data analysis and dissemination

Comments/Challenges/Issues/Concerns

None at this time.

Budget Expenditure to Date

Projected Expenditure: \$1,481,100

Actual Expenditure: \$0

Enhancing Identification of Suicide Risk among Military Service Members and Veterans: A Machine Learning Approach to Suicidality

Award Number: W81XWH-16-2-0004

PI: Andrew K. Littlefield

Org: Texas Tech University Award Amount: \$260,729



Study/Product Aim(s)

- To develop algorithms using CDE variables that optimize classification of (a) non-attempters/non ideators vs. ideators/non-attempters vs. attempters, (b) classify current passive suicide ideation (vs. no current passive ideation), (c) current active suicide intent (vs. no current active suicide intent), (d) presence of a current suicide plan (vs. no current suicide plan), (e) suicide attempt history (vs. lack of attempt history), (f) level of lethality among attempters
- To identify classes of individuals based on demographic CDE variables using both a priori designations and latent class analysis (LCA)
- To determine the extent to which the aforementioned prediction algorithms are invariant across key demographic variables and across classes of individuals identified with LCA, with a focus on comparing prediction models across military status
- To develop algorithms that optimally predict attempt characteristics (lethality) among attempters within each demographic group
- To create "suicide risk scores" that quantify the likelihood of experiencing key suicide outcomes
- To test which ML technique and which variable selection method best minimizes classification error among key suicide outcomes.

Approach

Various Machine Learning approaches will be used to develop algorithms that maximize the classification of key outcomes and to identify key assessments of suicidal thoughts and behaviors. Available Common Data Elements variables will be entered as potential predictors of outcomes described in the Aims. To identify latent classes of individuals with similar endorsement of demographic variables, Latent Class Analysis will be used.

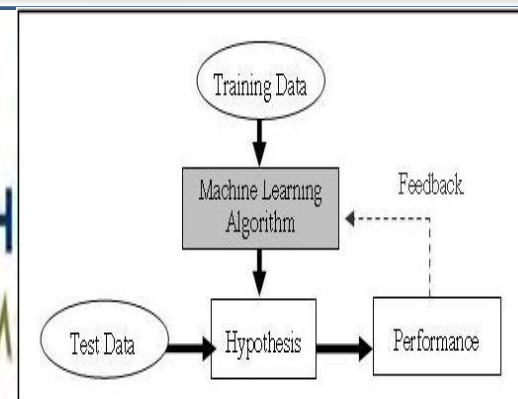


Figure Caption: Machine Learning Algorithms based on the Military Suicide Research Consortium's Common Data Elements will be developed to enhance current suicide risk assessments for Military Service members and Veterans.

Accomplishment: A start date was only recently obtained (DOD approval 3/9/18). IRB/HRPO approval has been obtained.

Activities	CY	18	19	NA	NA
Obtain IRB/HRPO APPROVAL		X			
Data Cleaning and Examination		X			
Analyses (LCA, EFA, ML)		X	X		
Manuscript Preparation, Dissemination of Findings			X		
Estimated Budget (\$K)		\$187,603	\$73,127		

Goals/Milestones

CY18 Goal – Project Approval and Preliminary Analyses for ML

- ☒ Obtain project approval from IRB/HRPO
- ☐ Data cleaning and preparing data for analysis
- ☐ Determine optimal number of classes in LCA
- ☐ Conduct EFA
- ☐ Review analytic plan with data analysis team

CY19 Goal – Conduct ML Analyses, Dissemination of Findings

- ☐ Conduct ML within entire sample, within latent classes
- ☐ Optimize classification algorithms through ensemble methods
- ☐ Prepare manuscripts/disseminate findings (e.g., white paper)

Comments/Challenges/Issues/Concerns

- Processing of award has only recently completed
- Coupled with IRB/HRPO determination, timeline can allow for extended preparation of manuscripts/dissemination efforts

Budget Expenditure to Date

Projected Expenditure: \$260,729

Actual Expenditure: \$0

Updated: 3/23/2018