



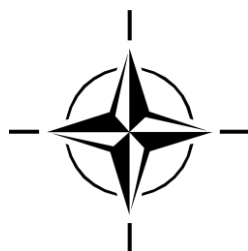
STO MEETING PROCEEDINGS

MP-HFM-302

Evidence-based Leader Interventions for Health and Wellness

(Interventions de dirigeants basées sur des éléments tangibles
pour la santé et le bien-être)

STO Human Factors and Medicine (HFM) Panel Symposium
held on 09-10 April 2019 in Berlin, Germany.



Published April 2019

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- AVT Applied Vehicle Technology Panel
- HFM Human Factors and Medicine Panel
- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS System Analysis and Studies Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

These Panels and Group are the power-house of the collaborative model and are made up of national representatives as well as recognised world-class scientists, engineers and information specialists. In addition to providing critical technical oversight, they also provide a communication link to military users and other NATO bodies.

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Evidence-based Leader Interventions for Health and Wellness

(STO-MP-HFM-302)

Executive Summary

The NATO Symposium entitled, “Evidence based Leadership Intervention for Health and Wellness,” was held in Berlin, Germany, from 9-10 April 2019. The symposium consisted of 17 individual presentations and two keynote presentations. Topics included: Morale and cohesion, job attitudes, climate and attitude surveys, total health and wellness, coping and resilience, technology and fatigue.

Particular recommendations are focused on the establishment of technical activities that might be considered by the HFM panel.

- Establish a NATO activity to determine if a brief unit climate assessment can be created to aid leaders to assess the general health and wellbeing of their units in both garrison and operational deployments, including combat.
- Establish a NATO activity to develop a unit climate assessment that can be implemented within NATO organizations, including headquarters that comprise multi-national members, including both military and civilian.
- Establish a NATO activity to develop a NATO-focused model of leader intervention model for health and wellness. Consider the inclusion of readiness, broadly defined.
- Establish a series of NATO / nation-led and funded research intervention studies that can overcome the scientific deficiencies and general lack of intervention studies in this area.
- Establish a NATO activity to explore the possibility of developing a holistic / whole person approach to health and wellbeing that includes at a minimum activity/exercise, nutrition, sleep, relationships and spiritual wellbeing.

Interventions de dirigeants basées sur des éléments tangibles pour la santé et le bien-être

(STO-MP-HFM-302)

Synthèse

Le colloque de l'OTAN intitulé « Interventions de dirigeants basées sur des éléments tangibles pour la santé et le bien-être » s'est tenu à Berlin, en Allemagne, les 9 et 10 avril 2019. Le colloque se composait de 17 présentations individuelles et de deux exposés d'ouverture. Les sujets traités ont été les suivants : moral et cohésion, attitudes professionnelles, études du climat et de l'attitude, santé et bien-être généraux, gestion et résilience, technologie et fatigue.

- Les recommandations particulières se concentrent sur la mise en place d'activités techniques pouvant être étudiées par la Commission HFM :
- Établir une activité de l'OTAN pour déterminer s'il est possible de créer une brève évaluation du climat d'une unité pour aider les dirigeants à évaluer la santé et le bien-être généraux de leurs unités, à la fois en garnison et lors des déploiements opérationnels, y compris au combat ;
- Établir une activité de l'OTAN pour développer une évaluation du climat d'une unité pouvant être mise en œuvre au sein des organisations de l'OTAN, notamment dans les états-majors qui comprennent des membres de multiples nationalités, à la fois militaires et civils ;
- Établir une activité de l'OTAN pour développer un modèle d'intervention des dirigeants axé sur l'OTAN pour la santé et le bien-être. Envisager d'y inclure l'état de préparation, dans une large définition ;
- Établir une série d'études interventionnelles, financées et dirigées par les pays/l'OTAN, pour combler les lacunes scientifiques et le manque général d'études interventionnelles dans ce domaine ;
- Établir une activité de l'OTAN pour étudier la possibilité de développer une approche holistique de la santé et du bien-être, qui inclue au minimum l'activité/l'exercice, la nutrition, le sommeil, les relations et le bien-être spirituel.

HFM-302 Programme Committee

CHAIRS

Dr. Kelly FARLEY (CANADA)

Director General Military Personnel Research and Analysis

Mail: kelly.farley@forces.gc.ca

LtCol Ass.-Prof Dr. Stefan SAMMITO (GERMANY)

Air Force Center for Aerospace Medicine

Mail: stefansammito@bundeswehr.org

MEMBERS

Dr. Søren Bo ANDERSEN (DENMARK)

Head of Research & Knowledge Centre, Danish Veteran Centre

Mail: VETC-CHVIC@mil.dk

Mr. Gary IVEY (CANADA)

Director Research Operational and Organizational Dynamics DGMPRA

Mail: gary.ivey@forces.gc.ca

Maj Dr. Erik DE SOIR (BELGIUM)

Research Manager Human Factors & Medicine, Associate Professor in Crisis & Trauma, Psychology, Royal Higher Institute of Defence, Department of Scientific and Technological Research,

Mail: erik.desoir@mil.be

TECHNICAL EVALUATOR

Dr. Carl CASTRO (USA)

Director, Center for Innovation and Research on Veterans and Military Families,

Associate Professor of Social Work, Dept. of Social Change and Innovation

USC Suzanne Dworak-Peck School of Social Work

University of Southern California,

Mail: cacastro@usc.edu



Technical Evaluation of HFM-SYS-302, “Evidence-Based Leader Interventions for Health and Wellness”

Carl Castro, Colonel (retired), Ph.D.

Director, Center for Innovation and Research on Veterans and Military Families

Associate Professor of Social Work

Director of Social Change and Innovation

USC Suzanne Dworak-Peck School of Social Work

University of Southern California,

669 W 34th St, Los Angeles, CA 90089

UNITED STATES OF AMERICA

carl.castro@usc.edu

ABSTRACT

The NATO Symposium entitled, “Evidence based Leadership Intervention for Health and Wellness,” was held in Berlin, Germany, from 9-10 April 2019. The purpose of the symposium was to consolidate current evidence-based leader interventions that support military personnel health and wellness from a holistic perspective in order to optimize and group functioning in operational and non-operational settings.” The symposium consisted of 17 individual presentations and two keynote presentations. Topics included: Morale and cohesion, job attitudes, climate and attitude surveys, total health and wellness, coping and resilience, technology and fatigue. Overall, the symposium achieved its goals. However, there were noticeable gaps in presentations focused on leader-based interventions that have been undertaken in the operational setting, more specifically the research conducted by numerous nations during combat operations in Iraq and Afghanistan. Recommendations in how NATO, specifically the Human Factors and Medicine panel, can capitalize on the efforts of this NATO activity are provided.

1.0 INTRODUCTION

Evidence-based recommendations to military and civilian leaders are important. Leaders will make decisions in the absence of evidence. So, it is incumbent on military scientists to anticipate actions that leaders to take and have the proper evidence to hand to advise leaders on evidence-based actions to consider.

2.0 THEME

The theme for the symposium taken from the “Symposium Theme” section of the approved technical activity proposal states the following: “breakthroughs in the domains of leadership, organizational justice, motivation, work engagement, organizational commitment, workplace wellbeing and job related burnout, among others, have influence models of health to include an increasing number of psychosocial factors. The result is a greater appreciation for a more holistic (or total) view of health and wellness in the workplace that has triggered action in public and private organizations, including the military...Accordingly, a current examination of evidence-based leader interventions to support service personnel health and wellness from a more holistic perspective is required.”

3.0 PURPOSE AND SCOPE OF MEETING

The stated objective of the symposium was to “bring together leading academics and military experts from a variety of health disciplines to consolidate current evidence-based leader interventions that support military

personnel health and wellness from the a holistic perspective in order to optimize and group functioning in operational and non-operational settings.”

Key topic areas included:

- Total health and wellness in a military context (scope, e.g., physical, psychological, spiritual, family, etc.)
- Risk and protective factors for health and wellness in a military context
- Current leader initiatives/practices to support personnel health and wellness
- Evidence-based leader interventions and tools for health and wellness at the individual, group and organizational levels
- Gaps in evidence-based leader interventions for health and wellness in the military
- Barriers to establishing/identifying evidence-based leader interventions for health and wellness in the military
- High risk groups. Where military leader interventions for health and wellness are most necessary

4.0 EVALUATION

4.1 Keynote 1

Kevin Kelloway. Focus on transformational leadership. In Canada, employers held responsible for stress-related disorders, especially workplace violence and aggression/harassment. Of disability claims, 30-40% stress related, but account of 70% of costs for insurance providers. Three pillars. Prevention, Intervention and Accommodation.

Prevention. Leaders can be the cause of stress. There is a lack of evidence-based leader interventions. Some evidence that training in transformational leadership, operationalized by the training of five skills, increased subordinates perceptions of leaders and improved the leaders own health.

Intervention. Indicators of employee mental health issues or signs of struggle (SOS): emotional outbursts, withdrawal, absence and performance.

Accommodation. What support do employees need to stay employed? Very little research on what approaches are best. Issues of privacy and retaliation were not addressed. Both of these issues tie into the issue of stigma around mental and behavioural health issues.

4.2. Morale

4.2.1 Background

It is generally accepted that the establishment of unit and personal morale is the responsibility of the leader. Yet, the empirical evidence to support the importance of morale and cohesion is generally lacking, although there have been a few studies showing the relationship between cohesion and mental health status (anxiety and depression).

4.2.2 Summary of Morale Presentations

Diverse groups, such as LGBT service members’, health is uniquely associated with morale and cohesion. Such that, anxiety was moderated by unit cohesion but not morale and PTSD and depression were moderated

by cohesion, but not morale.

A new model of morale was presented, entitled, Needs, Affect, and Motivation Model of Morale, which postulates that psychological needs is related to individual morale, which in turn is related to both individual functioning and group morale, the latter which is related to group functioning, with a positive feedback loop of individual and group functioning to psychological needs. Based on this model, various profiles of morale emerged: low morale-amotivated, slightly low morale-motivated, average morale and high morale, which differentially predict organizational citizenship behaviours and psychological distress. These findings indicated that morale is indeed a complex, psychological process that has important implications for military unit and individual readiness.

4.2.3 Analyses of Morale Presentations

Leaders and service members struggle to define what morale is. The Needs, Affect, and Motivation Model of Morale is the most sophisticated theoretical framework of morale developed, and represents a major advancement on our understanding of military morale. While a single item of morale performed satisfactorily, the Needs, Affect and Motivation Model of Morale provided greater predictive power. This finding aside, when brevity is paramount much utility may be gained from the use of the single item to measure morale.

That morale may differ among vulnerable/high risk groups has been known for some time. In particular, the morale of combat troops who have been engaging in combat operations for prolonged periods of time have shown low levels of morale, including veterans from World Wars I and II, and more recently in combat operations in Iraq and Afghanistan. Efforts are desperately needed to determine how best to sustain the morale of these service members. In addition, research assessing how morale may differ among diverse groups such as women service members and LGBT service members is also needed, although some work is underway.

While it is widely believed that leaders can influence morale and/or unit cohesion as a means for improving the health, wellbeing and readiness of service members, there is scant empirical evidence for how exactly leaders are to achieve this feat. Indeed, the existing scientific evidence only suggests an association, not a causal relationship. Whether an intervention designed to increase morale and cohesion is possible remains unknown.

4.3. Job Attitudes

4.3.1 Background

This section of papers focused on the impact of leader behaviours on job satisfaction and health. General leader behaviours have been shown to be related to health and wellbeing of their subordinates, including more specific constructs such as organizational justice.

4.3.2 Summary of Job Attitude Presentations

The impact of Leadership Behaviour and Leadership Satisfaction on Occupational Health Management and Job Satisfaction/Wellbeing is mediated by Socio Psychological Health, Military-Family Adaptation, Justice and Learning indices. By age, the Socio Psychological Health, Military-Family Adaptation display an inverted U-shape relationship, with the Justice and Learning indices declining as a function of age. Socio Psychological Health is related to Occupational Health Management. Overall, wellbeing is most influenced by learning. All Leadership behaviours are highly correlated with health. Military Family Adaptation is very important on leadership influence on health.

Organizational Justice during a military deployment is believed to be important for health and wellbeing. The focus was on the perception of leaders from the perspective of the subordinates. Conceptually, organizational justice is about fairness in three primary domains: distribution of rewards and resources, the processes for the distribution of resources, and the interactions that the procedures are enacted through. When preparing for a low-risk deployment, rumours and stories are central to the formation of justice.

4.3.3 Analyses of Job Attitude Presentations

It is not necessarily organizational culture that creates challenges for leaders, but the overall complexity of the challenges that leaders face. What is still unknown is how the perceptions of service members towards leadership and organizational justice are formed and by which processes these perceptions emerge. It is important to determine if there are important differences between low risk and high risk deployments. The distribution of rewards, such as medals and military coins are a perennial issue involving deployments.

Fairness Paradox: “People want to be treated fairly, yet uniquely.”

4.4 Climate and Attitude Surveys

4.4.1 Background

Leaders are expected to create a positive Organizational climate within the organizations that they lead. It is believed that the climate of the organization determines job satisfaction and intentions to remain in the organization. This challenge is magnified by the fact that the military consists of numerous broad –based occupations, ranging from war fighting to administration.

4.4.2 Summary of Climate and Attitude Surveys Presentations

Organizational climate consist of many dimensions, including polices, justice, job stress, social psychological, equal opportunities, and motivation of military personnel. Negative job satisfaction had the strongest relationship to intention to leave the organization. Image of the military institution, career development model and social policy predicted 64% of a service member’s job satisfaction, which is linked to intentions to leave the military.

Corporate Health Management is concerned with workplace health promotion, occupational safety and leadership and organization for both military personnel and civilians. The development of “snap shots” that easily convey the health of an organization can be valuable in assisting leaders in where to focus their efforts.

4.4.3 Analyses of Climate and Attitude Surveys Presentations

Indeed, organizational climate variables are related to many important organizational outcomes, such as job satisfaction, commitment to the organization, and intention to leave the military. However, therein lies the challenge. With so many important organizational variables identified, senior leaders in charge of organizations are challenged with determining where to focus their efforts. There is a lack of evidence that leaders actually use such information to improve the health of their organizations. Such data also has the possibility of being misused to ruin careers and for litigation purposes.

4.5 Total Health and Wellness: An Assessment to Solutions Approach

4.5.1 Background

This set of presentations are based entirely on the Canadian model of Total Health and Wellness. It’s an

attempt to align and integrate strategies, policies and programs that related to health and wellness.

4.5.2 Summary of Total Health and Wellness: An Assessment to Solutions Approach Presentations

There exists a relationship between work environment and individual health and wellbeing. There are both work and personal life dimensions that must be considered in the assessment. Interventions include assess, promote, empower, prevent, care and support. Adopts a multi-level approach, including external influences. Provides a visualization of all the important domains that impact health and wellness.

An example given focuses on the psychosocial domain. Basically the model is a stressor-strain-moderator approach. A number of theoretical frameworks were consulted that drove the development of this framework, including theories such as motivation-hygiene theory, self-determination theory, and positive psychology among others. Interventions focused on stressor reduction and increased level of positive experiences at work.

Identify psychological health profiles using latent profile analyses. The findings suggest that there are 2-4 psychological profiles, with the most parsimonious designation being 2 profiles. These profiles include: normative (55%), thriving (5%), coasting (6%), and struggling (34%). Levers for improve may include: meaningful work, organizational support, relatedness, and job stress.

4.5.3 Analyses of Total Health and Wellness: An Assessment to Solutions Approach

The model included a comprehensive approach to health and wellness, including input and buy in from key stakeholders. The model presented confuses determinants and outcomes. For example, morale is generally not viewed as an outcome, nor is engagement. These constructs are typically viewed as mediators/moderators. The goal was to take a strategic approach, yet the measures included individual-level measures. Importantly, no evidence exists for whether intervening in the modifiable constructs actually are the cause of the adverse outcomes so any interventions targeting these potentially modifiable constructs will lead to improvement. However, they are important points to begin such intervention efforts.

4.6 Keynote Talk 2

Amishi Jha. Brain mechanisms of attention, stress and mindfulness training. Stress, mood and threat can disrupt attention. Mindfulness training provides a cognitive advantage on cognitive, social and emotional domains. Biases and misconceptions prevent mindfulness training from being expanded into military settings. Mindfulness includes focused attention and open monitoring: involve attention, monitor for mind wondering and refocus when the mind wanders. Mechanisms of mindfulness include: attentional orienting, meta-awareness and decentering.

4.7 Coping and Resilience

4.7.1 Background

There is a rich and extensive research literature on the effects of coping, with positive coping behaviour attenuating the adverse effects of a variety of stressors. The concept of resilience within the military context is relatively new, being introduced approximately 15 years ago. Surprisingly, however, there is still is not an agreed upon definition of resilience that is widely accepted. This makes research into this area extremely difficult.

4.7.2 Summary of Coping and Resilience Presentations

Mindfulness is paying attention on purpose, in the present moment, non-judgementally. Acceptable to fighter pilots. Trained both pilots and spouses to prevent mismatch in discussing the topic. In one of four studies, only one had a control group, a wait-list control, which is not ideal. All the others lacked any type of control what so ever.

Road to mental readiness is a skills-based program to build resilience with the aim towards improving performance. Efforts are underway to move behavioural health skills outside of the classroom by using leaders to facilitate the use of these stress-coping skills among their subordinates. Stress skill training is embedded in military training. Findings presented lacked a rigorous experimental design, making reaching any firm conclusions impossible.

It is important to distinguish between individual resilience and team (or unit) resilience, which appears to be defined by the outcomes of interest. That is individual-level data was collected by asking about team-level phenomena.

4.7.3. Analyses of Coping and Resilience

If mindfulness works everywhere in every place, then it starts to become somewhat like prayer in religion. What are the negative effects of mindfulness? If there are no adverse effects, then the positive effects are possibly placebo. Further, mindfulness, as presented, is a one-size fits all approach. Mindfulness programs don't seem to be tailored to individual differences or to the context in which the individual works or performs.

Similar to mindfulness training, resilience training also employs a one-size fits all approach. Neither approach adopts an individual-centred approach. Scientific rigor is for the most part lacking in the research conducted to date.

4.8 Influencing Health and Wellness through Technology and Incentives

4.8.1 Background

Technology is being leveraged by many militaries to enhance the capability of their forces. This has been especially true in the mental and behavioural health arena for decades.

4.8.2 Summary of Influencing Health and Wellness through Technology and Incentives Presentations

The use of a mobile app to individualize the Road to Mental Readiness to enhance the program's effectiveness. Skills include: tactical breathing, self-talk, goal setting, visualization, attention control and memory. Increases use of skills learned outside of the classroom.

The use of a reward-based approach to improving workplace health and wellbeing. Lack of data on the workplace environment. So, a web-based app was deployed to survey workers health and wellbeing, among many other organizational variables. Receive points for engaging in health-promoting behaviours that can be redeemed for movie tickets, plane tickets, t-shirts, etc. Commanders provided a profile map of their unit.

Focus is on the use of incentives to improve physical fitness. In Canada there is only a minimum standard and the belief was that the physical minimum standard was too easy and they wanted a more difficult test. The minimum standard consist of 5 tasks. Additional tasks were added to get at mobility and load carry abilities. Body composition and cardiovascular were added. Waist circumstance was measured. Provides

measures of operational fitness and health-related status.

4.8.3 Analyses of Influencing Health and Wellness through Technology and Incentives

The development of an app as its first source appears to be different than when a paper-based program is translated to an app. Consideration needs to be given to the former to maximize the use of the technology. In other words, attempts to make the app exactly like the paper version must be avoided in order to take full advantage of the technology.

Other uses of technology include serious gaming, AI and machine learning among others.

The use of single items to assess major health and wellbeing organizational constructs is problematic.

Nutrition was absent from the analyses, which would appear to be especially important for addressing the issue of body composition, i.e., waist circumference.

4.9 Fatigue

4.9.1 Background

Sleep and fatigue have been topics of military interest since time immemorial. No doubt this is due to the catastrophic events that can occur due to fatigue such as air craft crashes, friendly fire casualties, among others. A culture within the military that sleep is for the lazy. The operational impact of inadequate sleep is well documented. Inadequate sleep is also related to decision-making, mental health, health risk behaviours, and affect dysregulation.

4.9.2 Summary of Fatigue Presentations

Pilot and driving fatigue remains a major issue, including truck drivers, airline pilots and ship crews; often resulting in major accidents and fatalities. Goal was to develop a single measure of sleep fatigue, referred as monotony intolerance, which was successfully achieved.

Soldiers receive the opposite pattern of sleep compared to civilians. Domain-specific leadership includes topics such as safety, sleep, mental health, etc. SLEEP acronym: set conditions, lead by example, educate, encourage, and prioritize and plan. Use of caffeine and nap (15 min) combined to feel more rested. GRT showed that leader sleep training improved knowledge, attitudes and behaviours towards improved sleep, and they liked the training, although a wait-list design was used.

4.9.3 Analyses of Fatigue

It is disheartening to learn that the military still has not addressed this important issue. Perhaps more work needs to be done in the area of “sleep banking.” There is, of course, the issue of performance enhancement drugs to also sustain alertness. This latter topic was noticeably absent, yet a topic that NATO should be monitoring.

5.0 CONCLUSIONS

It is clear that evidence-based leader interventions are highly relevant at all organizational levels and in all contexts. Yet, the number of variables assessed is enormously unwieldy. The foundations of health and wellbeing comprise a number of domains: sleep, exercise, nutrition, sleep and relationships, and perhaps spirituality. Consideration should be considered that focuses on this basic individual-level aspects of wellbeing. Regarding leader and organizational foundations for health and wellbeing, more research and

Technical Evaluation Report

thinking is needed to reduce the literally hundreds of organizational constructs that have been proposed as important for organizational health and wellbeing.

There appears to be a paucity of causal models related to leader behaviours and health and wellbeing. While focusing on risk and protective factors are interesting from an epidemiological perspective, such an approach is not useful for determining causality. And the determination of causality is critical for the development and validation of interventions. This critical point seemed to be missing throughout most of the presentations.

The symposium included a number of national initiatives underway, yet nearly all of them were focused on initiatives and practices that occur in garrison. There was only a single presentation that focused on service members during and around deployment. While this focus on garrison initiatives that includes civilians might be understandable during times of relative peace, in pulling together all the relevant data, the operation-focused data should be included. There are a number of nations that have developed organizational assessments aimed with providing leaders health and wellbeing metrics for how their deployment service members are performing. This is an important literature that shouldn't be forgotten.

Not surprisingly, there are few true evidence-based leader interventions for health and wellbeing at either the individual, group, or organizational level. The focus currently has been on the development and validation of the tools to assess health and wellbeing, along with the numerous predictors and moderating/mediating variables. For example, leaders might be told that morale in their unit is low, yet not be provided with any evidence-based approaches for how to improve morale. The solutions appear to be left to the leader to figure out for themselves. Thus, the gaps in evidence-based leader interventions for health and wellness in the military are near universal and a major research gap desperately needing attention.

Clearly one of the largest barriers to developing evidence-based leader interventions for health and wellbeing in the military is conducting rigorous, well powered, well-controlled studies. The reasons for this are varied, yet usually lie in the fact that military and civilian leaders are reluctant to support research in which not all the service members received the intervention under study, despite the fact that the intervention being studied has not been proven to be effective.

There are numerous high risk groups where military leader interventions for health and wellness are especially important. The military has focused on those service members deploying to combat, peacekeeping or peace enforcement missions, among others. Other high risk groups may include pilots, shift-workers and early warning personnel. Diverse groups such as women and other minority groups merit attention in this respect as well.

A final note should be provided that touches on other barriers to implementing some of the leader-based interventions discussed and proposed throughout the symposium. Broadly, these barriers include privacy and legal issues, as well as possible career-ending or impeding outcomes.

6.0 RECOMMENDATIONS

The recommendations of this report are focused on actions that may be considered by NATO in advancing the importance of this critical topic to further the health and wellbeing of NATO forces, including both military and civilian personnel and organizations. Particular recommendations are focused on the establishment of technical activities that might be considered by the HFM panel

- Establish a NATO activity to determine if a **brief** unit climate assessment can be created to aid leaders to assess the general health and wellbeing of their units in both garrison and operational deployments, including combat that can be used as a benchmark across NATO countries. Along with benchmarking, determine if interventions can be validated that result in measurable positive

change that supports leader decisions and/or operational effectiveness.

- Establish a NATO activity to develop a unit climate assessment that can be implemented within NATO organizations, including headquarters that comprise multi-national members, including both military and civilian.
- Establish a NATO activity to develop a NATO-focused model of leader intervention model for health and wellness. Consider the inclusion of readiness, broadly defined.
- Establish a series of NATO / nation-led and funded research intervention studies that can overcome the scientific deficiencies and general lack of intervention studies in this area.
- Establish a NATO activity to explore the possibility of developing a holistic / whole person approach to health and wellbeing that includes at a minimum activity/exercise, nutrition, sleep, relationships and spiritual wellbeing.

Additional areas that need to be monitored for future exploitation is the development of an integrated health and wellbeing app / technology.



Deploying Mindfulness to Gain Cognitive Advantage: Considerations for Military Effectiveness and Well-being

Amishi P. Jha, Ph.D.

Director of Contemplative Neuroscience, Mindfulness Research and Practice Initiative
Associate Professor, Division of Cognitive and Behavioral Neuroscience
Department of Psychology
University of Miami,
5665 Ponce de Leon, Coral Gable, FL 33146
UNITED STATES OF AMERICA

ajha@miami.edu

Scott Rogers, MA, JD

Director of Training, Mindfulness Research and Practice Initiative
Lecturer in Law and Director
Mindfulness in Law Program
University Miami School of Law,
1311 Miller Rd, Coral Gables, FL 33146
UNITED STATES OF AMERICA

srogers@law.miami.edu

Eric Schoomaker, MD, Ph.D.

Lieutenant General, US Army (Ret)
Professor and Vice Chair for Leadership & Programs
Department of Military and Emergency Medicine
Uniformed Services University of Health Sciences,
4301 Jones Bridge Rd, Bethesda, MD 20814
UNITED STATES OF AMERICA

eric.schoomaker@usuhs.edu

Edward Cardon, MS

Lieutenant General, US Army (Ret)
UNITED STATES OF AMERICA

edward.cardon@gmail.com

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ABSTRACT

Mindfulness involves paying attention to present moment experience without discursive commentary or emotional reactivity. Mindfulness training (MT) programs aim to promote this mental mode via introduction to specific mindfulness exercises, related in-class discussion, and ongoing engagement in mindfulness exercises. MT is being increasingly offered to high-demand, high-stress military/uniformed and civilian cohorts with a wide array of reported benefits. Herein, we begin by discussing recent theoretical models regarding MT's mechanisms of action from a cognitive training/cognitive neuroscience perspective, which propose that MT engages and strengthens three key processes [e.g., 1]. These are: 1) attentional orienting, which is the ability to select and sustain attention on a subset of information while remaining undistracted; 2) meta-awareness, which is the ability to monitor one's ongoing experience with an awareness of doing so; and 3) decentering, which is the ability to view one's experience at a psychological distance so that biases, mind-sets, and interpretations are viewed as mental processes rather than accurate depictions of reality. Next, we review evidence of MT's beneficial effects on cognitive, social, and emotional dimensions of human behavior, which are aligned with military frameworks describing the human dimension [e.g., 2]. We then discuss attitudinal impediments to broad adoption of MT in military settings, and propose counter-arguments so as to facilitate its implementation. We end by arguing that MT should be considered a key cognitive training tool by which to achieve cognitive advantage in the service of improved operational readiness and effectiveness, as well as greater resilience and well-being in military/uniformed cohorts.

1.0 INTRODUCTION

The United States (U.S.) military has identified global challenges that the U.S. and allied nations will likely face over the next two decades. These will range from: 1) increasing global proliferation of advanced technologies; 2) increased cyberthreats and data manipulation; 3) an uptick in the pace and intensity of human interactions in increasingly dense urban environments, that lack historical notions of a “front” and “rear”; and 4) discontinuity over the multiple environments comprising active war zones [2]. As described in recent discussions on the future of war, “A common trend across these characteristics is the complex, massive volume of stimuli soldiers will face, and the decentralized decision making required to gain and maintain the initiative in the future.” [3, pg. 1]

In a future where the ‘fog of war’ is typified by too much information too fast, mission success will rely on individual service members being able to efficiently decide what is most critical in the moment, in order to then determine if and how to engage with it, all while remaining undistracted by irrelevant information. Concurrently, ever-shifting situational challenges will require individuals or isolated small teams to be agile and adaptive while acting with autonomy, and simultaneously engaging in decisive problem solving and decision making.

In anticipation of such a future, militaries acknowledge the mission-critical role that individuals’ cognitive abilities will play. This has been detailed in military writings on the cognitive domain of the human dimension [4]. While the value of exceptional cognitive abilities is acknowledged, very little guidance has been provided on what or how this should be pursued. Indeed, in striking contrast to the considerable time and resources militaries invest in training individuals and teams in tactical, operational, and strategic scenarios to achieve military advantage, the cognitive domain has not been broadly conceptualized as malleable and trainable [5 for discussion]. As a result, many cognitive abilities are viewed as immutable, and valued primarily for selection (i.e. for elite forces) or assignment to military occupational specializations. When the malleability of cognitive abilities is acknowledged in military writings, it is most often in the context of functional degradation due to brain injury (e.g., TBI). In those circumstances, cognitive training is viewed as therapy in the service of recovery [5].

Relatedly, despite a pervasive emphasis on operational readiness [2], there is little discussion regarding the

potential for healthy individuals to suffer cognitive compromise due to persistent and intensive demands tied to military readiness training [6]. Indeed, there is a paucity of guidance regarding training methods for cognitive sustainment or enhancement for optimized readiness [5]. This begs the question: if cognitive training is to be pursued, which cognitive abilities should be prioritized as targets for such training?

Cognition refers to information processing in the service of gaining knowledge and achieving comprehension. A survey of military writings on the cognitive domain reveals that cognitive abilities, broadly categorized as ‘thinking skills’ (e.g., judging, strategizing, and problem solving) [e.g., 4] are highly valued and seen as the preferred route by which to gain knowledge and achieve comprehension. Indeed, traditional military education, including strategic leadership education, [7] aims to formally hone such skills and encourages formal analysis of leadership lessons from the past to inform and further drive military strategic thinking along these lines.

Yet, if the operational climate of the future is even more information-dense, fast-paced, volatile, ambiguous, uncertain, and decentralized than present day, educating and training future warfighters in ‘thinking skills’ alone may be insufficient for achieving mission success. We suggest that agile and adaptive warfighters must utilize adjunctive information processing modes, including those in which cognition is, in fact, antithetical to thinking.

Mindfulness typifies such a cognitive mode. Mindfulness is described as paying attention to present moment experience without conceptual elaboration, discursive editorializing, or emotional reactivity. We suggest that deploying mindfulness will allow individuals to gain cognitive advantage over their own information processing by expanding the quantity and quality of knowledge they gain, comprehension they achieve, and capacity to respond.

Expanding cognition to emphasize present-centered, moment-to-moment experience, while monitoring this experience and disengaging from editorializing about it, may allow information processing to be more agile and adaptive. In the sections that follow we discuss theoretical models of MT’s mechanisms of action and describe how mindfulness training (MT) exercises engage and strengthen specific cognitive processes. Next, we will review a growing body of evidence from civilian and military studies reporting MT-related salutary effects in cognitive, social, and emotional domains comprising the human dimension [4]. We then discuss attitudinal impediments to broad adoption of MT in military settings, and propose counter-arguments to encourage and support its implementation. We end by arguing that MT should be considered a key training tool by which to achieve cognitive advantage in the service of improved operational readiness and effectiveness, as well as a training and therapeutic modality for greater resilience and well-being in military/uniformed cohorts.

2.0 MINDFULNESS TRAINING AS COGNITIVE TRAINING

Recent theoretical models regarding MT’s mechanisms of action suggest that MT engages and strengthens three key functions [e.g., 1, 8]. These are: 1) attentional orienting, which is the ability to select and sustain attention on a subset of information while remaining undistracted; 2) meta-awareness, which is the ability to monitor one’s ongoing experience with an awareness of doing so; and 3) decentering, which is the ability to view one’s experience at a psychological distance so that biases, mind-sets, and conceptual interpretations are viewed as mental processes rather than accurate depictions of reality.

This theoretical perspective of MT, aligns well with the subjective insights that MT practitioners convey regarding shifts in their information processing after repeated engagement in MT exercises. As U.S. Army Major General (MG) Walter Piatt recently commented:

“Mindfulness exercises are like ‘push-ups for the mind’. They have helped me focus and stay focused on a situation or person more easily, without getting lost-in-thought or distracted by information being thrown at me. I can watch my mind and pull it back if it gets stuck in a memory or worry. I can drop the story of what I think should be happening so I don’t become blind to what is happening.”

In this comment, MG Piatt, who currently serves as Commanding General of Fort Drum, New York and the 10th Mountain Division (Light Infantry) and served as Deputy Commanding General of U.S. Army Europe and the Commanding General of U.S. Army NATO from 2014 to 2015, is succinctly describing the multiple ways in which mindfulness enhanced his information processing in his role as a military leader. MT increased his capacity for present-centered focus and reduced his susceptibility to external and internal sources of distraction and bias. How might such shifts in information processing promote agile and adaptive thinking? Note that none of the processes he describes (“focus”, “watch”, “drop the story”) are akin to thinking, *per se*. Yet, one’s thinking (i.e., ability to judge, strategize, and problem solve) may benefit from greater moment-to-moment attentional stability when challenged by distraction, heightened meta-awareness to catch rumination and mental time traveling to past- or future-focused thoughts, and better decentering to be able to step back from one’s biases and pre-conceived frameworks. Indeed, adaptive leadership has been described as having three hallmark features. These are the ability to: 1) observe events and patterns as they are occurring; 2) interpret events without an overreliance on fixed schemas or assumptions; 3) respond to crises with action plans based on immediate needs, but not at the expense of long-term objectives [9]. From this perspective, MT may promote cognitive advantage by shifting information processing in support of adaptive leadership.

To understand how one’s engagement in MT exercises may lead to such shifts requires insight into the processes engaged during these exercises. A cognitive training perspective predicts that cognitive processes which are engaged by a particular activity may be amenable to being strengthened by repeated engagement in that activity [10]. Below we review instructions for two categories of MT exercises which are foundational to most MT programs. These are: 1) focused attention (FA) and, 2) open monitoring (OM). In FA, practitioners are instructed to select a particular object of focus for the practice period (e.g., breath-related sensations), and sustain selective attention, moment-by-moment, on the object with a fairly narrow focus (e.g., the specific sensations caused by the breath at the nostrils or abdomen). When they notice that their attention has wandered away from the object, they are to redirect it back to the object. As such, this practice involves orienting attention toward breath-related sensations, being meta-aware of moment-to-moment experience by monitoring the quality of attention, detecting the arising of distraction, and when distractions arise, disengaging the mind from this mental content in order to reorient to the object of focus.

During OM, the practitioner is to remain in a receptive and open monitoring state, attending moment-by-moment to anything that arises in one’s conscious experience, without focusing and elaborating on the content of any particular object, including the breath. In OM, if attention becomes engaged in a particular thought, memory, emotion, or sensation (such that the occurrence of newly arising phenomena is obscured), the practitioner is to disengage his/her attention from this mental content. Thus, whereas FA emphasizes attentional orienting (toward the target object and away from distraction), OM emphasizes meta-awareness to ensure that information processing remains ‘at the ready’ (i.e., nonconceptual and nonelaborative) [see 1].

For both FA and OM, when attention becomes inadvertently engaged or “stuck” on an object, such as distracting content during FA or any object during OM, decentering is offered as a strategy by which to ‘unstick’ attention. Decentering involves acknowledging that the mental content that hijacked attention is not ‘reality’ but instead simply content that the mind generated, which is not relevant for the task at hand [8]. Thus, across both practices attentional orienting, meta-awareness, and decentering are repeatedly engaged. This observation leads to the prediction, from a cognitive training perspective, that MT may strengthen these processes.

In line with this prediction, there is growing evidence for improvements in selective and sustained attention

and affiliated executive control processes such as working memory with MT [11]. In addition, MT-related reductions in mind-wandering and self-reported improvements in meta-awareness have been reported in civilian [12,13] and military [14] cohorts. As well, many studies of MT in clinical populations have found that MT improves decentering [8]. Thus, examination of the processes engaged during MT exercises and evidence of the strengthening of these processes with MT, lends support to theoretical accounts [e.g., 1,8] of MT's mechanisms of action. In the next section, we discuss the impact of MT programs on the cognitive, social, and emotional domains of the human dimension.

3.0 SALUTARY EFFECTS OF MT ON COGNITIVE, SOCIAL, AND EMOTIONAL DOMAINS OF THE HUMAN DIMENSION

There is considerable evidence amassing in support of the salutary effects of MT on cognitive, social, and emotional processing [see 15 for review]. While promising, we caution that this literature is in its infancy and many more, and better controlled studies are required. In addition, while the cognitive, social, and emotional domains are conceptualized as independent in military writings [2, 4], psychological theories acknowledge that these domains depend on a shared set of core cognitive functions. One function that is known to be critical for aspects of information processing across multiple domains is attention. It is well

established that the integrity of attention and affiliated executive control processes such as working memory, is closely related to successful social abilities [16], emotion regulation [17], decision making [18, 19], perspective taking [20, 21], learning, and academic performance [22, 23]. As such, given its important role for many domains, if attention is compromised, the functioning of multiple domains may become compromised.

Attentional degradation is pronounced in high-stress conditions, not only in civilians during high-demand periods [24, 25] but also in the U.S. and other countries' military cohorts during high-demand intervals. Indeed, degradation in attention has been observed in U.S. active-duty service members during intense combat training/predeployment intervals [6, 14], in Spanish Army warfighters during simulated combat maneuvers [26], as well as in Belgian Special Forces candidates in high-intensity military training [27]. In light of the pivotal role played by attention and its influence on a myriad of processes, there has been great interest in determining if MT can protect against declines in attention over high demand intervals.

Accumulating evidence shows that MT programs can benefit the cognitive domain by enhancing as well as protecting cognitive processes such as attention and working memory [see 11 for review]. The protective effects of MT have been reported in civilians over high-demand intervals [24, 25] as well as in active-duty conventional forces over the predeployment interval [28, 29] for MT programs in which in-class and at-home engagement in MT exercises are emphasized. From this perspective, MT can be considered an effective form of cognitive resilience training. Further, the magnitude of MT's protective effects is commensurate with the amount of time individuals spend engaging in daily MT practice [14]. More recently, in offering MT to elite forces who are selected for their high cognitive and physical ability, whereas control participants' attention and working memory performance remained stable over an 8-week predeployment interval, those offered a 4-week MT program demonstrated significant cognitive improvements over this time interval [30]. In addition to attention and working memory, there is growing support from the civilian literature that MT benefits other aspects of the cognition domain. As reviewed by Creswell [15], MT reduces bias, improves performance on decision making tasks, increases cognitive flexibility, and improves real-world cognitive performance (e.g., in academic and workplace settings).

For the social domain, there is scant-yet-emerging evidence of MT-related benefits [31]. Of the few studies conducted to specifically investigate if MT results in salutary effects beyond the individual, most studies have been conducted in the civilian healthcare context or in the context of marital relationships [31]. Studies

also suggest that MT programs emphasizing collective mindfulness skills [32] may benefit team cohesion and collaboration [33, 34], interpersonal communication quality [35], and emotional intelligence and awareness of oneself and others [36]. No studies of MT have yet been published with such metrics in military cohorts.

Within the emotional domain, there is a robust civilian literature demonstrating MT-related improvements in self-reported positive emotion and well-being, and reductions in negative emotion, perceived stress, and anxiety in psychologically healthy individuals [see 15 for review]. These emotional benefits have also been found to be ‘dose-dependent’ in that greater benefits are observed with greater daily MT practice engagement [37]. Examination of the emotional domain in psychologically healthy military cohorts reveals a pattern similar to that observed for cognitive functions, such that over high-demand intervals, mood and well-being declined, but with MT they were maintained, with dose-dependent benefits. Specifically, MT was associated with protection against elevation in negative affect [38] and perceived stress [39] over high-demand intervals. Relatedly, MT was associated with greater well-being and reduced perceived stress in the German Armed Forces [40]. A similar pattern of improvements in well-being and reductions in perceived stress was reported in members of the Dutch Military [41]. In addition, MT-related decreases in anxiety were reported in a study with a Norwegian combat aircraft squadron [42]. In military cohorts suffering from active clinical disorders, emotional benefits are observed as psychological health benefits, with symptom reductions in disorders such as PTSD and depression [43]. Thus, MT-related salutary effects in the emotion domain have been found in civilians and military cohorts from the U.S. and abroad.

Thus, as reviewed above, studies investigating MT’s effects on cognitive, social and emotional domains are amassing at a rapid rate. Yet, the current literature is unable to fully explain with specificity, how MT’s proposed mechanisms of action, as described in Section 2.0, result in such a broad array of benefits, from improvements in academic performance, improved team cohesion, to reductions in PTSD. One proposal is that MT-related strengthening of core cognitive functions (i.e. attention and working memory, [11] may mediate emotional benefits, for example. But very few studies have yet been conducted to address such mechanistic questions. While studies of brain function and MT-related neuroplasticity are advancing our understanding [see 1], much more research is necessary and warranted. Nonetheless, extant evidence in support of MT’s salutary effects from both civilian and military cohorts is promising.

Given the urgent need for innovative training to protect and enhance the effectiveness and well-being of military/uniformed cohorts, we suggest that there should be a significant increase in research and dissemination of MT programming to military cohorts. Yet there are attitudinal biases against its broad adoption in these settings. Below we discuss these biases from a military leadership perspective, and provide counter-arguments.

4.0 ADOPTION OF MT IN MILITARY COHORTS: ATTITUDINAL IMPEDIMENTS AND COUNTER-ARGUMENTS

As discussed at the outset, war is getting faster. Advances in technology have increased the speed of sensor to shooter links to the point where human decision making is the slowest part of the cycle. As such, the *human* must be trained to optimize decision making and performance – at speed. This understanding has motivated senior military leaders to acknowledge the centrality of the human dimension [2,4], and the limitations in human information processing. These limitations apply to decision making by the warrior on the battlefield, the CEO of a high performing company in a rapidly changing business and technologic environment, the healthcare team in an intensive care unit, and many others.

This concept is not new. John Boyd created the OODA loop – observe, orient, decide and act -- as the critical components to operating inside an enemy fighter pilot’s decision making process [see 44]. If a pilot’s OODA loop is faster than the enemy’s OODA loop, there is a much higher probability of winning. That said,

increasing complexity through improved sensor technologies, advanced targeting systems, advanced command and control systems, and advanced munitions, combined with the increasing complexity of the battlefield with urbanization, social media and peer adversary-like capabilities are increasing an already heavy information processing load (i.e., cognitive load) on leaders and their followers, throughout our formations.

If a leader's mind is not focused –and is mind wandering to task unrelated thoughts [see 12 for discussion] for example, the full OODA loop will be compromised, which can have dramatic consequences, especially if speed is an essential factor. Fortunately, there is growing evidence, as reviewed in this paper, that shows that MT has the potential to make leaders better, by giving them the tools to gain cognitive advantage. Mindfulness training has the potential to help leaders sustain attention [14], notice their own mind wandering and distractibility [12], and give them the mental flexibility to be able to step outside of their current framework of 'thinking' and shift perspectives in the service of problem solving and decision making [8]. This is not trivial – this is the equivalent of discovering the edge on physical fitness – we now know one of the tools for cognitive fitness and well-being.

There is an added benefit to mindfulness: existing research shows that there are social and emotional advantages of MT. While more difficult to describe, this training can help with resilience. The social and emotional load that leaders experience is highly dependent on a number of factors such as personality, sleep, diet, life history, family demands, cognitive capacity, and team dynamics. As studies are beginning to demonstrate, across a wide range of these factors, MT can help protect against degradation in cognitive functions and well-being over high demand training environments, and by implication, these vulnerabilities and the power of MT to protect against them, would also apply to combat. Thus, MT addresses a pressing need for innovative training to protect and enhance the effectiveness and well-being of military/uniformed cohorts. Yet, there are attitudes and biases against MT, which we point out and argue against below.

1. It's not 'worth' the time

Despite the benefits now known (and described above), militaries have been slow to adopt MT as a tool for enhanced human performance. One reason is time – the practice of mindfulness requires dedicated time on a regular and ongoing basis, just like physical fitness requires dedicated time to engage in physical exercise. For an action-based profession, it is hard to implement the idea that mindfulness, which cannot be seen, can deliver the same outcomes as another iteration of live-fire training, for example. Therefore, leaders do not feel compelled to dedicate continuous time to something that is hard to see, hard to prove as an *advantage*, and is preventative in nature in a profession that prides itself on surviving through hardiness and grit.

Yet, hardiness and grit may not be enough in complicated and complex environments that require a high degree of cognition for successful decision making at speed. There is a saying, "Slow is smooth, and smooth is fast." While there are numerous interpretations, the idea of "slow is smooth" is about understanding time with a holistic view of the present environment and the mission set. It calls for clarity. "Smooth is fast" is about how that clarity and understanding translates into better decisions, especially in the face of chaotic situations. Engaging in numerous training repetitions, while helpful, is insufficient as a leader's mind is struggling for clarity and understanding. In such a state, the leader may need to spend time repeating information, struggle with multi-tasking, and exhibit other behaviours associated with cognitive and emotional overload. Such cognitive inefficiencies are actually wasting valuable training time, and can have detrimental effects during operations, at multiple levels. There is an imperative now to develop cognitive skills that broaden cognitive capacity. This broadening should include having better attention, an ability to monitor what is happening-- not just in the external environment--but in one's own conscious experience, to be able to catch moments of mind wandering or unsuccessful multi-tasking, and account for decision bias.

With these skills, leaders are more likely to achieve greater clarity in the face of chaotic situations and circumstances. Allocating time to educate, train and develop a practice of mindfulness is critical to the concept of gaining and sustaining cognitive advantage.

Indeed, MT may allow time to be more efficiently spent; moreover, through MT, hardiness and grit may be more readily achieved and less likely to be compromised. Determining time-efficient routes by which to offer MT may help support the adoption of MT in time-pressured settings like the military. Through a series of studies conducted by our group, it has been possible to identify key program components necessary to achieve salutary cognitive effects. We found that in an 8-week, 8-hour MT program which primarily included didactic content (information and discussion), and little opportunity for in-class MT practice, the participants' performance was no different from getting no training at all. In contrast, when in-class time was spent primarily engaging in MT practice, protective effects on attention [28] and working memory [29] were observed over the predeployment interval. In a recent study, we investigated the cognitive effects of an 8-hour program called Mindfulness-Based Attention Training (MBAT) that was contextualized for ease of delivery over 8 hours to military cohorts. When MBAT was delivered over 4 weeks, it resulted in beneficial cognitive effects in elite military cohorts. But when the same program was delivered over 2-weeks, these effects were reduced or absent [30]. As such, there are lower limits for time-demands at which point MT is ineffective in producing salutary effects. Yet, the important counterpoint to spending the least amount of time possible on MT, is that the more time that individuals spend engaging in mindfulness exercises each day, the more their cognitive processing and emotional well-being benefit [25, 30, 37]. Thus, just like physical exercise for physical fitness, more time spent engaging in MT promotes greater cognitive fitness [see 38].

2. It makes you 'weak'

The second challenge is the perception that if you need to train your mind, it must mean that your mind is weak. Relatedly yet paradoxically, the 'strong' think the 'weak' are weak because they haven't been training hard enough, or even worse, that they will never achieve the standard required. This belief is perhaps even more tenaciously held in the biases around complex human behaviour. The perception that someone is not hard enough, not good enough, or not resilient enough is already embedded in military culture. As such, the notion that the mind, like the body, can be trained must overcome a culture of "the strong survive."

The myth of invincibility has been challenged over the years by another saying, "Everyone can be broken." Here, there are many parallels to physical training. It is possible to over-train (and under-train) or over-tax the human body which will cause significant short and potentially long-term health issues. Similarly, the mind can be overtaxed, cognitively and emotionally [38]. The research reviewed herein shows that MT results in better attention, better emotion regulation, better performance, and distress tolerance [see 15, 45] over high demand and depleting military training intervals. Indeed, it is possible that MT may even help establish the conditions to allow for longer periods of mission-related physical and mental training, with less compromise to the integrity of the body and mind.

3. It's not a 'modern technological' solution

There are many in today's militaries who hold a technology bias. There are those who believe technology can solve many of the problems facing leaders, and those who believe that technology will not work, especially when needed most. Those who think technology will help with decision making, hold the view that more data, supported by machine learning and artificial intelligence, will lead to cognitive offloading and is the key to faster, better decisions. From this perspective, MT may not be required, since machines can make decisions at speed. Yet, such a scenario may, in fact, increase the necessity for mindfulness. It is now well-established that more technology does not always result in cognitive off-loading. Instead, in many

cases, it results in different or new, complex demands on leaders [see 3 for discussion]. With greater reliance on machines, for example, it is incumbent upon the human to *remember* to monitor, and then to actually monitor the machines/sensors to ensure that they are operating as designed. In addition, the human must be able to notice and select which outputs necessitate a response and when to act. Thus, cognitive functions such as those cultivated by MT (i.e., attention, working memory, and monitoring) are critical in technology-saturated operating environments.

On the other hand, some military writings have suggested that the battlefield will be so disruptive, that many of our technologies will not work. Therefore, more training repetitions will be key. Indeed, training repetitions are beneficial for domain specific ‘muscle memory’ for specific procedural skills so that they become rote (see [5]). Yet, human cognition in the service of agile and adaptive information processing cannot be automated in a manner akin to ‘muscle memory’. As such, the use of MT in such scenarios provides ‘push ups for the mind’ to improve leaders’ ability to: observe with discernment, orient with precision, decide without bias, and act with awareness (vs. being on autopilot).

4. It requires adopting a specific belief system/world view

Finally, there is an unfortunate and erroneous conflation of MT as being exclusively religious and spiritual. While there is no question that MT has cultural and historic roots in the wisdom traditions of the East, particularly Buddhism, there are elements of mindfulness, and other meditation practices in every major world wisdom tradition through the ages (e.g., in Western philosophical traditions, Marcus Aurelius and the Stoics provide an example). Yet, as discussed in Section 2.0, the core exercises that comprise MT programs require no particular religion, belief system, or world view. Mindfulness programs currently taught in thousands of medical, nursing, business, and more recently, military and civilian first-responder settings, are often referred to as ‘secular mindfulness’ programs. These programs emphasize the *mind training* aspects, to cultivate specific mental qualities such as attentional focus, meta-awareness, and decentering in the service of improved performance and wellbeing [see 1 for discussion].

5.0 SUMMARY AND CONCLUSIONS

Herein, we discussed the topic of mindfulness, and have argued for the broader adoption of mindfulness training in the service of improved effectiveness and well-being in military/uniformed cohorts. In support of this argument, we described the utility of mindful modes of information processing given that ‘thinking skills’ alone, may be insufficient for achieving mission success in the predicted operational climate of the future. We suggested that agile and adaptive warfighters must utilize adjunctive information processing modes, to gain cognitive advantage over their own information processing. Indeed, mindful modes of information processing promote many qualities which typify adaptive leadership. Beyond this theoretical argument regarding the utility of MT, we provided evidence for the salutary effects of MT in three critical domains of the human dimension (cognitive, social, and emotional). In both civilian and military cohorts, MT results in improvements in cognitive processes, and emotional metrics including psychological health symptom reduction for diseases for which military cohorts are vulnerable (e.g., PTSD, depression, and anxiety). We also reviewed encouraging evidence that MT benefits the social domain from studies in civilian cohorts. Despite these promising effects, there are attitudinal biases against the broader adoption of MT into military contexts. We provided counterarguments to misconceptions which contribute to some of these attitudinal challenges. In addition, we described the approach our group has implemented in creating and evaluating short-form MT programs, amenable to scalable and accessible delivery [see 30]. This approach is modelled after those used for introduction of novel training approaches in time-pressured settings. We suggest that next-generation studies should investigate the utility of such programs in selection and training courses to reduce attrition and improve resilience, as well as strategic leadership education, to promote

adaptive leadership qualities. In addition, we suggest that MT should be offered to senior leaders (i.e., general officers) and military spouses to bolster their effectiveness and resilience. Thus, prior evidence and present need strongly point to the utility of MT as a training tool by which to achieve cognitive advantage in the service of improved operational readiness and effectiveness, as well as greater resilience and well-being in military and other uniformed cohorts.

In conclusion, as mentioned at the outset of this paper, the future of war is predicted to be more complex and dangerous. We have suggested that MT may be a fruitful route by which to gain cognitive advantage in the service of mission readiness and success, including improved strategic leadership, team cohesion, and lethality as we face such a future. In addition, military and uniformed personnel are likely to be called upon for a broader range of missions, including those in which their service is necessary to tackle humanitarian and environmental challenges at home and abroad. Indeed, mindfulness has an important role to play in peace-promotion and peace-keeping, de-escalation of force, offering of greater compassion and civility in the face of human suffering and environmental devastation, and greater ease in efforts to build coalitions, alliances, and trust even when there has been a history of distrust, hatred, and violence. While MT may be *good for the mission*, it is equally important to acknowledge the personal utility of MT for greater well-being and psychological health, resilience, stress-reduction, and relationship satisfaction. While military/uniform personnel embody selfless service, their service must be honored by offering them access to the best evidence-based tools available in support of their ability to serve. As we have argued herein, mindfulness training is one such tool.

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Lesbian, Gay, Bisexual and Transgender Service Members' Mental Health: The Role of Morale and Unit Cohesion

Carl Castro, PhD

Director, Center for Innovation and Research on
Veterans and Military Families
Associate Professor of Social Work
Dept. of Social Change and Innovation
USC Suzanne Dworak-Peck School of Social Work
University of Southern California,
669 W 34th St, Los Angeles, CA 90089
UNITED STATES OF AMERICA

carl.castro@usc.edu

Jeremy Goldbach, PhD, LMSW

Senior Associate Dean of Faculty Affairs
Tenure/Tenure-Track Faculty
Associate Professor of Social Work
Department of Children Youth and Families
USC Suzanne Dworak-Peck School of Social Work
University of Southern California,
669 W 34th St, Los Angeles, CA 90089
UNITED STATES OF AMERICA

goldbach@usc.edu

Mary Rose Mamey, PhD

Research Assistant Professor of Social Work
Dept. of Children, Youth, and Families
USC Suzanne Dworak-Peck School of Social Work
University of Southern California,
669 W 34th St, Los Angeles, CA 90089
UNITED STATES OF AMERICA

mmamey@usc.edu

Cary Klemmer, MSW

Doctoral Candidate
USC Suzanne Dworak-Peck School of Social Work
University of Southern California,
669 W 34th St, Los Angeles, CA 90089
UNITED STATES OF AMERICA

cklemmer@usc.edu

ABSTRACT

Background: Military leaders are responsible for the morale and cohesion of the units they lead. Research has shown that both morale and cohesion are important determinants of unit readiness, including medical readiness. As the composition of the military becomes more diverse an important question emerges as to whether there are important differences among minority groups regarding morale and cohesion such as gender and sexual minorities. While previous research has shown there to be difference between women and men service members, there is little know about morale and cohesion among sexual and gender minorities. This study seeks to close that gap by assessing the relationship of sexual and gender minorities and health.

Methods: Response Driven Sampling (RDS) procedures were employed to identify active duty service members from the four major branches: Army, Air Force, Navy and Marines. In total, 248 lesbian, gay, bisexual and transgender (LGBT) service members and 296 non-LGBT service members completed a comprehensive survey that assessed a variety of issues, including morale, cohesion anxiety, depression, PTSD and suicidality. Ordinary least squares regression was used to examine for moderating effects of morale and unit cohesion on the relationship between group membership and mental health outcomes.

Results: The general findings from this study indicate (a) that while morale and cohesion moderate the mental health of service members for both LGBT and non-LGBT (i.e., cisgender heterosexual) service members, the effects were not uniform across outcomes. (b) Unit cohesion moderated the relationship between LGBT status and anxiety, (c) while unit morale moderated the relationship between depression and PTSD and LGBT status. (d) Morale and unit cohesion failed to moderate the relationship between LGBT status and suicidality.

Conclusions/Implications: The findings from this study replicate and extend the importance of morale and

cohesion in moderating the mental health of service members for both LGBT and non-LGBT service members. Yet, the benefits of high morale and cohesion were not uniform among the groups. Non-LGBT service members benefited to a greater extent as morale and unit cohesion increased than did LGBT service members. These findings indicate that leaders should include other important markers of acceptance and inclusion in unit wellbeing assessments that go beyond morale and cohesion, emphasizing the increased importance of unit leadership on ensuring the full integration and acceptance of LGBT service members.

1.0 INTRODUCTION

Including both guard and reserve, nearly 71,000 (or 2.8%) military personnel across all the services identify as lesbian, gay, or bisexual (Gates, 2010) with many others identifying as transgender (Kerrigan, 2012). Until the repeal of Don't Ask, Don't Tell (DADT), LGB service members could not disclose their sexual orientation ("come out"); and if they did so, discharge from the military was common. More than 19,000 service members were discharged between 1980 and 1993 (prior to the passing of DADT) while 13,000 were discharged between 1993 and 2009 (Burrelli, 2010; DOD, 2010). Despite the repeal of DADT, transgender individuals remain unable to openly serve in the military (Bowling & Sherman, 2008; Kerrigan, 2012). The unique needs of these service members and their nearly 870,000 veteran counterparts are not well understood (Gates, 2004).

1.1 The Unique Experience of LGBT Military Service Members

The experiences of LGBT service members may be distinctly different from their non-LGBT military counterparts yet remain largely unexplored. LGBT service members may experience heightened harassment related to the "hyper-masculinity" of military service (Moradi, 2009). In the general population, LGBT individuals have a greater likelihood of experiencing traumatic events such as child maltreatment, interpersonal violence, intimate partner violence, sexual assault (Balsam et al., 2005; Tjaden et al., 1999), child abuse or neglect (Alvy et al., 2013), hate crimes (Herek, 2009), rejection from family, friends and religious communities (Gibbs & Goldbach, 2014), and unexpected death (including suicide) (Roberts et al., 2010).

These outcomes above are commonly attributed to unique stress experiences related to LGBT identity known as minority stress (shown right, Meyer, 2003). Stress theory, in general, states that as major life events and chronic circumstances accumulate, an individual becomes less equipped to adapt, adjust and tolerate continued life stress experiences (Brown & Harris, 1978). In civilian studies, minority individuals repeatedly consistently show increased stress and psychological vulnerability when compared to their majority group peers (Thoits, 1991; Meyer 2003). Minority stress theory suggests that societal oppression and chronic victimization lead to significant distress for LGBT people and result in poorer health and mental health outcomes. These stressors include negative events, negative attitudes towards homosexuality, and discomfort with homosexuality (Rosario, et al., 2002) and have been extensively linked with negative behavioral health outcomes among LGBT people (e.g., Goldbach et al., 2014; Marshal et al., 2012; Rosario, Schrimshaw, Hunter & Gwadz, 2002).

1.2 Group Cohesion and Leadership

The experience of navigating potentially hostile social environments also adds stress to LGBT individuals. A number of studies have linked the stress of coming out (i.e., fear of family disapproval, loss of close friendships) to negative mental health outcomes (D'Augelli, 1998; Russell, Franz & Driscoll, 2001). In fact, upwards of 67% of LGBT individuals who report coming out to their family to be *somewhat* or *extremely troubling* (Pilkington & D'Augelli, 1995). Further, LGBT people who fear disclosure may feel further isolated from their peers (Berkman & Glass, 2000; Silenzio et al., 2009).

Given the importance of leadership and unit support and cohesion in the military (Griffith, 1988; Manning, 1991; Siebold, 1999), minority stress experiences such as “coming out” may be particularly relevant not only to the mental health outcomes of this population, but the health and wellbeing of the unit as well. Leadership and cohesion within the military have been shown to influence health and performance in combat and in garrison (Bliese & Castro, 2000; Castro & McGurk, 2007; Wong, Kolditz, Millen & Potter, 2003). In a study conducted in garrison among soldiers with a high workload, soldiers in units with higher cohesion displayed fewer mental health symptoms associated with depression and anxiety than did soldiers where cohesion was lower (Bliese & Castro, 2000). In a conceptually similar study conducted in Iraq where combat operations were on-going, constructive and positive leadership behaviors were shown to attenuate the adverse effects of combat (Castro & McGurk, 2007). Subordinates whose leaders displayed positive leader behaviors were less likely to screen positive for probable PTSD and depression following combat experiences than leaders who displayed negative leader behaviors.

Thus, the present study sought to explore the relation between LGBT identity and mental health outcomes, and further understand whether unit cohesion and morale mediate this relationship. Viewed with the minority stress theory, it was expected that LGBT service members who report higher morale and higher unit cohesion would report fewer mental health concerns than LGBT service members who report lower morale and lower unit cohesion.

2.0 METHODS

2.1 Procedures

2.1.1 Recruitment

Our study utilized a respondent driven sampling (RDS) methodology. We began with recruitment of seeds using referrals from an Expert Advisory Panel (EAP). Primary investigators and study staff also provided seed recruits through their network contacts. When seed recruitment through EAP referrals and study staff slowed, we expanded seed recruitment by promoting the study through popular military-related social media and on college campuses. Each strategy was accompanied with a unique referral code in order to monitor and track referral effectiveness and to ensure that no single group or platform yielded more than 20 eligible seeds at a time. Survey respondents were provided up to six unique referral codes to refer others into the study. Survey participants were provided a \$25 electronic gift card (if they completed the online survey off duty) and \$10 gift card incentives for each referral who completed the survey. Checks for fraud were conducted throughout study recruitment and during analysis. For example, IP addresses outside of the U.S. in areas with no military-base were not permitted to take the survey, and those survey responses with at least two incorrect attention-control measures were removed from the analytic sample. The crude recruited sample consisted of 544 individuals.

2.2 Participants

The resulting sample consisted of about one third active-duty military officers ($n = 185$, 34.0%), and about two thirds enlisted members ($n = 359$, 66.0%). The U.S. Army ($n = 226$, 41.5%), the U.S. Air Force ($n = 182$, 33.5%), the U.S. Navy ($n = 84$, 15.4%), and the U.S. Marine Corps ($n = 52$, 9.6%) were each represented among respondents. The majority of the sample had served less than two years of service time in the military ($n = 368$, 72.3%). Racial and ethnic identity composition of the sample was majority White ($n = 316$, 58.1%), with Black or African American service members ($n = 91$, 16.7%) and Latino or Hispanics ($n = 73$, 13.4%) as the second and third largest respective groups self-reported in the study. The majority of the sample was under the age of 30 ($n = 377$, 69.3%). LGBT service members were well represented in our data, the number of non-cisgender heterosexual respondents was nearly half ($n = 248$, 45.6%). Transgender service members ($n = 58$, 10.7%) were also well-represented given that general population estimates of this

group' prevalence range from 0.3% to about 1% (Reisner et al., 2016; "The Health of lesbian, gay, bisexual, and transgender people," 2012). Under half of participants were assigned female sex at birth ($n = 194$, 35.7%).

2.3 Measures

2.3.1 Demographic Characteristics

Sexual Orientation was measured using one item asking, "What is your sexual identity?" Response options were, heterosexual or straight, gay or lesbian, bisexual, or sexual orientation not listed. Sex assigned at birth was reported in one item asking, "What sex were you assigned at birth, (i.e., what sex is on your birth certificate)? Response options were male and female (binary coded, male set as reference group). Gender identity was assessed in an item with six response options, male, female, transgender male/trans man, transgender female/trans woman, genderqueer/gender non-conforming, and gender identity not listed. For analysis, these three variables were used to construct a single binary item for lesbian, gay, bisexual and transgender (LGBT) service members (reference group: cisgender, i.e., not transgender, heterosexual). Respondents also reported their age and race/ethnicity.

2.3.2 Characteristics of military service

Study respondents reported sociodemographic information reflective of their status as active duty military service members. Service members reported the number of years they have been serving in the military, their service branch (U.S. Airforce, U.S. Army, U.S. Marine Corps, and U.S. Navy; reference group: U.S. Airforce), as well as their pay grade which was used to determine their rank (reference group: E-1 to E-3).

2.3.3 Hypothesized moderators and mental health

In the present study, unit cohesion and morale are hypothesized moderators of mental health outcomes. Unit cohesion was measured using the four-item platoon cohesion index, total scores range on a continuous scale from 4 to 20 with higher scores representing more integration with unit (Bartone, Johnsen, Eid, Brun, & Laberg, 2002; Siebold & Kelly, 1988). Morale was measured using a single response item from Woodruff, Keltz, and Segal (2006) that asked respondents to rate their personal morale on a scale of 1 to 5 with higher scores representing a higher degree of morale to serve. Anxiety was assessed using a brief measure to assess for generalized anxiety disorder, the GAD-7 (Spitzer, Kroenke, Williams, & Löwe, 2006). Total scale scores range from 0 to 21 with higher scores representing greater anxiety symptomatology. Depression was measured using eight items from the Patient Health Questionnaire (PHQ; Kroenke, Spitzer, & Williams, 2001). This item ranges from 0 to 24, with higher scores representing a greater degree of depression symptomatology. Post-Traumatic Stress Disorder (PTSD) was assessed using the PTSD PCL-5, a 20-item measure examining the presence and severity of PTSD symptomatology with higher scores representing greater severity of symptoms (Blevins, Weathers, Davis, Witte, & Domino, 2015). Finally, suicidality was measured using the suicidal behaviors questionnaire - revised (SBQ-R) with scores ranging from 0 to 15 with higher scores representative of a greater degree of suicidality (Osman et al., 2001).

2.4 Analysis

The purpose of the present study was to assess for a moderating impact of unit cohesion and morale on the relationship between LGBT identity and mental health outcomes among a cohort of active duty military service members. To begin, 1) authors conducted descriptive analysis of demographic and military-related sample characteristics as well as reports of mental health (i.e., anxiety, depression, PTSD, and suicidality). Then, 2) bivariate analyses using ordinary least squared regression was used to assess for significant relationships between each mental health outcome and LGBT service members, indicators of integration

(i.e., unit cohesion and morale), as well as military-related covariates (i.e., length of service, military branch, and rank). Interactions were also examined in order to assess for moderation of the relationship between LGBT status and mental health by unit cohesion and by morale (i.e., LGBT X morale, and LGBT X unit cohesion). Finally, 3) authors ran multivariate regression models by loading each of the four mental health outcomes on variables, including interaction terms, significant at the bivariate level. Variables that fell from significance in these models were removed to achieve the most parsimonious final estimates. All analyses were conducted in STATA version 14 (StataCorp, 2015). Where interaction terms were significant in final models, STATA's margins command was used to obtain expected probabilities and develop figures. Very little data was missing overall, and therefore listwise deletion was used for each analysis.

3.0 RESULTS

Demographic characteristics are summarized in Table 1. Responses to indicators of integration (i.e., unit cohesion and morale) and mental health experiences are listed in Table 2. The mean moral score among LGBT service members was 3.4 (SD: 1.0), while the mean moral score among cisgender heterosexual service members was 3.8, (SD: .90). As for unit cohesion, LGBT service members were found to have a mean score of 15.4 (SD: 3.4) and cisgender heterosexual respondents a mean score of 17.2 (SD: 3.1). Cisgender heterosexual service members reported a mean anxiety score of 2.6 (SD: 3.9) while LGBT respondents were found to have a mean anxiety score of 4.7 (SD: 5.90). The mean depression value among LGBT service members was 4.9 (SD: 6.1), and 2.6 (SD: 4.2) among cisgender heterosexual service members. As for PTSD symptomatology, the LGBT respondents in our sample were found to have a mean score of 33.7 (SD: 18.3), while cisgender heterosexual respondents had a less severe mean score of 27.1 (SD: 11.7). Finally, the mean suicidality scores were 5.2 (SD: 3.6) and 3.1 (SD: 2.3) for LGBT and cisgender heterosexual service members respectively.

Following sociodemographic analysis, bivariate regression was used to examine for significant correlates of Mental Health outcomes. Increased Anxiety was found to be significantly correlated with LGBT group membership, assigned female sex at birth, lower levels of morale and unit cohesion, more than two years of military service, service in the U.S. Navy, and enlisted status (E-4 and above). Interaction terms between LGBT group membership and indicators of integration were each significant. Significant correlates of elevated depression in our sample were LGBT group membership, female assigned sex, low levels of moral and unit cohesion, more than two years of military service, U.S. Naval service, and enlisted rank (E-4 and above). Both Interaction terms were significantly associated with depression. In bivariate analysis, heightened PTSD symptomatology was found to be significantly correlated with LGBT group membership, female assigned sex, lower levels of morale and unit cohesion, more than two years military service, service in the U.S. Navy, and rank (E-4 and above, and O-4 and above). PTSD was also found to be significantly associated with study interaction terms. Finally, LGBT group membership, assigned male sex at birth, decreased levels of morale and unit cohesion, more than two years of military service, U.S. Army service, and rank (E-4 and above, and O-1 to O-3) were each associated with increased suicidality scores relative to variable reference groups. No interactions were found to be significantly associated with suicidality indicating that moral and unit cohesion do not moderate the relationship of LGBT group membership with rates of suicidality.

To develop final estimates, multivariate models were created for each outcome. Standardized beta estimates with p-value are listed in Table 3 for each final model. The final model for anxiety (adjusted $R^2 = .38$) showed that female assigned sex at birth ($b = 0.82$, $p = .031$), U.S. Marine Corps service ($b = 2.34$, $p < .001$), U.S. Naval service ($b = 1.98$, $p = .001$), rank E-4 and above ($b = .98$, $p = .043$), rank O-4 and above ($b = 1.90$, $p = .014$), and LGBT group membership ($b = 7.31$, $p < .001$) were each associated with elevated anxiety. Unit cohesion was not significant in our final model for anxiety, though higher levels of morale ($b = -2.52$, $p < .001$) were found to be associated with decreased anxiety. Finally, our interaction term (LGBT x Unit Cohesion) was significant ($b = -.43$, $p < .001$). Figure 1 shows that, for LGBT service members, levels

of anxiety steeply increased as unit cohesion decreased whereas for cisgender heterosexual service members, unit cohesion remained relatively stable. Our final model for depression (adjusted $R^2 = .44$) showed that LGBT group membership ($b = 5.18, p < .001$), U.S. Marine Corps ($b = 2.39, p < .001$) and U.S. Naval ($b = 1.77, p = .002$) service, ranks E-4 and above ($b = 1.53, p = .001$) and O-4 and above ($b = 1.82, p = .015$) were each associated with increases in depression. As for indicators of integration, unit cohesion ($b = -.31, p < .001$) and morale ($b = -2.08, p < .001$) were each found to correlate with decreasing levels of depression. The significant interaction term (LGBT X morale; $b = -1.37, p < .001$) indicated that, as morale decreased among the sample, LGBT service members were found to have a steeper increase in depression than cisgender heterosexual service members.

The final model for PTSD (adjusted $R^2 = .41$) showed that LGBT group membership ($b = 14.88, p < .001$), U.S. Marine Corps ($b = 7.69, p < .001$) and U.S. Naval service ($b = 6.25, p < .001$), and ranks E-4 and above ($b = 4.14, p = .003$) and O-4 and above ($b = 6.57, p = .004$) were each correlated with higher rates of PTSD symptomatology. Morale ($b = -5.71, p < .001$) and unit cohesion ($b = -.80, p < .001$) were associated with decreased PTSD symptom severity in this final model. The interaction term (LGBT x morale; $b = -3.84, p < .001$) was significant, demonstrating that PTSD symptomatology increased more steeply for LGBT service members than for cisgender heterosexual service members as levels of morale fell. In the adjusted multivariate model for suicidality (adjusted $R^2 = .25$), only LGBT group membership ($b = 1.60, p < .001$), and morale ($b = -1.26, p < .001$) were significant.

4.0 DISCUSSION

The primary research question of this study was to determine whether unit morale and cohesion moderate the relationship between LGBT group membership and mental health outcomes including anxiety, depression, PTSD and suicidality. The findings from this study replicate and extend the importance of morale and cohesion in moderating the mental health of service members for both LGBT and non-LGBT service members.

Regardless of sexual orientation, unit cohesion and morale were associated with mental health outcomes. Yet, the importance of morale and cohesion for LGBT service members was even more evident. That is, when morale and cohesion are low, it appears that LGBT service members report worse outcomes than their cisgender-heterosexual peers. When unit cohesion and morale are high, their outcomes are superior to their cisgender-heterosexual counterparts.

The benefits of high morale and cohesion were not uniform among the groups. Non-LGBT service members benefited to a greater extent as morale and unit cohesion increased than did LGBT service members. These findings indicate that leaders should include other important markers of acceptance and inclusion in unit wellbeing assessments that go beyond morale and cohesion.

Table 1: Sociodemographic Characteristics, 2017-18.

	N	%
LGBT (<i>n</i> = 544)	248	45.6
Sexual Orientation (<i>n</i> = 544)		
Heterosexual	316	58.1
Gay or Lesbian	174	32.0
Bisexual	43	7.9
Other sexual orientation	11	2.0
Gender identity (<i>n</i> = 544)		
Cisgender man	329	60.5
Cisgender woman	164	30.2
Transgender man	21	3.9
Transgender woman	23	4.2
Genderqueer	5	0.9
Another gender identity	2	0.3
Sex Assigned at Birth (<i>n</i> = 544)		
Male	350	35.7
Female	104	64.3
Age (<i>n</i> = 544)		
18-24	198	36.4
25-29	179	32.9
30-34	97	17.8
35-54	70	12.9
Racial and Ethnic identity (<i>n</i> = 544)		
White	316	58.1
Black or African American	91	16.7
Latino	73	13.4
Native American or Alaska Native	5	0.9
Asian or Pacific Islander	33	6.1
Multiracial	19	3.5
Other	7	1.3
Length of Service (<i>n</i> = 544)		
0 – 4	254	49.9
5 – 9	164	32.2
≥ 10	91	17.9
Military Service Branch (<i>n</i> = 509)		
U.S. Air Force	182	33.5
U.S. Army	226	41.5
U.S. Marine Corps	52	9.6
U.S. Navy	84	15.4
Rank (<i>n</i> = 544)		
E-1 to E-3	215	39.5
E-4 and above	144	26.5
O-1 to O-3	151	27.8
O-4 and above	34	6.2

Table 2. Sample Morale to Serve, Unit Cohesion, and Mental Health Reports, 2017-18.

	Mean	Standard Deviation	Range
Morale (<i>n</i> = 541).	3.64	0.97	1 - 5
Unit Cohesion (<i>n</i> = 542)	16.35	3.37	4 - 20
Anxiety (<i>n</i> = 506)	3.54	5.01	0 - 21
Depression (<i>n</i> = 543)	3.68	5.26	0 - 24
PTSD Symptomatology (<i>n</i> = 540)	30.07	15.36	20 - 100
Suicidality (<i>n</i> = 542)	4.12	3.16	1 - 15

Table 3: Results of Multivariate Ordinary Least Squares Regression, 2017-2018.

	Anxiety (<i>n</i> = 501)	Depression (<i>n</i> = 538)	PTSD (<i>n</i> = 535)	Suicidality (<i>n</i> = 539)
	β (p-value)	β (p-value)	β (p-value)	β (p-value)
Lesbian, Gay, Bisexual, and/or Transgender (LGBT)	.72 (<.001)	.48 (<.001)	.48 (<.001)	.25 (<.001)
Female Sex Assigned at Birth	.07 (.031)	--	--	--
Less than two years of service	--	--	--	--
Service branch (reference: U.S. Air Force)				
U.S. Army	.03 (.349)	.04 (.232)	-.01 (.908)	--
U.S. Marine Corps	.14 (<.001)	.13 (<.001)	.14 (<.001)	--
U.S. Navy	.14 (.001)	.12 (.002)	.14 (<.001)	--
Rank (reference: E-1 to E-3)				
E-4 and above	.08 (.043)	.12 (.001)	.11 (.003)	--
O-1 to O-3	-.01 (.874)	.07 (.044)	.02 (.515)	--
O-4 and above	.09 (.014)	.08 (.015)	.10 (.004)	--
Unit Cohesion	.01 (.85)	-.20 (<.001)	-.17 (<.001)	--
Morale	-.48 (<.001)	-.38 (<.001)	-.35 (<.001)	-.38 (<.001)
LGBT X Morale	--	-.48 (<.001)	-.45 (<.001)	--
LGB X Unit Cohesion	-.68 (<.001)	--	--	--

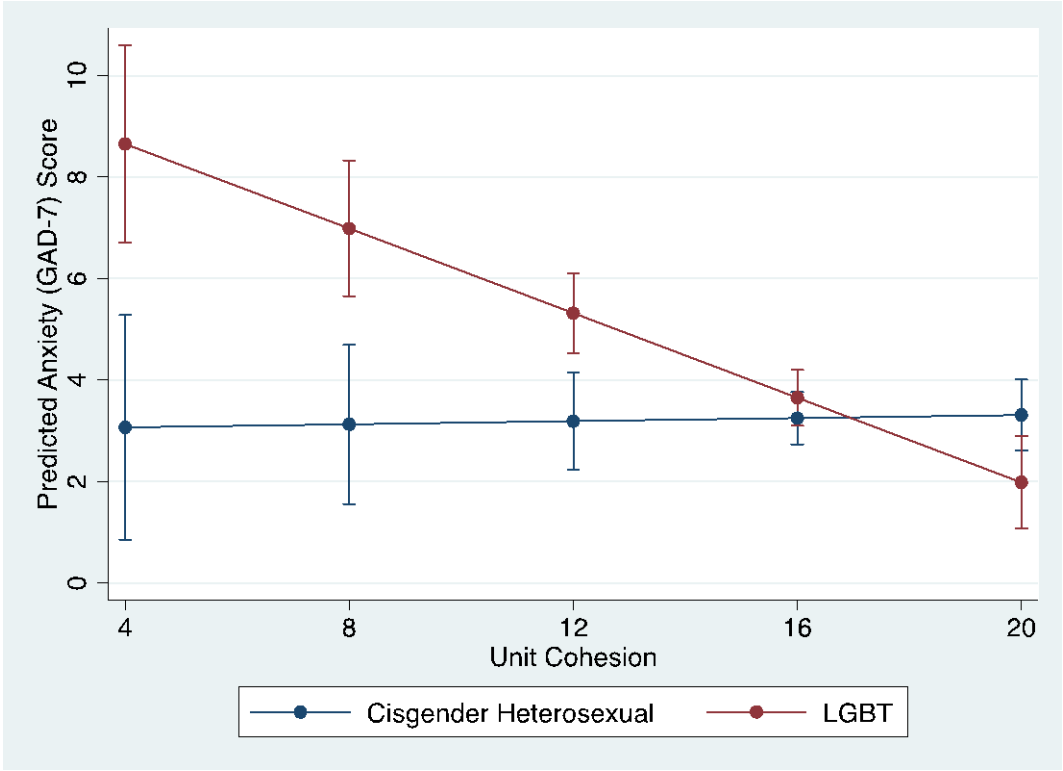


FIGURE 1. Predicted Anxiety Score among LGBT and non-LGBT Service Members by Unit Cohesion

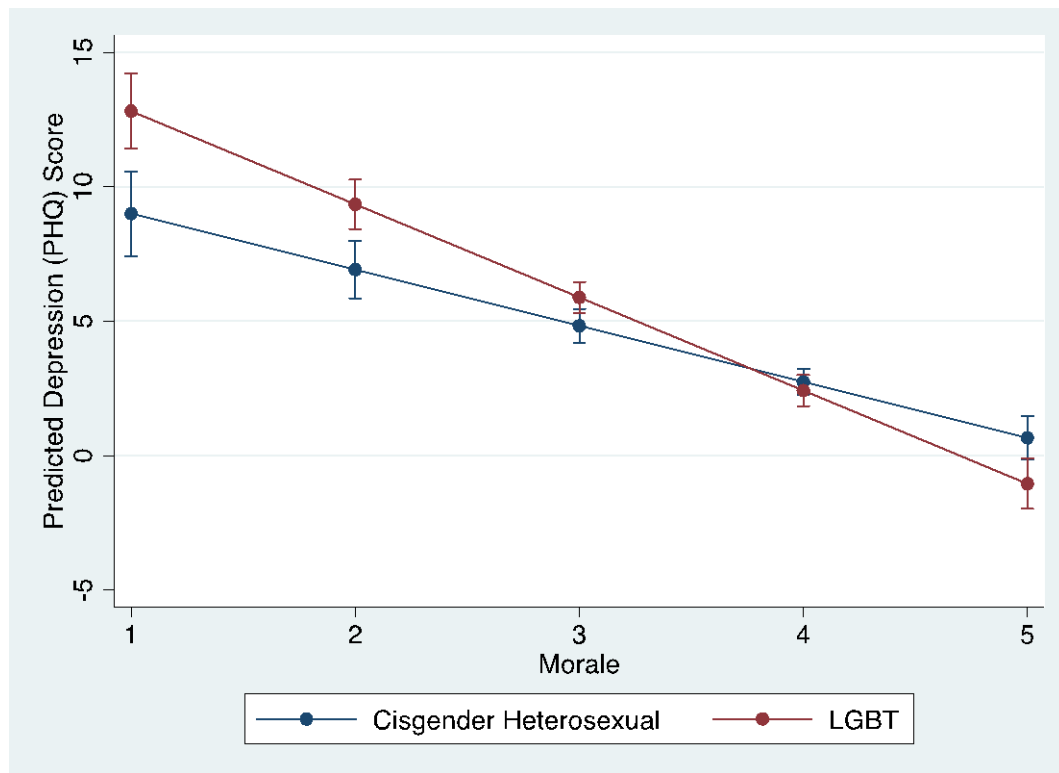


FIGURE 2. Predicted Depression Score among LGBT and non-LGBT Service Members by Unit Cohesion

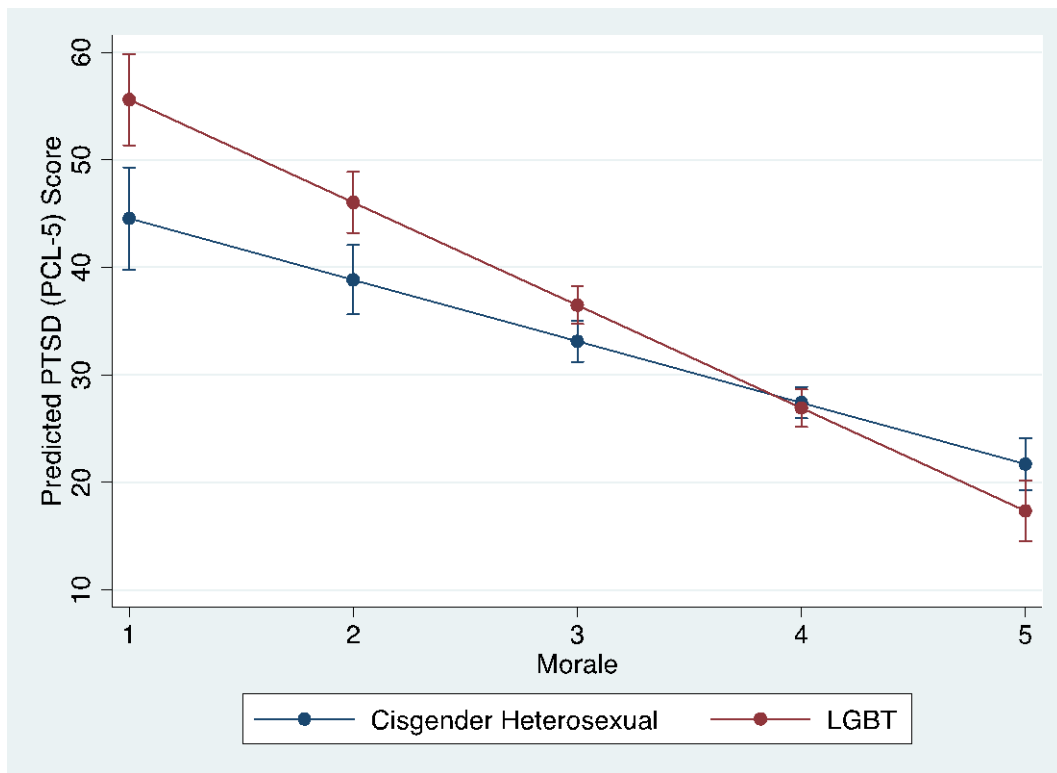


FIGURE 3. PREDICTED PTSD SCORE AMONG LGBT AND NON-LGBT SERVICE MEMBERS BY MORALE

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An Evidence-based Model of Morale: So What for Leaders?

Gary Ivey and Ann-Renee Blais

Director General Military Personnel Research and Analysis
Department of National Defence
CANADA

Janet Mantler

Department of Psychology
Carleton University
CANADA

gary.ivey@forces.gc.ca

ann-renee.blais@forces.gc.ca

janet.mantler@carleton.ca

ABSTRACT

This paper describes our efforts (a) to bring added fidelity to the military morale construct, and (b) to develop and test an evidence-based and theoretically grounded model of morale on behalf of a large branch of the Canadian military. We start with a comprehensive qualitative study of a morale (phase 1) that confirmed that soldiers hold a variety of divergent views on what morale is. Collectively, however, those ideas resulted in a thematic map that highlights the key elements and drivers of soldiers' morale. In phase 2, we leveraged the broader academic literature to develop an evidence-based and a theory grounded conceptual model – the needs, affect, and motivation model of morale (NAM3). In phase 3, we undertook two studies to test the NAM3; this paper focuses on Study 1, which involves latent profile analysis of large-scale survey data. Results support aspects of the NAM3 that pertain to individual morale and confirmed the utility of a bifactor model that includes a Morale G-factor (or M-factor) and its dimensions (types of motivation and job-related affect). Implications for science and leaders are discussed.

1.0 INTRODUCTION

Morale is a widely used military construct, often cited as the key to victory,¹ but the scientific rigour applied to studying morale does not measure up to the amount of interest in it. This mismatch, characterized largely by inconsistent definition and a lack of theory, has led several researchers to conclude that there is not a clear consensus on what morale is, and what it is not.¹⁻³ This puts military leaders in a bind. If we cannot agree on what morale is, how can we deliver evidence-based measures, how do we identify key drivers of low or high morale, and how can we assess the effectiveness of leader interventions aimed at improving morale? This paper describes our efforts (a) to bring added fidelity to the military morale construct, and (b) to develop and test an evidence-based and theoretically grounded model of morale on behalf of a large branch of the Canadian Armed Forces (CAF).

1.1 What we know about military morale

References to morale in military historical records go back hundreds of years, but military morale started appearing in peer reviewed scientific journals in the 1970s with psychologists' attempts to support military leaders by applying scientific methods to the measurement of morale.⁴ Since then, numerous studies have been undertaken, predominantly out of the U.S., but with notable contributions from Israel, Canada, and the UK, and to a lesser

extent, The Netherlands and Australia. Military morale researchers have examined morale as an indicator of individual well-being or as a buffer between military stressors and strain,⁵⁻²⁰ as a work group climate factor, based on claims that it is a key ingredient to mission success and effective team functioning,^{1,2,21-35} and as a correlate of another focal variable,³⁶⁻⁴² although the barriers between these domains are often porous.

1.1.1 Morale and psychological health

Within the body of military research examining morale as a correlate of psychological health, several researchers have operationalized morale as a proxy for mental health. For example, in his study of stress among Turkish Air Force pilots, Cetinguc¹¹ extrapolated morale from measures of depression and anxiety. Other researchers were interested in studying the effects of military stressors on morale. For example, Bartone et al.⁵ identified five dimensions of psychological stress on peacekeeping operations in the Former Republic of Yugoslavia (isolation, ambiguity, boredom, powerlessness, danger/threat) associated with low morale and other mental health outcomes. In a sample of U.S. Army soldiers, McKibben and colleagues¹⁶ examined the relationship between receipt of stress management training and various outcomes of interest to the military, including morale, and found a positive association between the two. Using group randomized trials on U.S. Army troops, Foran et al.¹² found that participants' reports of training effectiveness uniquely predicted enhancements in both personal morale and unit morale. Several studies have looked at morale as either a mediator or moderator of stressors and strain, and with mixed results. In their study that compared the antecedents and outcomes of morale versus depression among U.S. Army soldiers on a peacekeeping mission in Kosovo, Britt and colleagues,⁸ for example, found that individual morale mediated the relationship between several indices of engagement in meaningful work, such as task significance and military pride, and postdeployment health outcomes. In a longitudinal study of U.S. soldiers who had deployed to Iraq, Britt et al.⁶ found that individual morale buffered the effects of combat exposure on posttraumatic stress disorder (PTSD).

1.1.2 Morale and unit/organizational climate

Much of the military research related to unit or organizational climate followed the influential works of Gal and Manning.^{24,25,30} Based on an analysis of a pre-war morale survey administered to Israeli combat soldiers, Gal²⁴ proposed that military "unit" climate is comprised of morale and a number of other highly correlated factors, such as cohesion, confidence in leadership, confidence in one's self and team, and legitimacy of the war. In contrasting data from Israeli and U.S. forces, Gal and Manning²⁵ suggested unit climate is comprised of four factors, one of which is a combined 'morale and cohesion' factor. In a subsequent review of morale and cohesion for the *Handbook of Military Psychology*, Manning³⁰ described morale as the enthusiasm and persistence with which soldiers carried out their activities in the unit. Since then, many other military morale researchers from across the globe have examined morale and associated variables, such as leadership, cohesion, and esprit de corps (or pride), in the context of unit climate, or as an ingredient of combat readiness.^{23,28,31,34,42} More recently, in sync with the growing popularity of the positive psychology movement, military morale has been operationalized in terms of enthusiasm, energy, zeal, and motivation, and it has been linked to optimism, confidence, and purpose.^{2,33,35} As well, some researchers have shifted their focus from unit or organizational climate, to *psychological climate*,^{21,27} which places more emphasis on the significance and meaning of work environments, and which includes factors such as challenge, autonomy, role stress, leader support, and work group cooperation.

1.1.3 Morale and other variables of interest

This section includes studies that measure morale as a correlate of another variable or factor of interest. Murphy and Sharp⁴² studied the impact of pre- and post-enlistment factors on morale in a sample of UK military personnel deployed in Iraq. Under the hypothesis that soldiers in high morale units will be less likely to engage in

counterproductive, self-serving behaviours, Manekin³⁹ looked at the association between unit morale and opportunistic violence in a sample of Israeli combat soldiers. Noting similarities in the scale content and theoretical foundation of Britt and Dickinson's² military morale construct and Schaufeli and colleagues'⁴³ work engagement construct, Ivey et al.³⁸ tested the association between the two and their patterns of association with several antecedents and outcomes in a sample of non-deployed Canadian Armed Forces (CAF) members. And as a final example, Gould et al.³⁷ evaluated the impact of resistance training on mental health outcomes, including morale, among UK Armed Forces personnel undergoing training.

1.1.4 Individual vs. group morale

Unlike research within the education and health care domains, which more often conceptualize morale as an individual-level construct,⁴⁴⁻⁴⁷ about half of the research on morale in the military deals with morale at the group-level (e.g., platoon morale, unit morale). For example, Peterson and colleagues suggested morale is "an indicator of group well-being, just as life satisfaction is an indicator of individual well-being".^{32(p20)} Morale has also been closely linked with group cohesion in the military context. For example, a morale/cohesion dimension has been studied in both the Canadian and U.S. militaries, either based on a factor analysis²³ or for the "sake of brevity".^{15(p199)} Murphy and Sharp⁴¹ used a measure of cohesion as a proxy for morale. More recently, several researchers have investigated morale as an individual-level, affective-motivational phenomenon, similar to work engagement, and characterized by states like energy, enthusiasm, and motivation.^{2,7-9,26,34,37,38} Finally, many military researchers did not define or describe morale at all, opting for a more "straightforward"^{22(p92)} approach by simply measuring individual or group morale with a single item, such as *Rate your personal morale*,¹⁶ *How is your morale?*,¹⁰ or *How would you rate the overall morale of your present (or most recent) command?*²¹

1.1.5 Associations with morale

High group morale has been associated with individual-level variables, including satisfaction with military life,³² one's sense of pride or esprit-de-corps,³¹ and attitudes toward leadership,^{25,41} as well as group-level variables, including unit effectiveness,⁴ low rates of counterproductive behaviours,⁴ and adaptive interpersonal work group relations (i.e., cohesion, trust, belonging).^{22,30,41} The results between retention and morale at the group-level are mixed; although Motowidlo and Borman⁴ found a positive association, Wright et al.²⁰ did not. Moreover, researchers have identified that group morale and individual are positively associated within one another.²⁵

At the individual-level, low morale has been positively associated with workplace stressors, including work overload⁶ and exposure to combat,^{6,16} and also with mental health-related outcomes, including depression,^{7,8} anxiety,^{7,20} somatization,⁷ PTSD,^{6,14,16,19,20} and psychological distress.^{19,26,39} On the other hand, high personal morale has been associated with material variables including satisfaction of basic needs (i.e., food, water, sleep, protection;),³⁰ and the timing and quality of entertainment to deployed troops.¹⁴ High personal morale has also been associated with individual factors, such as pride in the military or group identification,^{8,33} organizational commitment,^{21,27,36} retention or stay intentions,^{16,21,27,38} and willingness to deploy on operations.³⁸ Moreover, high individual morale is associated with a number of job-related variables, such as job satisfaction,^{7,21,34,40} one's sense of job competence (i.e., self-efficacy, self-confidence),^{25,30,38} autonomy,²¹ role clarity,⁷ job fulfillment or engagement in meaningful work.^{8,27,38,40} High individual morale is also associated with a number of group-level factors, such as effective interpersonal work relationships (i.e., cohesion, trust, belonging),^{15,19,21,38} leadership,²¹ unit support,⁶ and collective efficacy (confidence in group members).^{2,8} Finally, morale has been positively associated with resilience⁹ and resilience training.^{10,12}

Although some of the above associations are based on theory and historical anecdotes, the majority are drawn from studies limited by: (a) poor definition—most researchers have borrowed the term morale in the same way

non-researchers use it or they have conflated morale with numerous other well-established constructs, such as job satisfaction and cohesion; (b) little to no underlying theory; and/or (c) an inability to infer causality among associated variables due to an overreliance on cross-sectional survey data and other methodological limitations. With a few exceptions,^{6,8,12,38} the rigour applied to studying morale does not measure up to the amount of interest in it. As this review suggests, what we know from the military morale literature, thus far, is that morale is a subjective workplace well-being construct that is associated with a large number of health and job factors. In other words, we do not have the evidence to infer much about morale per se. Clearly, this has impacts on leaders' ability to accurately measure and nurture morale. This lack of certainty in a construct that is imbedded in the doctrine of many militaries¹ was the impetus behind a large phenomenological study of morale in the Canadian military.

2.0 CANADIAN MILITARY MORALE STUDY

Given that the *maintenance of morale* is a CAF principle of war,¹ a large branch of the Canadian military was particularly interested in confirming the extent to which soldiers' views of morale differed, and to identify the key factors that support and thwart high morale. This multi-year, mixed methods approach included a qualitative study of soldiers, a comprehensive review of the military and science literatures on morale, theoretical model development, and model testing. In the following section, we summarize the initial work and focus more on model testing and implications.

2.1 Phase 1: Qualitative study of Army morale

A social constructionist perspective was applied to construct meaning from soldiers' experiences, and to better understand the processes through which experiences affect morale, as well as the outcomes of low or high morale. An iterative thematic analysis approach was used analogous to Braun and Clarke's⁴⁸ method, supplemented with grounded theory techniques where practical and appropriate.

Participants ($N = 177$) varied by rank, role, years of service, and education. The majority were Regular Force Army (98%) males (88%) with at least one operational tour (76%). Data were gathered in 2015 from 22 focus groups and 13 interviews conducted at four bases across Canada and within the branch's headquarters in Ottawa. The same semi-structured protocol was used for both interviews and focus groups. It was designed to capture soldiers' understanding of what morale is, what affects morale, and the outcomes of high or low morale in operational and non-operational contexts.

Prior to each interview and focus group, participants completed a short survey of work history (e.g., number of tours, years of service), and they were asked to write down three words or phrases that come to mind when they see or hear the word "morale". This question was designed to capture individual morale schemas before the potential influence of interview or focus group discussions. A word frequency query of this data using NVivo version 11.4.3 revealed the 50 most frequent words (Figure 1), with the collective top 10 being (in order) *happiness, satisfaction, work, well, job, motivation, cohesion, leadership, esprit-de-corps, and effectiveness*.



¹ A fuller account of this qualitative study will be submitted by Ivey and Mantler for publication in an academic journal.

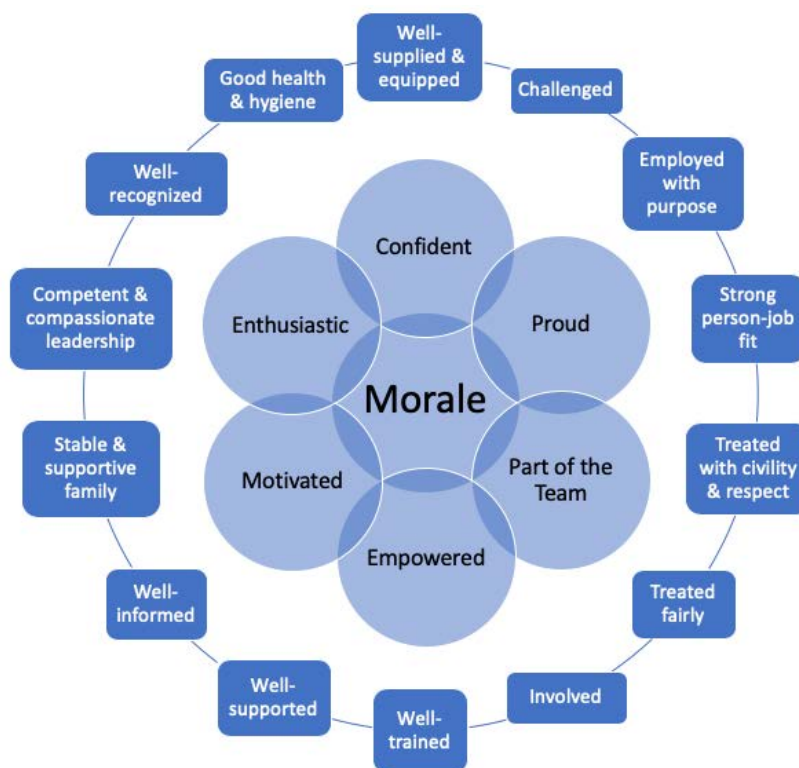


Figure 2: Thematic map of antecedents to soldier morale.

2.2 Phase 2: Literature review and theory development⁽²⁾

Building on phase 1, identification of an appropriate theoretical framework for morale started with a broader review of the scientific literature on morale beyond military contexts. The review revealed a significant body of research in the education⁴⁹⁻⁵¹ and health care domains,⁵²⁻⁵⁵ and other industries, including finance, information technology, manufacturing, government, and so on,⁵⁶⁻⁶² and that it is a global phenomenon in so far as studies of morale have been conducted in countries on almost every continent.⁶³⁻⁷⁰

The review produced a lengthy list of variables with which morale is associated, but they suffer the same limitations that plague military studies, including poor and inconsistent definition. In fact, in some studies, morale was not measured at all. As examples, Byrd-Blake et al.⁴⁹ extrapolated what participants liked or disliked about their work to their morale, and Troutt⁴⁷ inferred morale from measures of job satisfaction and other variables. The totality of the literature, however, suggests that morale has an affective component (e.g., satisfaction, pride, enthusiasm) and a motivational component (e.g., motivation, meaning, purpose, persistence), and that it manifests at two levels (individual and group). Accordingly, a subsequent review of theories related to affect and emotion, such as the *circumplex model of affect*,^{71,72} *affective events theory*,⁷³ *broaden-and-build theory*,⁷⁴ and *emotional labour*,⁷⁵ was undertaken to understand the links to morale. As well, theories related to motivation at work were

² This work was conducted within Ivey's PhD dissertation.¹⁰¹

considered, including Maslow's famous *hierarchy of needs*,⁷⁶ *motivation-hygiene theory*,⁷⁷ *existence, relatedness, growth theory*,⁷⁸ *job characteristics theory*,⁷⁹ and *goal-setting theory*.⁸⁰

Self-determination theory⁸¹⁻⁸⁴ is particularly relevant to partially explaining workplace morale, yet it is surprisingly underrepresented in the morale literature. According to self-determination theory, people invest in an activity as a function of both degree (how much?) and reason (why?). It is the variance in people's reasons that contribute to self-determination theory's multidimensional conceptualization of motivation⁸⁵⁻⁸⁷ and their differential effects. In contrast to *amotivation*, which is the absence of motivation toward an activity, self-determination theory posits two broad categories of motivation: *intrinsic* and *extrinsic* motivation.⁸² Intrinsic motivation refers to engaging in an activity for the inherent pleasure one derives from it. Extrinsically motivated individuals receive something external to the activity; the work "serves only as a means to an end".^{88(p3)} Intrinsic motivation and the sub-types of extrinsic motivation are further compartmentalized as either controlled or autonomous (self-determined) forms of motivation. Specifically, external regulation and introjected regulation are types of controlled motivation, and identified regulation and intrinsic motivation are autonomous.^{86,89} Whereas those whose behaviours are controlled by external pressures can experience negative organizational outcomes, such as burnout⁹⁰ and turnover intentions,⁸⁸ individuals who act autonomously—on their own volition and in accordance with their values and goals—demonstrate optimal functioning at work, characterized by superior performance, persistence, initiative, creativity, psychological well-being, affective commitment, and/or retention.⁹¹⁻⁹⁵

Autonomous motivation emerges from the satisfaction of three basic psychological needs: *competence* (embrace challenge and experience mastery), *autonomy* (self-organize, self-regulate, and work toward inner coherence), and *relatedness* (seek attachments and experience a sense of security and belonging with others). These essential nutrients to optimal human development and functioning are universal.⁹⁶ Research in a variety of settings has demonstrated that needs satisfaction is associated with vitality, positive affect, and affective commitment,⁹⁷⁻¹⁰⁰ and needs frustration is related to decreased motivation, burnout, depressive symptoms, and turnover intentions.^{81,97,98,100}

"Whether this unknown factor X be called soul, spirit, heart, or morale, it refers to the enthusiasm and persistence with which soldiers carry out the prescribed activities of their unit".^{30(p467)} After reflecting on the biological determinants of morale (e.g., food, water, sleep, protection from the elements), Manning argues that *"Other individual needs are psychological, and not so negotiable as the physical. High morale demands a goal, a role, and a reason for self-confidence. The goal does not have to be a grand one—in fact it most often is not—but nothing hurts morale faster than activity the soldier sees as pointless. Likewise, his role does not have to be a key one, but the perception that one's activities have no real value invariably leads to less activity. Closely linked with role and goal is self-confidence, a belief that the goal is attainable and the role is one that can be carried out".*^{30(p468)}

Manning³⁰ continues to describe the critical importance of group cohesion—the relations between soldiers within their primary work group—suggesting it is what encourages selfless behaviour and motivation in a combat setting. Although he did not cite self-determination theory in particular, the excerpts above illustrate the relevance of basic psychological needs satisfaction and autonomous motivation to morale. Ivey¹⁰¹ cites many examples of the link between self-determination theory and morale. For example, Shamir¹⁰² suggested that morale, operationalized as combat motivation, requires the internalization of values and identification with the collective. Schumm and colleagues⁴⁰ found that factors associated with job fulfilment (i.e., challenge, amount of enjoyment from the job, use of skills and training on the job) appeared to have the strongest impact on morale in a military sample. In their positive psychology inspired model of military morale, Britt and Dickinson² posited that a sense of confidence, optimism, and purpose inspire individual morale, as reflected by individual work motivation and enthusiasm. Hardy³ suggested that morale, in part, comprises worker's feelings of being valued, self-worth in relation to the

job, and being supported by others. Ivey, Blanc, and Mantler³⁸ found that basic psychological needs were related to military morale, which in turn predicted willingness to deploy on operations, well-being, and intentions to stay with the organization. In this NATO series, Blais, Howell, Wang and Comeau describe how, in a representative sample of the Canadian Defence Team, meaningful work and relatedness are key drivers of global well-being, which includes morale.

2.2.1 Needs, Affect, and Motivation Model of Morale⁽³⁾

The central components of the preceding research were captured in a *needs, affect, and motivation model of morale* (NAM3; Figure 3).¹⁰¹ According to the model, good or high individual morale is a combination of autonomous motivation and positive job affect (e.g., feeling enthusiastic, satisfied), and it is achieved by the satisfaction of the basic psychological needs. While there are aspects of military life that soldiers may find fun and exciting (e.g., parachuting, weapons training), most soldiers do not find pleasure in firing upon other human beings.¹⁰³ Most soldiers likely hold an identified regulation type of autonomous motivation—that is, they are serving because of the meaning military service has for them. However, one cannot endure stressful or unpleasant work conditions on an ongoing basis without an eventual negative effect on motivation, performance, and well-being. This might illustrate the important role of *morale boosters* (e.g., welfare services, such hot showers, good food, mail, and entertainment in theatres of operations) as a mechanism to lift spirits. A combination of positive affect and autonomous motivation may help provide the soldier with the physical and emotional energy, clarity of thought, determination, self-discipline, and hardiness for optimal individual functioning.

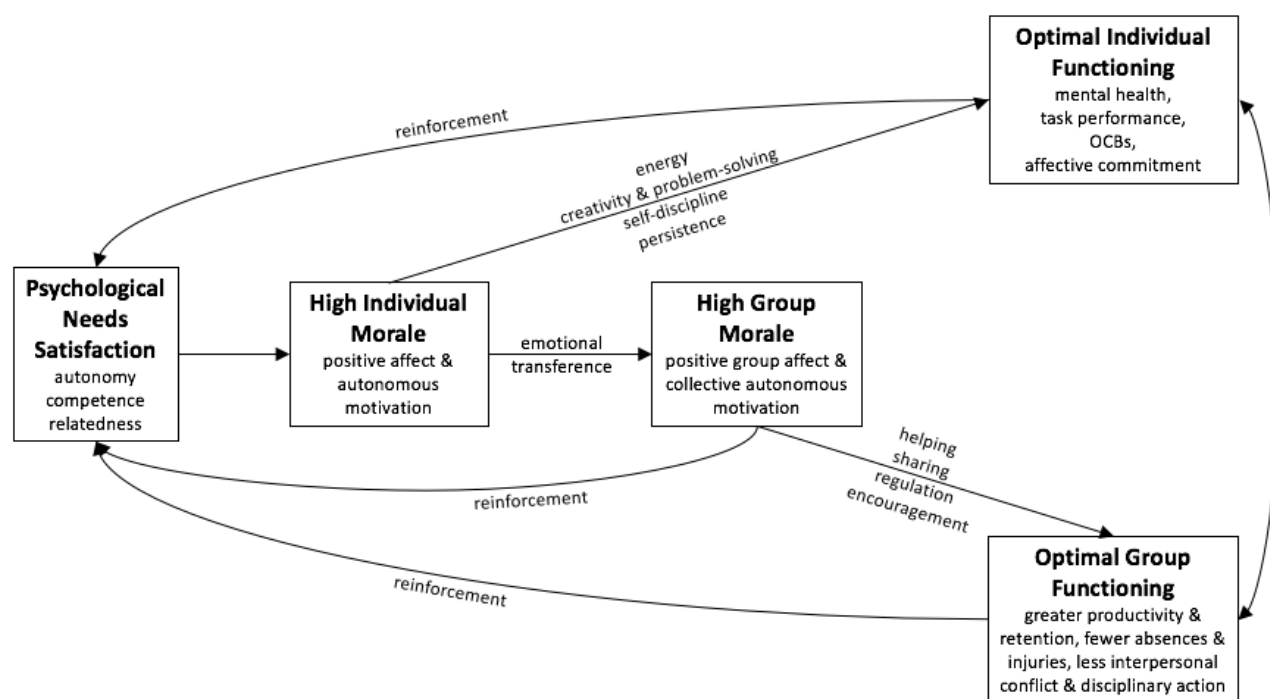


Figure 3: Needs, affect, and motivation model of morale (NAM3).
Note: OCBs is organizational citizenship behaviours.

Through the process of emotional transference,¹⁰⁴⁻¹⁰⁶ the positive affect and job directed energy and enthusiasm that those with high morale exude is passed on to others in the work group verbally and nonverbally, directly and indirectly. When the majority or all group members are autonomously motivated and experiencing positive affect, it can be said that group morale is good or high. Group morale is not cohesion. Rather, a sense of cohesion satisfies the basic psychological need for relatedness which, when accompanied by a sense of purpose, autonomy, and competence, leads to good or high individual morale. Good or high individual morale is transferred between group members to influence group morale. As well, positive group morale supports cooperative and efficient teamwork toward a common goal, and it promotes helping and other prosocial behaviours, the sharing of information and resources, and encouragement and other forms of social support. Individual group members have transitioned from a “me” to “we” mentality, such that they identify with their collective objectives and their workgroup, and threats to either are dealt with; they “police” themselves.

According to the NAM3, the morale process is dynamic and cyclical. Just as optimal individual and group functioning are influenced by the satisfaction of basic psychological needs, the wellness, positive attitudes, and accomplishments associated with optimal functioning reinforce individual needs satisfaction. High performing groups feel confident and proud of their achievements, which can bolster individuals’ sense of competence. Capable, reliable, and low maintenance groups may be empowered with greater freedom, control and responsibility, which can reinforce individuals’ sense of autonomy. Finally, the positive atmosphere, shared identity, and teamwork that is born from high morale and that facilitates the successful achievement of work objectives fortifies bonds and, consequently, their sense of relatedness.

2.3 Phase 3 - Model validation

2.3.1 Latent profile analysis of Canadian military survey data

The purpose of this study was to test key aspects of the NAM3 pertaining to individual morale. Specifically, we sought to determine if a morale construct comprised of autonomous motivation and positive affect would be associated with the proposed antecedents (psychological needs) and outcomes (psychological distress and organizational citizenship). To do so, we conducted latent profile analysis of data collected in conjunction with a larger DND/CAF survey.⁽³⁾

2.3.1.1 Method

2.3.1.1.1 Study design

A stratified random sample of a large branch of the Canadian military was selected from a sampling frame comprised of 39,109 military and civilian personnel drawn from Canada’s Defence Resource Management Information System. Random samples were drawn from each stratum (i.e., command, occupation) with proportional allocation for component (Regular Force, Primary Reserve, civilian), biological sex, rank group for military personnel, and years of service. The final target population included 13,524 personnel after necessary exclusions, such as undeliverable emails, with an acceptable expected margin of error (< 1%) for branch estimates.

Selected personnel were invited to participate in a Defence Workplace Well-being Survey via email or postcards. The survey was live from May to August 2018. After data cleaning, 3,122 respondents remained, for an overall response rate of approximately 23%. Respondents within each CA sub-organization were post stratified by

³ See Suurd Ralph, as well as Blais and Howell, in this NATO series for more information on this survey.

component and rank group for military personnel, and by age group for civilians, and sampling weights were calculated so the sample represents the CA respecting original stratification.

Seventy-six percent of the branch personnel⁽⁴⁾ completed the DWWS in English (vs. French). Fifty-three percent were members of the Regular Force, 38% were members of the Primary Reserve, and 9% were civilian employees. Thirteen percent were Officers, and 19% of the civilians were managers/supervisors. Eighty percent identified as male, 19% identified as female, and 1% identified as other. Seventy-one percent reported English (vs. French) as their first official language. Fifty-one percent were younger than 35, 41% were between 35 and 54, and 8% were older than 54. In terms of tenure, 47% had been with the DND or CAF for less than 11 years, 31% between 11 and 20 years, and 22% for 20 years or more.

2.3.1.1.2 Measures

Psychological needs. Autonomy, Competence, and Relatedness were assessed using the Work-related Basic Need Satisfaction Scale (WRBNS).¹⁰⁷ Respondents indicated their level of agreement with six statements related to Autonomy (e.g., *The tasks I have to do at work are in line with what I really want to do*; four statements pertaining to Competence (e.g., *I really master my tasks at my job*) and six statements pertaining to Relatedness (e.g., *At work, I feel part of a group*) on a 5-point scale from 1 = *Totally disagree* to 5 = *Totally agree*. Cronbach's α were .79, .89, and .88 respectively.

Job-related affect. The 20-item Job-related Affective Well-being Scale (JAWS)¹⁰⁸ was used to measure affect at work. On a 5-point scale (from 1 = *Never* to 5 = *Extremely often*), respondents rated how often they experienced a variety of positive (e.g., excited, satisfied) and negative (e.g., angry, bored) emotional states at work in the past 30 days. Cronbach's α were .93 and .91 for positive and negative affect respectively.

Work motivation. Motivation types were assessed with the 19-item Multidimensional Work Motivation Scale (MWMS).⁸⁶ Respondents rated items in response to the stem "*Why do you or would you put effort into your current job?*" on a 7-point scale from 1 = *Not at all* to 7 = *completely*. The MWMS was designed to be conceptually distinct from the three basic psychological needs in assessing self-determination theory's six motivation subtypes: amotivation (lack of motivation; α = .84), external regulation (engaging in an activity to obtain material or social rewards, avoid punishment; α = .66 for material and α = .78 for social), introjected regulation (individuals feel compelled to engage to preserve a sense of self-worth or to avoid feelings of shame or anxiety; α = .67), identified regulation (individuals act on their own volition, because the activity coheres with their goals and values and is viewed as meaningful; α = .82), and intrinsic motivation (an individual derives pleasure from the activity; α = .91). The identified regulation and intrinsic motivation subtypes are forms of autonomous motivation.

Convergent validity. A straightforward, single-item measure of morale (i.e., *How would you rate your individual level of morale?*) was used assess convergent validity of our global morale construct. Respondents rated their individual morale on a 5-point scale from 1 = *Very low* to 5 = *Very high*.

Mental health. The Kessler Psychological Distress Scale (K10)¹⁰⁹ was used to measure levels of unspecified Psychological Distress. The 10-item scale measures symptoms of anxiety and depressive symptoms in the four-week period preceding survey administration (e.g., *Did you feel tired out for no reason?*). Participants rated the extent to which they experienced each symptom on a 5-point scale from 1 = *None of the time* to 5 = *All of the time*. Cronbach's α was .94.

⁴ We describe these characteristics with weighted percentages.

Organizational citizenship behaviours. Four subscales of the OCB Scale¹¹⁰ were used to measure this indicator of contextual performance: conscientiousness ($\alpha = .76$), civic virtue ($\alpha = .83$), courtesy ($\alpha = .86$), and altruism ($\alpha = .89$). Participants rated their level of agreement with statements (e.g., “*You are always ready to lend a helping hand to those around you*”) on a 7-point scale from 1 = *Strongly disagree* to 7 = *Strongly agree*.

Weighted descriptive statistics for each of the study variables are displayed in Tables 1a and 1b.

Table 1a: Study variables: Weighted descriptive statistics.

Study variable	Unweighted <i>n</i>	Range	<i>M</i>	95% CI		<i>SD</i>
				<i>LL</i>	<i>UL</i>	
Basic Psychological Needs						
1. Autonomy	2,941	1-5	3.01	2.98	3.05	0.74
2. Competence	2,889	1-5	4.03	4.00	4.06	0.67
3. Relatedness	2,939	1-5	3.59	3.54	3.63	0.84
4. Single-item Morale	2,968	1-5	3.42	3.37	3.47	0.98
Affect						
5. Positive Affect	2,851	1-5	2.91	2.86	2.95	0.86
6. Negative Affect	2,890	1-5	2.27	2.23	2.32	0.87
Motivation						
7. Intrinsic Motivation	2,915	1-7	4.31	4.23	4.38	1.57
8. Identified Regulation	2,915	1-7	5.16	5.09	5.23	1.39
9. Introjected Regulation	2,878	1-7	4.41	4.34	4.48	1.32
10. Extrinsic Regulation - Material	2,908	1-7	2.25	2.20	2.31	1.19
11. Extrinsic Regulation - Social	2,921	1-7	3.15	3.07	3.23	1.52
12. Amotivation	2,911	1-7	1.92	1.85	1.98	1.21
13. Psychological Distress	2,987	1-5	1.87	1.83	1.91	0.85
Organizational Citizenship Behaviours						
14. Altruism	2,888	1-7	6.08	6.04	6.13	0.86
15. Civic Virtue	2,882	1-7	5.05	4.99	5.12	1.29
16. Conscientiousness	2,849	1-7	5.71	5.66	5.75	0.94
17. Courtesy	2,884	1-7	6.13	6.09	6.18	0.82

Note. *M* = mean; CI = confidence interval; *LL* = lower limit, *UL* = upper limit; *SD* = standard deviation.

Table 1b: Study variables: Weighted descriptive statistics (cont'd)

Study variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Basic Psychological Needs																	
1. Autonomy	-																
2. Competence	.27	-															
3. Relatedness	.49	.27	-														
4. Morale	.61	.35	.50	-													
Affect																	
5. Positive Affect	.64	.30	.49	.71	-												
6. Negative Affect	-.64	-.22	-.45	-.64	-.60	-											
Motivation																	
7. Intrinsic Motivation	.56	.30	.42	.63	.70	-.46	-										
8. Identified Regulation	.41	.28	.31	.53	.52	-.35	.65	-									
9. Introjected Regulation	.15	.28	.14	.27	.27	-.11	.36	.57	-								
10. Extrinsic Regulation - Material	-.01	-.08	-.01	-.01	.04	.08	.03	.03	.22	-							
11. Extrinsic Regulation - Social	.02	-.01	.05	.09	.10	.03	.09	.18	.47	.45	-						
12. Amotivation	-.46	-.21	-.27	-.50	-.43	.49	-.45	-.50	-.21	.18	.07	-					
13. Psychological Distress	-.51	-.24	-.44	-.57	-.53	.75	-.36	-.26	-.04	.12	.08	.45	-				
Organizational Citizenship Behaviours																	
14. Altruism	.11	.25	.14	.25	.20	-.10	.24	.36	.19	-.10	< .01	-.20	-.10	-			
15. Civic Virtue	.26	.27	.23	.37	.31	-.21	.36	.39	.23	< .01	.09	-.29	-.20	.41	-		
16. Conscientiousness	.09	.27	.05	.23	.15	-.08	.23	.35	.21	-.05	.08	-.21	-.08	.46	.47	-	
17. Courtesy	.13	.19	.16	.24	.18	-.15	.24	.36	.19	-.10	.03	-.26	-.12	.68	.48	.55	-

Note. Correlation coefficients greater than .04 are significant at the .05 level (two-tailed).

2.3.1.1.3 Analytical approach

Dimensionality of Morale. We examined the conceptual representation of higher-order Morale via confirmatory factor analysis (CFA) and exploratory structural equation modeling (ESEM) with *Mplus* (Version 8)¹¹¹ by means of its robust maximum likelihood (MLR) estimator.⁽⁵⁾ This estimator provides “maximum likelihood parameter estimates with standard errors and a chi-square test statistic (when applicable) that are robust to non-normality and non-independence of observations when used with TYPE=COMPLEX”.^{113(p668)} With MLR, the default is to estimate models under missing data theory using all available data.¹¹¹ Referred to as, full information maximum likelihood (FIML), this method works with various patterns and rates of missing data⁽⁶⁾ (e.g., > 50%).^{112,113}

We report the Satorra-Bentler scaled chi-square with its degrees of freedom (*df*) and *p* value. However, because this statistic can be overly sensitive to sample size,^{114,115} we interpreted the following approximate fit indices, corrected for non-normality and non-independence of observations: (a) the Steiger-Lind root mean square error of approximation (RMSEA)¹¹⁶ and its 90% confidence interval (CI); and (b) the comparative fit index (CFI).¹¹⁷ Values close to .06 and .95, respectively, suggest excellent data-model fit, and values close to .08 and .90, respectively, indicate acceptable fit.¹¹⁸

As per Morin and colleagues’¹¹⁹⁻¹²¹ approach to the investigation of *construct-relevant psychometric multidimensionality*, we first compared the results from the CFA and ESEM on the dimensions of morale (affect and motivation). We selected this approach because the dimensions represent *conceptually-related* constructs. We then contrasted the retained CFA or ESEM solution with its matching bifactor model to evaluate the presence of construct-relevant psychometric multidimensionality due to the assessment of a *hierarchically-superior* construct (a.k.a. G-factor) – in this case, morale (referred to henceforth as M-factor).

We conducted the LPAs on the factor scores.^{122,123} Following Howard and colleagues,¹²⁴ we examined one to eight profiles. In all LPAs, we freely estimated the means and variances of the factor scores.¹²⁵ We used 10,000 random sets of start values and 1,000 iterations for each random start, and we retained the 500 best solutions for final stage optimization.¹²⁶ All models converged on replicated solutions.

Morale Profiles. To guide our selection of the optimal number of profiles, we considered the following indices, which are particularly helpful in choosing the model that best recovers the sample’s true parameters^{(7),126} the Bayesian Information Criterion (BIC)¹²⁷ and the Sample-Adjusted BIC (SABIC),¹²⁸ where lower values signify better fit.¹²⁹ As sample sizes become larger, however, these indices may point to an ever-increasing number of profiles.¹³⁰ We depict, in an elbow plot,^{125,131} the decreasing values of the BIC and SABIC as the number of profiles increases. The point at which the slopes flatten suggests the optimal number of profiles.¹²⁵ For descriptive purposes, we also report the entropy, which ranges between 0 and 1 and provides a summary of the classification accuracy, where higher values indicate greater accuracy.

Predictors, Correlate, and Outcomes. Because the set of predictors and the set of outcomes each represents conceptually-related constructs, we explored both the CFA and ESEM representations of these data. Following Gillet et al.¹³² and Morin et al.¹¹⁹, and using the factor scores from the retained factor solutions, we tested the associations between the Morale profiles and predictors, the correlate, and outcomes using methods appropriate to their status. To explore the relationships between the predictors and the odds of membership into the various

⁵ We relied on *Mplus* and its MLR estimator for all subsequent analyses as well.

⁶ In the current study, listwise deletion would have resulted in $n = 2,426$ or approximately 81% of the initial sample.

⁷ The bootstrap likelihood ratio test,¹³¹ equally effective, is not available with TYPE=COMPLEX in *Mplus* (Version 8).¹¹¹

profiles, we conducted a multinomial logistic regression. We contrasted levels of individual morale using the *Mplus* AUXILIARY (e) function, and we compared outcomes levels via the *Mplus* AUXILIARY (BCH) approach for continuous outcomes.¹³³

2.3.1.2 Preliminary Results

2.3.1.2.1 Conceptual representation of the M-factor

The ESEM showed an excellent data-model fit ($\chi^2[457] = 1,826.50, p < .001$, RMSEA [90% CI] = .032 [.030, .033], CFI = .95; vs. $\chi^2[674] = 5,311.69, p < .001$, RMSEA [90% CI] = .048 [.047, .050], CFI = .85 for the CFA model), generally well-defined factors with standardized factor loadings greater than .50 ($|\lambda| = .24-.93$), and small-to-moderate cross-loadings ($|\lambda| < .01-.52$).^{(8),123} The ESEM also resulted in a clearer differentiation between the factors ($|r| = .01-.61$) relative to the CFA model, $|r| = .02-.90$. Compared to the ESEM, the subsequent bifactor ESEM showed a slightly improved fit to the data, $\chi^2(426) = 1,553.77, p < .001$, RMSEA [90% CI] = .030 [.028, .032], CFI = .96.

The M-factor supported the notion of a continuum structure of motivation underlying morale, $|\lambda| = .05-.84$. More specifically, the standardized factor loadings on the M-factor were negative for the items associated with Amotivation, small or negative for the items related to External Regulation, small-to-moderate for the items associated with Introjected Regulation, and moderate-to-large and positive for the items pertaining to Autonomous Motivation. Furthermore, the Negative Affect items had moderate and negative loadings on the M-factor, whereas the Positive Affect items showed moderate-to-large positive loadings. Overall, the specific factors retained a meaningful level of specificity ($|\lambda| = .10-.84$), especially the External Regulation (Social), Amotivation, and Negative Affect factors. Lastly, the superiority of the bifactor ESEM is also apparent from the slightly reduced cross-loadings ($|\lambda| < .01-.43$) relative to the ESEM.¹²¹ Together, these results support the NAM3's notion of a higher order morale construct that is comprised primarily of autonomous motivation and positive affect.

2.3.1.2.2 Morale profiles

When conducting LPA on a higher order construct, such as the morale M-factor studied herein, Morin et al.¹³⁴ suggest incorporating this construct as an additional profile dimension in the LPA. After controlling for the general tendency shared across all dimensions, unique variance remains at the dimension level that allows for the identification of patterns across dimensions. Not incorporating the G-factor makes identification of well-differentiated profiles significantly more challenging.¹³⁴ Therefore, we included the M-factor with the specific motivation and affect dimensions in our LPA and, in so doing, identified a four-profile solution. Goodness-of-fit indices from all LPAs are listed in Table 2, and the factor score means and variances in Table 3.

As illustrated in Figure 4, four morale profiles emerged: The *Low Morale - Amotivated* profile (1) represents 35% of the sample and can be described as having low levels of autonomous motivation, high Amotivation, low Positive Affect, and moderate Negative Affect. Even after accounting for this group's M-factor, a substantial

⁸ The complete set of results is available upon request from the first author.

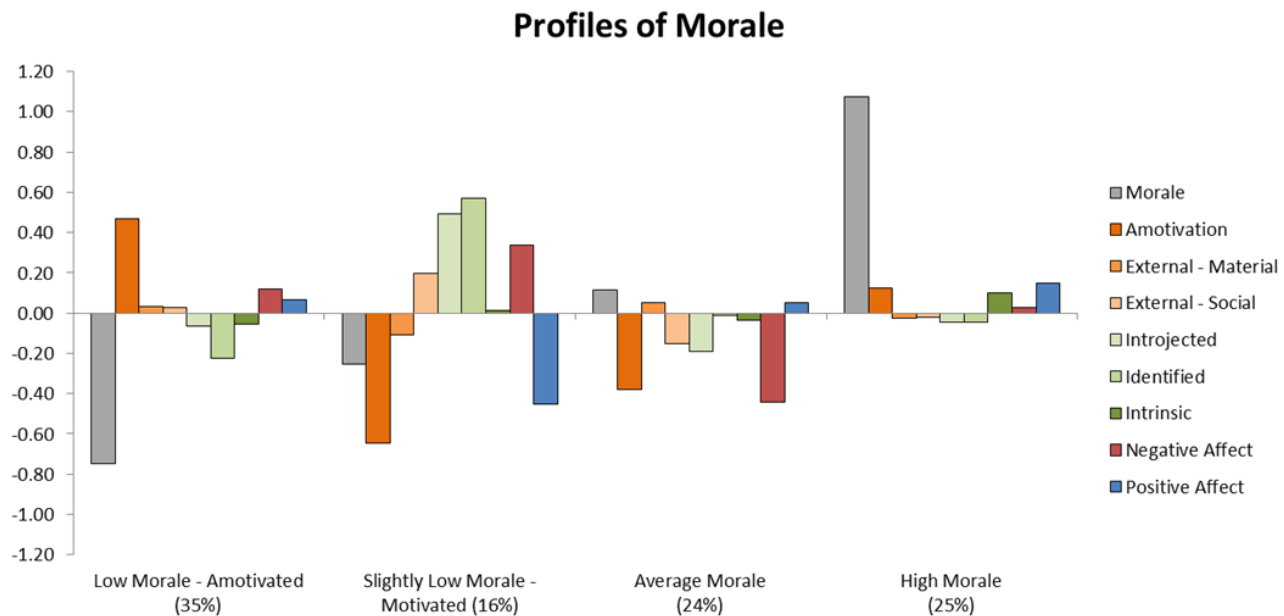


Figure 4: Morale profiles.
Note: Morale is the M-factor (global morale).

degree of Amotivation remains. The *Slightly Low Morale - Motivated* profile (2) includes 16% of the sample. Like the first profile, this group has lower levels of autonomous motivation and Positive Affect. However, after the M-factor is accounted for, substantially low levels of Amotivation and high levels of External Regulation (Material) and Identified Regulation remain, along with higher levels of negative affect and lower positive affect. Altogether, this profile appears to be highly motivated to do their work, but they are not deriving pleasure or satisfaction from it; on the contrary, they appear to be experiencing negative emotional states from it. The *Average Morale* profile (3) consists of 24% of the sample and reflects a group with good levels of autonomous motivation and Positive Affect, and low Negative Affect. Once the M-factor has been accounted for, low levels of Amotivation and Negative Affect remain, reinforcing the notion that these individuals are indeed motivated and functioning well at work. Finally, the *High Morale* profile (25%) is characterized by peak levels of autonomous motivation and positive job-related affect, and low negative affect, all captured within the M-factor. This group is doing work that they find pleasurable, but also very meaningful, and they are enthusiastic, inspired, and excited by their work.

Table 2: Results from the latent profile solutions.

	Profile 1 Low Morale - Amotivated (35%)	Profile 2 Slightly Low Morale - Motivated (16%)	Profile 3 Average Morale (24%)	Profile 4 High Morale (25%)
Within-profile means				
Morale (M-factor)	-0.75 [-0.89, -0.61]	-0.25 [-0.48, -0.02]	0.12 [-0.07, 0.30]	1.08 [0.87, 1.29]
Intrinsic Motivation	-0.06 [-0.16, 0.05]	0.01 [-0.20, 0.23]	-0.03 [-0.14, 0.07]	0.10 [0.02, 0.18]
Identified Regulation	-0.23 [-0.36, -0.09]	0.57 [0.28, 0.86]	-0.01 [-0.15, 0.13]	-0.04 [-0.13, 0.04]
Introjected Regulation	-0.07 [-0.17, 0.04]	0.50 [0.02, 0.97]	-0.19 [-0.36, -0.02]	-0.05 [-0.15, 0.06]
Extrinsic Regulation - Material	0.03 [-0.07, 0.14]	-0.11 [-0.27, 0.05]	0.05 [-0.04, 0.14]	-0.03 [-0.11, 0.06]
Extrinsic Regulation - Social	0.03 [-0.06, 0.12]	0.20 [-0.10, 0.50]	-0.15 [-0.29, -0.02]	-0.02 [-0.14, 0.09]
Amotivation	0.47 [0.29, 0.64]	-0.65 [-0.78, -0.51]	-0.38 [-0.53, -0.23]	0.12 [0.07, 0.18]
Negative Affect	0.12 [< -0.01, 0.25]	0.34 [-0.08, 0.76]	-0.44 [-0.67, -0.22]	0.03 [-0.06, 0.12]
Positive Affect	0.06 [-0.03, 0.16]	-0.45 [-0.78, -0.12]	0.05 [-0.43, 0.53]	0.15 [0.03, 0.27]
Within-profile variances				
Morale (M-factor)	0.84 [0.68, 1.00]	0.41 [0.30, 0.52]	0.18 [0.12, 0.24]	0.22 [0.12, 0.31]
Intrinsic Motivation	0.80 [0.65, 0.96]	1.15 [0.82, 1.48]	0.38 [0.23, 0.52]	0.33 [0.23, 0.43]
Identified Regulation	0.88 [0.55, 1.20]	0.75 [0.23, 1.28]	0.38 [0.26, 0.50]	0.32 [0.25, 0.39]
Introjected Regulation	0.71 [0.61, 0.80]	0.67 [0.32, 1.03]	0.49 [0.40, 0.59]	0.72 [0.64, 0.81]
Extrinsic Regulation - Material	0.81 [0.67, 0.96]	0.83 [0.58, 1.08]	0.30 [0.22, 0.37]	0.38 [0.28, 0.50]
Extrinsic Regulation - Social	0.68 [0.58, 0.78]	1.25 [1.01, 1.48]	0.66 [0.52, 0.79]	0.96 [0.83, 1.09]
Amotivation	1.45 [1.18, 1.73]	0.14 [0.09, 0.19]	0.11 [0.05, 0.18]	0.10 [0.07, 0.13]
Negative Affect	1.23 [1.04, 1.42]	1.46 [1.15, 1.77]	0.37 [0.24, 0.50]	0.26 [0.20, 0.33]
Positive Affect	0.79 [0.66, 0.92]	1.33 [0.98, 1.68]	0.55 [-0.36, 1.46]	0.64 [0.42, 0.85]

Table 3: Profile-Specific Factor Scores [and 95% Confidence Intervals] on the Morale Facets.

Profile	LL	#fp	CF	BIC	SABIC	Entropy
1	-33,894.05	18	2.54	67931.89	67874.70	1.00
2	-32,818.61	37	2.23	65932.76	65815.20	.64
3	-32,469.72	56	2.54	65386.75	65208.82	.66
4	-32,221.51	75	2.67	65042.11	64803.81	.68
5	-32,041.31	94	2.61	64833.47	64534.80	.72
6	-31,887.36	113	2.53	64677.35	64318.31	.69
7	-31,738.74	132	2.61	64531.87	64112.46	.71
8	-31,597.75	151	2.52	64401.67	63921.89	.73

Note. LL = loglikelihood; #fp = number of free parameters; CF = correction factor; BIC = bayesian information criterion; SABIC = sample-size adjusted BIC.

2.3.1.2.3 Predictors, Correlate, and Outcomes

An excellent data-model fit ($\chi^2[75] = 342.10, p < .001$, RMSEA [90% CI] = .035 [.031, .038], CFI = .97), slightly reduced factor correlations ($|r| = .29-.55$ vs. $|r| = .30-.64$), small-to-moderate cross-loadings ($|\lambda| < .01-.35$), and well-defined factors ($|\lambda| = .43-.89$) supported the ESEM representation of the predictors relative to the CFA model, $\chi^2(101) = 595.24, p < .001$, RMSEA (90% CI) = .040 (.037, .044), CFI = .94. A slightly elevated data-model fit ($\chi^2[269] = 1,563.48, p < .001$, RMSEA [90% CI] = .040 [.038, .042], CFI = .93), slightly reduced factor correlations ($|r| = .08-.71$ vs. $|r| = .07-.77$), small-to-moderate cross-loadings ($|\lambda| < .01-.41$), and well-defined factors ($|\lambda| = .40-.91$) supported the ESEM representation of the outcomes relative to the CFA model, $\chi^2(365) = 2,140.39, p < .001$, RMSEA (90% CI) = .040 (.039, .042), CFI = .91.

The results from the multinomial logistic regression showed that higher perceived levels of Autonomy, Competence, and Relatedness were all associated with greater odds of membership in the *High Morale* profile (the benchmark) relative to the *Low Morale – Amotivated* profile (14.67, 1.53, and 2.66 respectively; Figure 5). Higher Autonomy and Relatedness were both associated with greater odds of membership in the *High Morale* profile relative to the *Slightly Low Morale - Motivated* profile (6.12 and 3.37 respectively); Competence was not a significant distinguisher in this case. Lastly, higher perceived levels of Autonomy, Competence, and Relatedness were all associated with greater odds of membership in the *High Morale* profile compared to the *Average Morale* profile (1.70, 1.59, and 2.53 respectively). That *Low Morale*, *Slightly Low Morale*, and *Average Morale* membership (versus membership in the *High Morale* profile) was predicted by psychological needs satisfaction supports the NAM3.

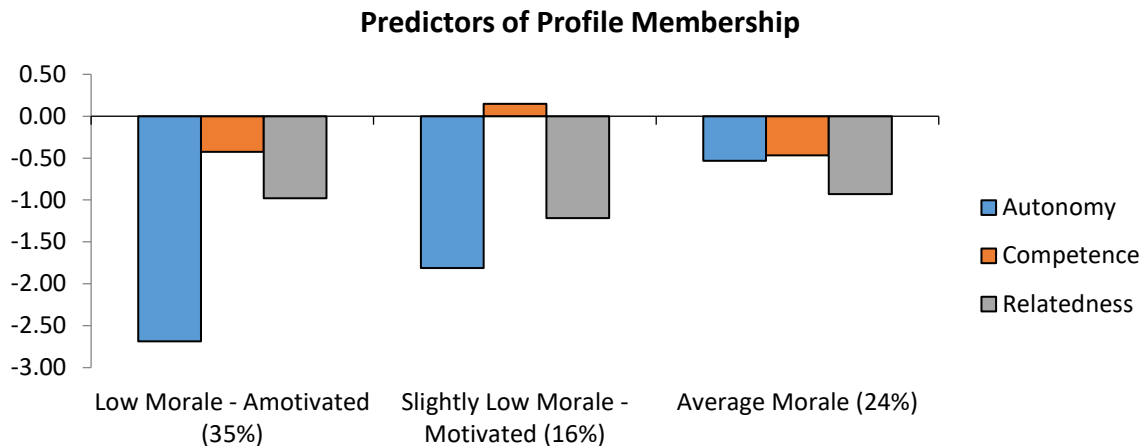


Figure 5: Distribution of single item morale scores across global morale profiles.

Paralleling levels of global morale (M-factor), levels of individual morale (our single convergent validity item) were the highest in the *High Morale* profile ($M = 4.12, SE = 0.04$), followed by the *Average Morale* profile ($M = 3.48, SE = 0.04$), and then by the *Slightly Low Morale - Motivated* ($M = 2.77, SE = 0.07$) and *Low Morale - Amotivated* ($M = 2.62, SE = 0.04$) profiles, which were not distinguishable from one another (Figure 6). Psychological Distress was lowest in the *High Morale* ($M = -0.57, SE = 0.03$) and *Average Morale* ($M = -0.52, SE = 0.05$) profiles, but indistinguishable from one another, followed by the *Slightly Low Morale - Motivated* ($M = 0.43, SE = 0.09$) and *Low Morale - Amotivated* ($M = 0.58, SE = 0.06$) profiles, which were also indistinguishable from one another (Figure 7). Interestingly, the OCBs followed a slightly different pattern. As expected, higher

levels of OCBs were associated with the *High Morale* profile. However, the two low morale profiles yielded different results; although OCB levels were low in the *Low Morale – Amotivated* profile (as expected), OCB levels were high in the *Slightly Low Morale – Motivated* profile. Levels of OCBs were average in the *Average Morale* profile. That the *Low Morale* and *High Morale* profile membership predicted psychological distress and OCBs supports the NAM3. Interestingly, while *Average Morale* predicted average levels of OCBs, this group was not different than the *High Morale* group on Psychological Distress. Surprisingly, the other low morale profile, *Slightly Low Morale – Motivated*, were performing OCBs at a higher level than the *Average Morale* group, though their Psychological Distress levels were also higher.

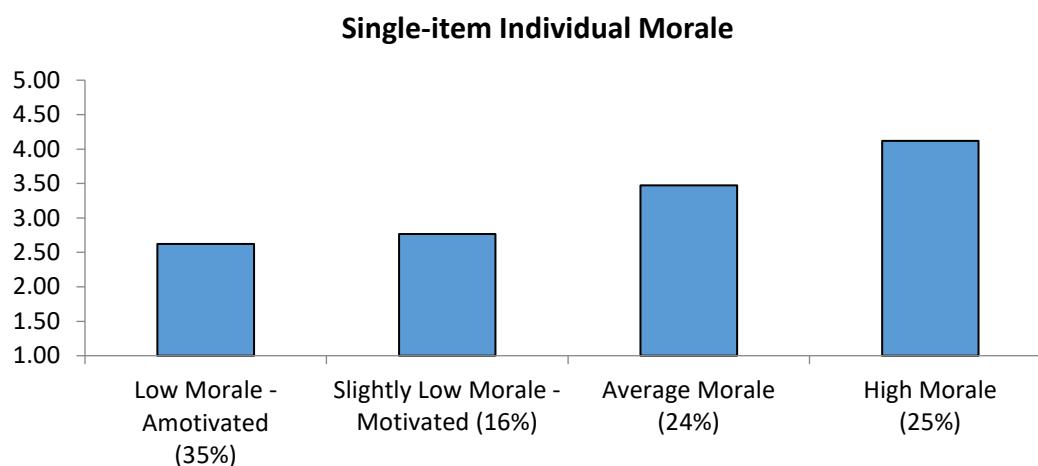


Figure 6: Distribution of single-item morale scores across global morale profiles.

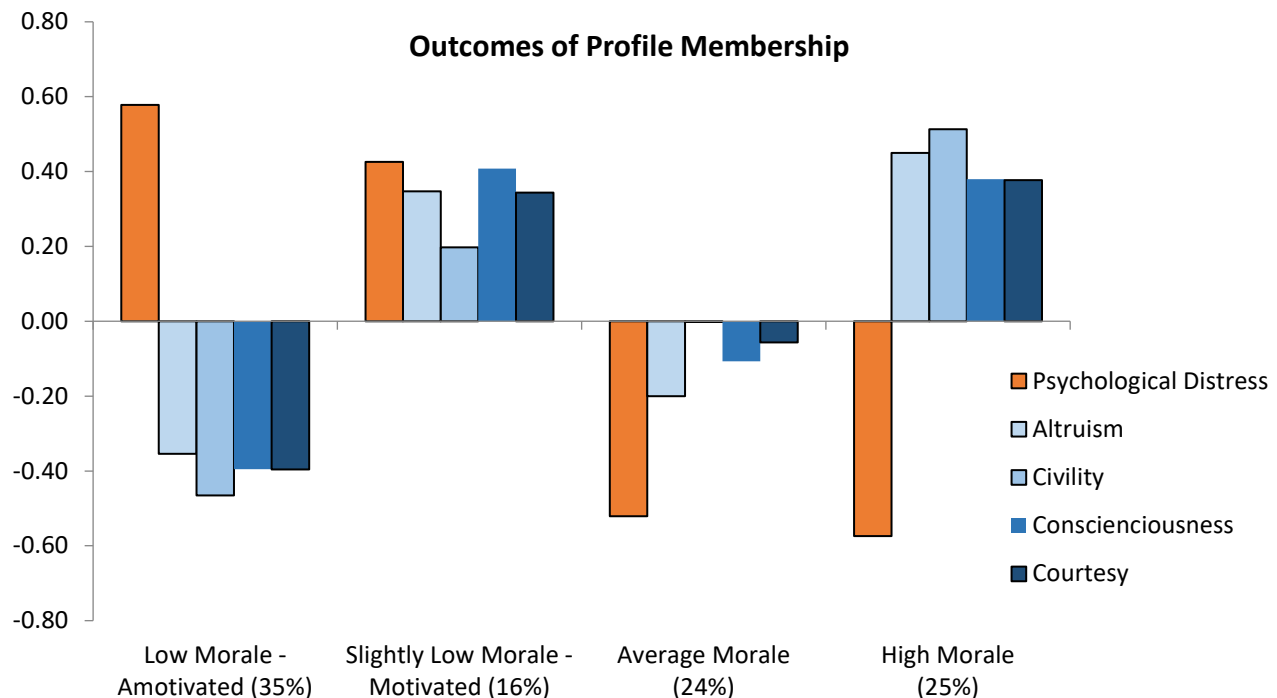


Figure 7: Distribution of outcomes across global morale profiles.

From the final retained bifactor ESEM solution, we conducted additional analyses to evaluate the criterion validity of the various morale indicators. More specifically, we used multiple regression analyses to assess the added value of the M-factor, as well as that of the specific M-factor facets, over and above the individual morale item in terms of percentage of explained variance in the outcomes. As the sole predictor, the individual morale item explained 32% of the variance in Psychological Distress. Adding the M-factor explained an additional 2% of the variance in Psychological Distress, and including the specific factors contributed an additional 33% to its explained variance. Turning to the OCBs, the results were very consistent across dimensions. More precisely, when considered as the sole predictor of the OCBs, the individual morale item explained between 3% and 10% of their variance. The M-factor contributed between 4% and 7% over and above the single item, and the specific factors explained between 3% and 8% of the variance in the OCBs above and beyond the M-factor. In other words, the M-factor and its specific factors explained twice as much of the variance in Psychological Distress (67%) and almost three times as much variance in OCBs (10-25%) compared to a single item of individual morale.

3.0 DISCUSSION

3.1 Summary

Given the divergent application of the term morale in the military and academic literatures, we undertook a comprehensive scientific examination of morale on behalf of the Canadian military. This paper focused on two key components of this effort: development and validation of an evidence-based model of morale. Specifically, we introduced the NAM3, which draws from motivation, affect, and emotional transference theories to describe

the key components of individual morale and the processes through which morale has its effect on individual functioning, and on group morale and group functioning.

We applied a state-of-the-art integrated variable- and person-centred framework for the investigation of the underlying dimensionality of morale. In accordance with Morin and colleagues' findings,^{134,135} variable-centered approaches (i.e., CFA, ESEM, and bifactor ESEM) revealed the presence of two distinct sources of construct-relevant psychometric multidimensionality underlying the indicators of a hierarchically superior construct; in our case, morale. Specifically, our results pointed to six motivation sub-types and positive and negative affect as conceptually related constructs subsumed under a global morale factor (or M-factor). This representation of morale makes it possible to explicitly represent the global morale construct while taking into account the information associated with the specific morale dimensions. Moreover, in support of the NAM3, the M-factor was largely influenced by the autonomous motivation subtypes (intrinsic motivation and identified regulation) and positive affect (high arousal emotions in particular, such as feeling enthusiastic, energetic, and inspired).

Preliminary results of a series of LPAs revealed four distinct morale profiles. As well, meaningful specificity remained in the morale dimensions after accounting for the M-factor. In addition to each morale profile being distinct in their level of global morale, they each revealed unique patterns of results on the specific morale dimensions which allowed for greater interpretation of each factor. Consequently, relying solely on the M-factor score to describe personnel would result in a loss of information. For example, two of the four profiles indicate lower than average morale, but the two groups (*Low Morale – Amotivated* and *Slightly Low Morale – Motivated*) vary distinctly on their motivation; one group is unmotivated and the other is very motivated, albeit extrinsically (vs. intrinsically) motivated. The slightly low morale stems from the lack of satisfaction derived from their work. Note, the individual morale item could not discriminate between these two low morale groups, nor could it provide insight into the quantity and quality of motivation and job-related affect that distinguish these two low morale groups.

Higher levels of perceived Autonomy, Competence, and Relatedness distinguished the *High Morale* profile from both the *Low Morale – Amotivated* and *Average Morale* profiles. Autonomy and Relatedness, but not Competence, distinguished the *High Morale* profile from the *Slightly Low Morale – Motivated* profile. As per the NAM3, basic psychological needs satisfaction supports positive morale (average and high morale), but insufficient levels of Autonomy, Competence, and Relatedness (or needs frustration) can negatively impact morale. Note, Autonomy emerged as a particularly salient distinguishing predictor.

As per the NAM3, *High Morale* was associated with lower Psychological Distress and more OCBs, which reflect the extent to which people go above and beyond in their work or to help others. *Average Morale* had similarly low Psychological Distress, but their OCBs were average. The two low morale profiles revealed some interesting findings. As expected, they had similarly higher levels of Psychological Distress, but they had different OCB patterns; the *Low Morale – Amotivated* group was low on OCBs and the *Slightly Low Morale – Motivated* group was high on OCBs. In fact, the latter group was higher on OCBs than the *Average Morale* group. Perhaps this group is burned out as a consequence of going above and beyond. Or, perhaps this group is going above and beyond to compensate for deficiencies in psychological needs satisfaction or in response to their extrinsic work motivation (e.g., to avoid punishment, to please others, or to feel a sense of self-worth).

Together, these results provide preliminary support for the NAM3, including the representation of individual morale and its association with theory informed predictors and outcomes. It also demonstrated convergent validity with a straightforward single-item measure of individual morale in that single item morale scores followed the M-factor profiles, from low to high morale. So, what is the added value of the M-factor? As stated previously, the M-factor provides much greater insight into the complex nature of morale. Not only could the single-item not

discriminate between the two forms of low global morale, but it is unable to explain the low morale. The NAM3 provides a theoretical roadmap to morale, and the profiles show the signs. Moreover, the M-factor and the specific dimensions accounted for doubling the variance in Psychological Distress, and tripling the variance in OCBs, above and beyond the single-item measure of morale.

3.2 Limitations

Like all qualitative research, regardless of how rigorous the studies are, generalizability is limited to the sample. Therefore, we caution readers in applying our thematic map of Army morale to other populations without careful consideration of context. Nonetheless, readers can be reassured in the extent to which the map's core features (i.e., motivation, empowerment, confidence, belonging, pride) cohere with previous morale studies and well validated theories, such as self-determination theory. With respect to the NAM3 validation (Study 1), the findings are based on self-report data (associated with social desirability and common method biases), and on a cross-sectional design, which limits claims to causality. However, we drew on theory to situate variables as predictors and outcomes. Also, to mitigate survey fatigue, we left out important individual difference variables (e.g., emotional stability, trait negative affect) that likely also predict morale profile membership. With the exception of the MWMS and K10, the scales used herein have not undergone language invariance testing. Consequently, the English and French versions may not be equivalent, which limits the extent to which you can pool data. This may not be a major issue as less than one quarter completed the survey in French. Still, we ran the English only data and the same four profiles emerged. To be sure, future research should control for potential language effects. The strong correlation between negative affect and psychological distress ($r = .75$) raises concern about discriminant validity. Although conceptually distinct, common method bias may have made it more difficult for respondents to distinguish the two. This might account for the substantial amount of incremental variance accounted for by the M-factor and its specific dimensions (which includes negative affect). Future research should mitigate common method bias and consider other mental health scales, and other outcomes theoretically linked to morale per the NAM3 (e.g., organizational commitment, task performance). Finally, the extent to which similar global morale profiles emerge in other services and militaries is not known. Although the NAM3 is grounded in international science and well-validated theories, whether or not the dimensionality of morale, the profiles, and the relationships between the profiles and their predictors and outcomes hold in other settings and cultures is yet to be determined.

3.3 The Way Ahead

Recognizing the need to supplement this study with a longitudinal design, and to test the group-level aspects of the NAM3, we undertook a group randomized controlled trial in a field setting. We set out to determine if leadership training⁹ designed to increase leaders' psychological needs supportive leadership behaviours enhanced small Army team functioning through its impact on individual morale. Unfortunately, participant attrition limited statistical analysis. However, preliminary results trended according to NAM3 expectations.¹³⁶ Going forward, we will consider new and innovative ways to apply rigorous research methods without being obtrusive to operational tempo or leading to excessive study attrition. We will consider these findings against complementary research using similar methods, such as the work described in Suurd Ralph and by Blais and colleagues reported in this series. For example, do we need a global morale measure and a global well-being measure? How can findings from both works merge to inform military operational readiness and resilience?

⁹ Transformational leadership training delivered by Dr. Kevin Kelloway and Needs Supportive Leadership training delivered by Dr. Jacques Forest. The first author would like to acknowledge and thank both for their significant contributions.

3.4 Implications of the Research

3.4.1 Impact on Science

The research presented herein addresses a gap in the morale literature by developing and testing a conceptualization (representation) of morale and an associated model that draws from a comprehensive review of the morale literature, as well as applicable theories and validated studies. In doing so, it adds fidelity to our understanding of individual morale and the processes through which it leads to optimal individual and group functioning.

The research also adds to a growing body of support for the positive psychology paradigm and related theories, including self-determination theory. Specifically, it highlights the importance of autonomous motivation to well-being and performance, and its reliance on psychological needs satisfaction. It also supports the continuum of controlled to autonomous motivation. It builds recent research that has developed motivation profiles^{132,137} however, with the addition of the positive and negative dimensions. Not only is this supported by the theory underlying morale, but it added valuable insight to the profiles. For example, profile 2 (*Slightly Low Morale – Motivated*) might otherwise be labelled *Extrinsically Motivated* in the absence of the Positive and Negative Affect dimensions which point to lower workplace well-being. With the addition of job-related affect, we have greater insight into the complex nature of motivation, in addition to morale.

3.4.2 So What for Leaders?

The methods we used to represent morale herein (i.e., latent profile analysis of multiple dimensions) are not accessible to leaders, especially in deployed settings. We used them to test a theoretical model of morale meant to provide greater fidelity to the morale construct and the processes through which it is affected and has its effects. Leaders should attend to the signs of low or high morale that result from this research. To that end, we believe greater discourse is merited in leaders' professional development. Learning and discussions should include relevant theories of affect and motivation, as well theories of emotional transference, so soldiers understand the psychological and social processes that may impact morale, and how low or high morale can impact individual and group functioning.

The NAM3 represents some of the key components of those processes, but it is not exhaustive, nor is it prescriptive at a practical level. However, when considered in combination with the thematic map in Figure 2, greater insights are apparent. The map highlights several factors that can affect autonomous motivation and positive affect. As examples: (a) employing soldiers in jobs that aligns with one's goals, values, and skills [strong person-job fit], and that give them a sense of purpose and achievement; (b) empowering soldiers through challenging experiences [e.g., with greater responsibility, job variety, exciting training], providing them with the right tools and people to do the job [well equipped & supplied], and with sufficient information to understand expectations and act, and to quash fear and ambiguity; (c) treating soldiers with compassion, fairly, and with dignity and respect, and insisting on the same from them, can provide soldiers a sense of relatedness (cohesion, belonging); and (d) building a sense of competence, confidence, and pride through challenging training and tasks, and with timely and appropriate recognition of a job well done. Of course, these examples apply to a diverse sample of members of a specific branch of the Canadian military. Other factors may emerge in other samples and in other contexts through leader discussions or formal research methods.

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Consequences of Leadership Behavior for Job Satisfaction and Health in the Bundeswehr

Prof. Dr. Martin Elbe

Zentrum für Militärgeschichte und Sozialwissenschaften der Bundeswehr (ZMSBw)
Zeppelinstrasse 127/128
14471 Potsdam
GERMANY

MartinElbe@bundeswehr.org

ABSTRACT

Leadership behavior is stated to have a core influence on wellness and the experience of health that members of organizations in general have – it is to be expected that this is to be found in military organizations too. In 2016 a research project on the attractiveness of the Bundeswehr as an employer with a special focus on job satisfaction (which is to be interpreted as well-being) as well as aspects of health and leadership has been conducted by the Bundeswehr Center for Military History and Social Sciences (ZMSBw). The data was statistically analyzed with SPSS. On this empirical basis the paper discusses the different aspects of well-being as well as on physical and psychological health aspects. Especially target-performance comparison of leadership dimensions will be focused on in their impact on health. The influence of socio psychological aspects like justice and learning and of occupational health management on health and well-being is analysed and the relevance of physical and psychological health aspects is discussed.

1.0 INTRODUCTION

Total health, well-being and wellness have become an important aspect in military life and for the functionality of military organizations. Leadership behavior is stated to have a core influence on the experience of health members of organizations in general have. In military organizations this is of even greater importance as the interrelation of leadership and health influences the soldiers' performance directly and in combat leadership is responsible for the soldiers' survival. Action forces can be described as organizations where cold phases of operation „... where there is no need for real action ...“ (Soeters et al.: 247) are followed by hot phases of action. Although deployment is more and more common for the armed forces in most countries, soldiers spend most of their time in cold phase situations with everyday life working conditions. Even though sports and physical fitness are important elements of military training and canteen food supports a healthy diet, general working conditions, leadership and social stability seem to have a crucial impact on the soldiers' health condition and job satisfaction.

This paper discusses the different aspects of leadership behavior in its influence on job satisfaction as well as on health aspects. Especially target-performance comparison of leadership dimensions will be focused on in their impact on health. The influence of socio psychological aspects like justice and learning and of occupational health management on health and well-being will be discussed. After a look at the theoretical background three questions will be discussed:

1. What influences soldiers' health in the Bundeswehr?
2. What influences soldiers' well-being in the Bundeswehr?
3. What effect does leadership have on health for soldiers in the Bundeswehr?

The findings will be finally discussed in a résumé.

2.0 THEORETICAL BACKGROUND

First of all, leadership and health are problems of *everyday life* in the military. Soldiers interact with their superiors and this interaction is thought to have an impact on health and well-being of the subordinates as well as the superiors. In the Bundeswehr (as supposed in most armed forces) there are *regulations* dealing with leadership and with health in the military. In the Bundeswehr soldiers are obliged by the military service act to keep up their health (Soldatengesetz, § 17 (4)). They must not intentionally or grossly negligently affect their health. The soldier must tolerate medical intervention with regard to his physical integrity to a certain extent. The Bundeswehr Central Regulation A-2600/1 on Civic Education and Leadership (Innere Führung) points out the connection between health and leadership: „Superiors make an important contribution to maintaining the health of their soldiers.” (BMVg 2008 p. 28) This interrelation between leadership and health is quite obvious and applies not only to the military, but as F. W. Taylor put it: “The elimination of ‘soldiering’ and of the several causes of slow working ... would have a more permanent and far-reaching effect upon these misfortunes than any of the curative remedies that are now being used to soften their consequences.” (Taylor 1911 p. 15) Taylor used ‘soldiering’ according to the habit of the time as an expression for slow working and to him it was quite clear, that *management and leadership* were main influences on the health and efficiency of workers. So, health and work have been a topic for the academic since the early 20th century. Since the 1990^{ies} interest in occupational health issues, absenteeism and job satisfaction has increased significantly (Kastner 1994). According to Vincent (2011) there is a *broad empirical basis* by now as well as theoretical analysis of the connection between leadership behavior and health or well-being in occupational contexts. Badura’s anthology (2011) provides an overview of the state of research and the rapidly differentiating breadth of empirical instruments and investigations. At the heart of the consideration is the health of the employees and the *effect of the management behavior* of superiors on this, as well as the health of the executives themselves. Gregersen/Kuhnert/Zimber/Nienhaus (2011) examine the influence of leadership on employee health using a *meta-analysis* in which they evaluate 42 studies between 1990 and 2009. They conclude that leadership can function both as a resource and as a stressor. In addition to *leadership*, other factors (e.g. personality of the employees, working conditions) influence health. In addition to *stress*, *job satisfaction* is raised as the most common feature in the investigations and is considered a health indicator in this study. Leadership is an important factor for corporate health experience and combined with self-management (Meyer/Töpsch/Schiller 2017). Stress obviously is one of the key factors influencing health and self-efficacy is an important resource for healthy behavior under working conditions. As Hüttermann (2015) shows, there is a link between leadership and mental health, but he sees the need for further studies and, in particular, on the effect on intermediate superiors.

Kastner (2017, 2010) places leadership and health in the context of holistic, inclusive, sustainable and system-oriented performance and health management. He notes that there are links between *organizational culture, leadership, performance and health* that cannot be squeezed into simple schemes. In order to promote a culture that is beneficial to health, it is necessary to integrate work design and good leadership in such a way that performance and health are addressed in equal measure. This is done in particular through the imparting of recognition and appreciation. For several years, Westermayer has been pointing out in his long-term study on the link between work and health (with approximately 25,000 respondents) that next to leadership *learning* is one of the key influencing factors for health (Westermayer/Brand 2017). In their anthology Zinner/Elbe/Lange (2014) develop *health coaching* as a specific approach to health promotion under working conditions. Based on central problems in the field of management and health such as organizational culture and socialization, the relevant systems and actors are identified and, building on them, practical design, development and competence perspectives for coaching as a leadership task are presented. As McMahon/Williams/Tapsell (2010) show, there is a broad discussion throughout the disciplines whether wellness or well-being would be an appropriate concept to get an expanded perspective on health. Health – in contrary to sickness as a medical condition – is not yet sufficiently defined (Elbe 2019) but, in a basic sense, may be referred to as the experience of being physically and mentally in an appropriately good condition. Well-being covers a broader perspective than health, it refers to a sense of coherence (Antonovsky 1987), a state of satisfaction with the overall situation whereas wellness seems to refer to a state of

contentment with a rather temporary covering. In connection with occupational health issues it is not so much the short term concept of wellness that is sought, but a longer-term sense of coherence, which, from a labour science point of view, can be found in job satisfaction.

In the military there seems to be an important influence by the intersection of two societal institutions: family and the military, both of which make great demands on the soldiers (Segal 1986). Burrell et al (2006) showed the influence of *family military adjustment* has on psychological and physical well-being. There is also a connection of recreation as a resource for coping with stress to be seen.

Considering these insights it is to be expected, that in military settings *leadership and job satisfaction* would also have a large influence on the experienced health state of the soldiers. Klammer et al (2018) analysed how *leadership and commitment* influenced soldiers' health experience in the Bundeswehr with N=1,294 participants. Their finding is that there is a relation between commitment, health oriented leadership and the employees' health, although there is an especially strong effect of health oriented leadership on participants with a low commitment. Hoffmann (2019) compares the influences of health on work in the military and in private companies and Lusch (2019) discusses leadership in the area of tension between goal attainment and health management (with a special focus on sports). Especially in the military there seems to be a strong link between health and leadership.

3.0 EMPIRICAL RESEARCH & MEASURES

In 2016 a research project on the attractiveness of the Bundeswehr as an employer with a special focus on job satisfaction as well as aspects of health and leadership has been conducted by the Bundeswehr Center for Military History and Social Sciences (ZMSBw). 3 197 questionnaires (33%) were returned by soldiers and civil employees of the Bundeswehr. The data was statistically analysed with SPSS (Richter 2016). In this personnel survey the attractiveness of the Bundeswehr as an employer was the main topic, combined with soldiers' needs, job satisfaction and leadership aspects. It was a paper and pencil survey with a field phase of five weeks in June/July 2016. For the paper presented only those participants that clearly stated to be soldiers were taken into account (N=2 121) and the focus is not on the attractiveness of the Bundeswehr as an employer but on how the aspects health and well-being interact with leadership. To answer the three questions raised in the introduction eight key variables will be used in the analysis. In the centre of the explanatory model four variables have been constructed as indexes. In the questionnaire there are 32 items with needs that possibly should be fulfilled (range from one to five). This scale has been used for several years by the ZMSBw to analyse the soldiers' and civil servants' needs and motivation (Richter 2016) and goes back to a specification of Alderfer's ERG-Theory (Alderfer 1972). In this analysis of motivational effects health and wellness aspects as well as job satisfaction haven't been focused on so far. This will be conducted here. From the 32 motivational items four indexes with four items each have been extracted to measure health and well-being effects:

1. Socio Psychological Health Index (SPH_I)

The Socio Psychological Health Index consists of four items. Two items represent how much the Bundeswehr cares about soldiers' health (Are there healthy working conditions? And Does the Bundeswehr offer extensive social benefits, such as free medical care?). The other two items represent hygiene factors in the sense of Herzberg (1987): salary (Are you well paid?) and personal life (Is it possible for you to reconcile family and service well?). These aspects are considered to influence soldiers' health conditions directly.

2. Military-Family-Adaption Index (MFA_I)

The Military-Family-Adaption Index includes the items "You rarely have to move because of your job.", "You don't have to work more than 41 hours a week.", "You always have off on weekends." and "You rarely have to do business trips." These aspects influence recreation as a resource for coping with stress

and are to be considered as general factors on psychological and physical well-being.

3. Justice Index (J_i)

The justice index contains the items “Men and women are treated equally.”, “There are clear responsibilities in an obvious hierarchy.”, “There is comradeship and teamwork.” and “I can have a say in important issues.” Social justice is considered to have a strong influence on peoples’ well-being.

4. Learning Index (L_i)

The learning index includes the items “I can unfold and develop.”, “I can regularly take on new tasks.”, “I can often learn new things.” and “I can foster my training and education on a regular basis.” Learning is a key aspect of personal growth and well-being.

In the ZMSBw-survey of 2016 job satisfaction (well-being) was measured with the question “How satisfied are you at present, all in all, with your service in the Bundeswehr?” (**JS/WB**). According to the theoretical and empirical background *leadership and job satisfaction* (which is to be interpreted as well-being) is a broader construct than health. The influence factors on well-being are expected to be found in the indexes and are analysed in this paper.

The interrelation between leadership and health is of great importance for all military settings and an important aspect for the concept of *Innere Führung* (BMVg 2008). Dörfler-Dierken/Kramer (2014) have translated the central requirements for leadership from the Bundeswehr Central Regulation A-2600/1 on Civic Education and Leadership (*Innere Führung*) into a scale with 20 items to measure leadership behavior (**LB**), comparable to LBDQ – Leader Behavior Description Questionnaire or FVVB – Fragebogen zur Vorgesetzten-Verhaltens-Beschreibung (Neuberger 2002). This concept was used for measuring leadership in this study, added by a principal question on leadership satisfaction (**LS**): “How satisfied are you, all in all, with the leadership style of your immediate superior?” Leadership will be differentiated into factors and their impact on health will be focused on as well as other socially relevant constructs such as justice, security and learning.

The influence of Occupational Health Management (**OHM**) was measured by asking, whether it influences the attractiveness of the Bundeswehr as an employer and whether the participants already had had any experiences with Occupational Health Management.

Figure 1 shows the expected influences between the eight variables in the explanatory model. It is expected that health interrelate with the other three indexes and occupational health management. An influence of all four indexes on well-being (job satisfaction) is expected as well as an influence of leadership behavior and leadership satisfaction on health.

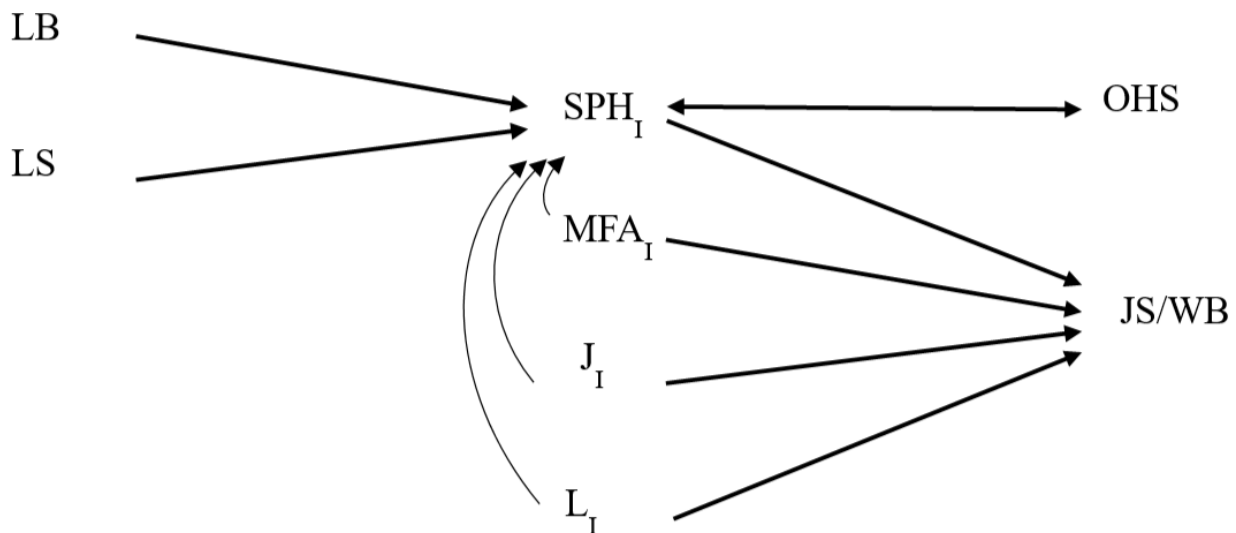


Figure 1: Explanatory Model

The first question, on what influences health for soldiers in the Bundeswehr, is approached in section 4.1 with the examination of the interrelation between the indexes, age, service grade and occupational health management. The second question, on what influences well-being for soldiers in the Bundeswehr, is examined in section 4.2. The third question, on what effect does leadership have on health for soldiers in the Bundeswehr, and the final inquiry on the interrelations of the indexes are dealt with in section 4.3 to finally be able to answer all three question.

4.0 FINDINGS

4.1 Health, Well-Being & Occupational Health Management

The four indexes with four items each show acceptable interrelatedness (Cronbach's α) and show means (M_a) with a slightly positive tendency:

- The Socio Psychological Health Index (N = 2 085) shows a Cronbach's $\alpha = .63$, a mean $M_a = 2.8^1$ and standard deviation SD = .80.
- The Military-Family-Adaption Index (N = 2 015) has a Cronbach's $\alpha = .68$, a mean $M_a = 2.9$ and standard deviation SD = .85.
- The Justice Index (N = 2 071) shows a Cronbach's $\alpha = .62$, a mean $M_a = 2.9$ and standard deviation SD = .99.
- The Learning Index (N = 2 111) shows a Cronbach's $\alpha = .84$, a mean $M_a = 2.9$ and standard deviation SD = .82.

The highest score is to be found in the Socio Psychological Health Index ($M_a = 2.5$), which shows that soldiers generally experience good health conditions, with the highest value of $M_a = 1.8$ in social benefits (esp. free medical aid). The Socio Psychological Health Index is the key objective of this analysis, the other three indexes (recreation, justice and learning) are constructed as expressions of well-being.

Table 1 and Figure 2 give an overview of the indexes in connection to the age of the soldiers in the survey. All four indexes generally show similar bell-shaped frequency distributions but vary in connection with the

age. The Socio Psychological Health Index and the Military-Family-Adaption Index show slightly lower means for younger and older participants in the study. Both indexes do not correlate with age ($\text{Eta}^2 = .01^{***}$) but correlate significantly with each other ($r_{\text{Pearson}} = .52^{***}$). The Learning Index and Justice Index show significant effects with age on a low level ($\text{LI-Eta}^2 = .04^{***}/\text{JI-Eta}^2 = .01^{***}$) – older participants see these aspects fulfilled on a higher level. These two indexes also correlate with each other significantly ($r_{\text{Pearson}} = .47^{***}$). With increasing age soldiers get more satisfied with learning and justice in their working surrounding. The Socio Psychological Health Index shows a common effect: younger and older soldiers have better scores than soldiers in their 40ies (Figure 2). This seems to support the famous u-shape-hypotheses (Banchflower/Oswald 2008; Wunder et al. 2009), that middle-aged people experience less well-being but in our survey this effect is not very strong. The other indexes show bulges at younger ages and for all indexes the group differences are significant (Eta^2). This argument is all the more important because a service group analysis shows a similar manifestation of graphs.

Table 1: Age and Indexes

How old are you?	Socio Psychological Health Index M_a	Military-Family- Adaption Index M_a	Learning Index M_a	Justice Index M_a
17 to 25 years	2.7	2.8	3.0	3.0
26 to 30 years	2.8	2.9	3.1	3.0
31 to 35 years	2.9	3.0	2.9	2.8
36 to 45 years	3.0	2.8	2.8	2.8
46 to 55 years	2.8	2.8	2.7	2.7
56 years and older	2.4	2.7	2.3	2.3
Eta^2	.01 ^{***}	.01 ^{**}	.04 ^{***}	.03 ^{***}

Remarks: ZMSBw Personal Survey 2016. Comparison of means; significances: * $p < .05$, ** $p < .01$, *** $p < .001$.

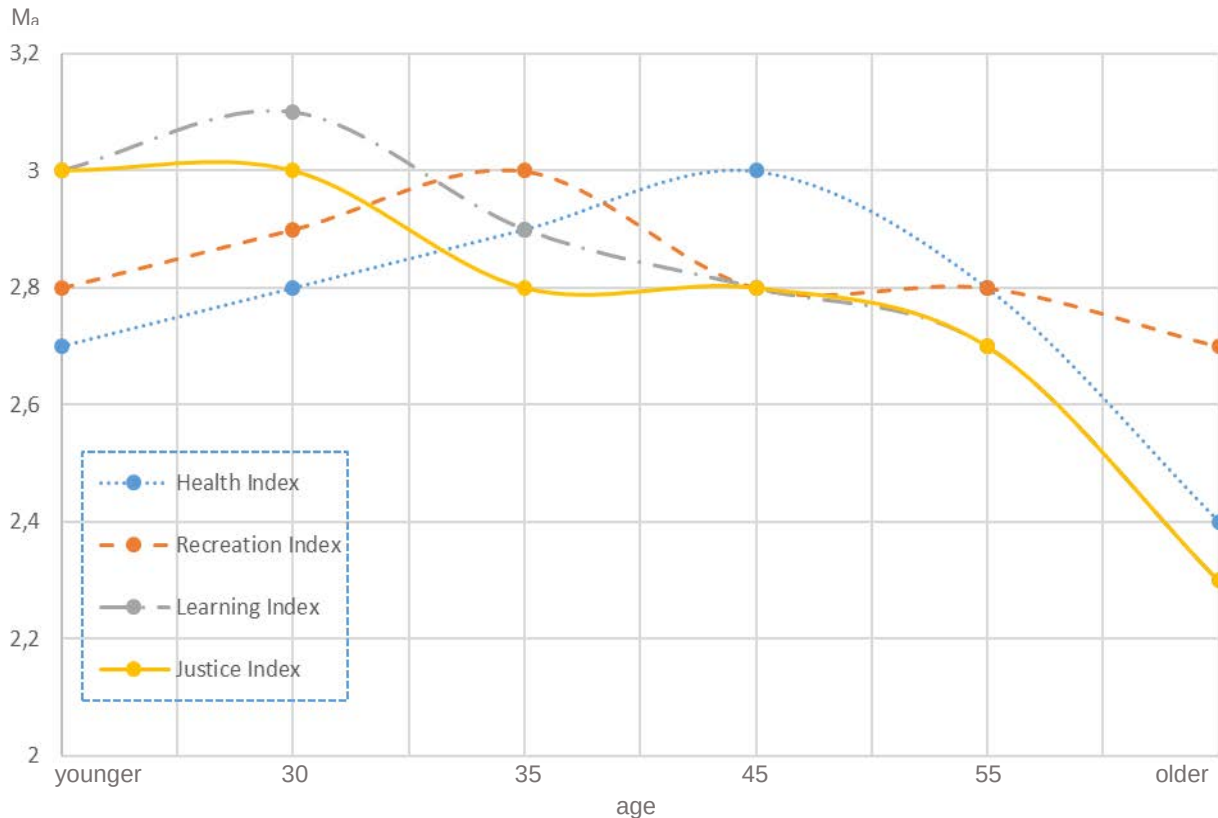


Figure 2: Age and Indexes

Next to age, rank could be a good assumption as a strong influence on health, as service groups indicate status and social stratification in the military. A comparison of means is shown in Table 2.

Table 2: Rank and Indexes

NATO Rank-Codes (Dienstgradgruppen)	Socio Psychological Health Index M _a	Military-Family- Adaption Index M _a	Learning Index M _a	Justice Index M _a
OR-1 to OR-5 (Mannsch./Uffz. m. P.)	2.7	2.8	3.2	3.1
OR-6 to OR-9 (Uffz. m. P.)	2.9	2.9	2.9	2.9
OF-1 to OF-2 (Leutnante & Hauptleute)	2.9	3.1	2.5	2.7
OF-3 to OF-9 (StOffz. & Generale/Admirale)	2.7	3.0	2.5	2.5
Eta ²	.02***	.02***	.10***	.06***

Remarks: ZMSBw Personal Survey 2016. Comparison of means; significances: *p<.05, **p<.01, ***p<.001.

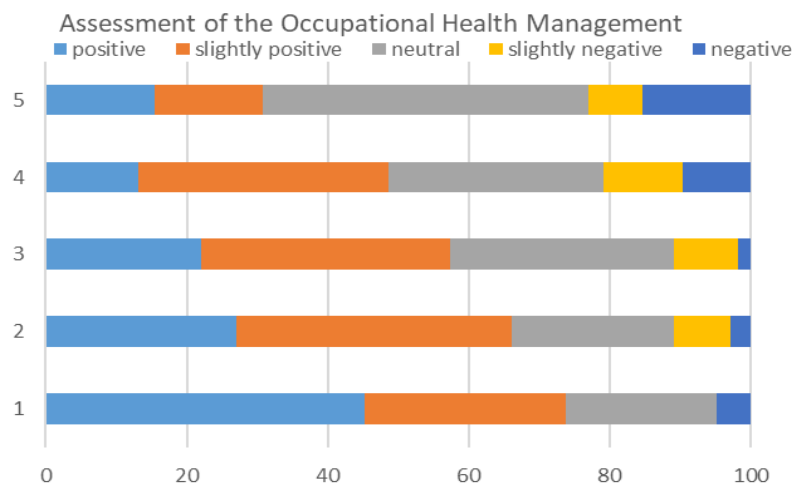
Recreation, learning and justice are all significantly influenced by the service groups (Eta²). Active soldiers assess health and recreation as related constructions as well as learning and justice, which is also shown by a correlation analysis: r_{Pearson} is significant between all four indexes but only the combinations of Socio

Psychological Health Index and Military-Family-Adaption Index have high scores ($r_{\text{Pearson}} = .51^{***}$) on the one side and Learning Index and Justice Index on the other hand ($r_{\text{Pearson}} = .47^{***}$). Well-being is influenced by more factors with structural and personal aspects being involved. From a structural perspective the Bundeswehr “Agenda for Attractivity” especially fosters *occupational health management* as one of eight areas of measures. As 9.8 per cent of the soldieres state to have personally participated in the program and 32.2 per cent have experienced effects in their direct work environment, 57.9 per cent have not seen any effect so far. Still 59.3 per cent think that occupational health management has a positive impact on the attractiveness of the Bundeswehr as an employer and there is a significant correlation between the assessment of occupational health management and the Socio Psychological Health Index ($r_{\text{Pearson}} = .17^{***}$). Table 3 shows the data and Figure 3 shows the interrelation between the two variables.

Table 3: Occupational Health Management and Socio Psychological Health Index

Socio Psychological Health Index	Does occupational health management influence the attractiveness of the Bundeswehr as an employer?				
	positive	slightly positive	neutral	slightly negative	negative
1 (1 – 1,49)	45.2	28.6	21.4	0.0	4.8
2 (1,5 – 2,49)	27.0	39.2	23.0	7.9	2.9
3 (2,5 – 3,49)	22.0	35.3	31.8	9.1	1.8
4 (3,5 – 4,49)	13.2	35.5	30.5	11.2	9.6
5 (4,5 – 5)	15.4	15.4	46.2	7.7	15.4
Σ	23.0	36.2	28.5	8.7	3.6

Remarks: ZMSBw Personal Survey 2016. Numbers in percent.



Remarks: ZMSBw Personal Survey 2016. Abscissa in percent, ordinate shows Health Index from 1 (high) to 5 (low).

Figure 3: Occupational Health Management and Socio Psychological Health Index

Occupational Health Management and programs of occupational health promotion are important for the majority of the soldiers in the Bundeswehr and it is quite clear, that those soldiers with a high Socio Psychological Health Index consider occupational health management as most important. The problem is that only 10.1 per cent of the soldiers so far have directly participated in an occupational health activity, 32.5 per cent have noticed it in their direct working surrounding and 57.4 per cent have no experience at all with it. Again: Those soldiers with more experience assess occupational health management more positively than those without any know-how.

4.2 Influences on Well-Being

In the ZMSBw-survey of 2016, 49 per cent of the soldiers answered the question “How satisfied are you at present, all in all, with your service in the Bundeswehr?” as very, more or rather satisfied. 19 per cent of the participants were partly satisfied and 32 per cent were very, more or rather dissatisfied. From a health perspective this means that 51 per cent of the soldiers are not in the state of well-being in their working life. What are the reasons for this situation, what influences job satisfaction as measurement of well-being? Table 4 shows five models of linear regressions with an increasing number of independent variables that might influence job satisfaction as a dependent variable.

Table 4: Job satisfaction and Indexes

Independent variable	model 1	model 2	model 3	model 4	model 5
Age	.02	.02	.02	.02	.02
Service level group	-.07*	-.08**	.05	.07**	.07**
Sex (1=male)	-.07**	-.04	-.05*	-.06**	-.05**
Socio Psychological Health Index	-	.42***	.32***	.28***	.27***
Learning Index	-	-	.43***	.35***	.35***
Justice Index	-	-	-	.18***	.18***
Military-Family-Adaption Index	-	-	-	-	-.00
R ²	.01	.18	.35	.36	.36

Remarks: ZMSBw Personal Survey 2016. Effect strength in beta; significances: *p<.05, **p<.01, ***p<.001.

The dependent variable in all models is job satisfaction.

- Model 1 shows the influence of general social determinants (age, status measured as service level group and sex) on job satisfaction. Although all influences are weak, sex and status seem to have an impact on such a low level ($R^2 = .01$) that it has to be assumed, that they might be hygiene-factors more than motivators (Herzberg 1987).
- Model 2 takes the Socio Psychological Health Index into account – the impact of health on job satisfaction is highly significant and rather intense (Beta = .42***) – 18 per cent of the variances can be explained.
- If the Learning Index is introduced (Model 3) the explanatory strength rises to $R^2 = .35$ (35 per cent of the variances can be explained). Both indexes (health and learning) have significant influence, although the effect strength of the health index declines to Beta = .32*** and the Learning Index becomes the strongest influence with Beta = .43***.
- In Model 4 the Justice Index is introduced and again there is a significant influence of Beta = .18***, but learning remains the strongest influence (Beta = .35***) and health the second strongest (Beta = .28***).
- Introducing the Military-Family-Adaption Index (Model 5) doesn't change the constellation any more. Military-Family-Adaption doesn't have an influence on job satisfaction itself, the explanatory strength doesn't change and the influence effects are stable: Learning has the strongest impact, the influence of health is second in intensity and justice third.

This shows that well-being in working environments is most intensely influenced by the ability to learn and develop, health and justice are also important aspects but recreation doesn't have a direct influence. These

findings support the two-factor theory (Herzberg 1987): If you do not have enough possibilities to recreate and spend leisure time with your family and friends it contributes to dissatisfaction in the job, but having enough recreation time doesn't contribute to job satisfaction. Recreation and spending time with your family, like status, is a hygiene-factor and not a motivator.

4.3 Leadership & More Influences on Health

As mentioned before the interrelation between leadership and health is of great importance for all military settings. As mentioned before the central requirements for leadership from the Bundeswehr Central Regulation A-2600/1 on Civic Education and Leadership (Innere Führung) have been translated into a scale with 20 items to measure leadership behavior. Table 5 shows all 20 items measuring the importance of leadership aspects as well as raising an item to describe the overall satisfaction with the immediate superior. Table 5 shows the means for all items and in the last column the r_{Pearson} -correlation between the Socio Psychological Health Index and the leadership items (this is what the table was sorted for). Table M_a gives the mean of all items, for the whole scale $M_a = 2.5$. The average of the scale is a little lower than the mean of the overall satisfaction with the immediate superior ($M_a = 2.4$).

Table 5: Leadership Effects on Health

	M_a	r_{Pearson} SPH _I / Leadership
My immediate superior is recognized as an authority.	2.3	.12***
My immediate superior is unbureaucratic in his actions.	2.5	.12***
My immediate superior takes time for me and does know me well.	2.5	.13***
My immediate superior talks openly to his subordinates about fears or special experiences, including death and wounding.	3.2	.13***
The demand and promotion of intercultural competence is personally close to the heart of my immediate superior.	2.8	.16***
It is easy for my immediate superior to convey the political sense of a task as well.	2.7	.16***
He trusts the skills of his subordinates.	2.2	.16***
He is professionally competent.	2.0	.16***
My immediate superior leads in partnership.	2.8	.16***
He is happy to accept suggestions from subordinates.	2.4	.16***
For his subordinates, he always leads the way with good example.	2.6	.17***
He gives me certainty of action in every situation.	2.6	.17***
He gets through difficult situations together with his subordinates.	2.6	.18***
Rebuke and, above all, praise are elementary leadership elements for him.	2.7	.18***
Gender equality is an indispensable element of his leadership.	2.2	.18***
I trust my immediate superior.	2.3	.18***
In his decisions he takes proposals from subordinates into account.	2.5	.18***
He is able to assess himself critically.	2.8	.19***
He regularly involves his subordinates in the service design.	2.7	.19***
He takes into account the needs I have in relation to my family life.	2.3	.23***
How satisfied are you, all in all, with the leadership style of your immediate superior?	2.4	.16***

Remarks: ZMSBw Personal Survey 2016. Significances: * $p < .05$, ** $p < .01$, *** $p < .001$.

All items in the scale as well as the satisfaction item show significant correlations, the following items have an especially high impact:

- **Family life:** He takes into account the needs I have in relation to my family life.
- **Embedding:** He regularly involves his subordinates in the service design.
- **Self-Criticism:** He is able to assess himself critically.
- **Participation:** In his decisions he takes proposals from subordinates into account.
- **Trust:** I trust my immediate superior.
- **Gender Equality:** Gender equality is an indispensable element of his leadership.
- **Appraisal:** Rebuke and, above all, praise are crucial leadership elements for him.
- **Attendance:** He manages difficult situations together with his subordinates.
- **Certainty:** He gives me certainty of action in every situation.
- **Example:** For his subordinates, he always leads the way with good example.

For these items the correlation between the Socio Psychological Health Index and the leadership item was higher than the correlation of the item “overall satisfaction with the immediate superior” with the Socio Psychological Health Index. Therefore these leadership items do have a special impact on health.

In direct relation leadership seems to have a significant influence on health in the Bundeswehr as a work environment but to answer the last of the three questions raised in the introduction to this paper, on what effect leadership has on health for soldiers in the Bundeswehr, leadership and health have to be analysed in a more complex model. Table 6 shows five models of linear regressions with an increasing number of independent variables that might influence health as a dependent variable.

Table 6: Main Influences on SPH_i

Independent variable	model 1	model 2	model 3	model 4	model 5
Age	.01	.10***	.09***	.09***	.09***
Service level group	.02	-.10***	-.05*	-.02	-.03
Sex (1=male)	-.09***	-.08***	-.80***	-.08***	-.08***
Military-Family-Adaption Index	-	.53***	.51***	.48***	.48***
Learning Index	-	-	.15***	.07**	.06*
Justice Index	-	-	-	.19***	.18***
Satisfaction with leadership	-	-	-	-	.07**
R ²	.01	.28	.30	.32	.33

Remarks: ZMSBw Personal Survey 2016. Effect strength in beta; significances: *p<.05, **p<.01, ***p<.001.

The dependent variable in all models is the Socio Psychological Health Index. Model 1 again shows the influence of general social determinants (age, status measured as service level group and sex) on health. Again all influences are weak, with only sex having a significant influence but with little effect (R² = .01). Model 2 takes the Military-Family-Adaption Index into account and here we see a highly significant and strong effect (Beta = .53***) – already 28 per cent of the variances can be explained. In this model all general social determinants have significant effects. The Introduction of the Learning Index (Model 3), the Justice Index (Model 4) and finally the overall-satisfaction-leadership-item in Model 5 only contribute another .05 to

the explanatory strength of the model ($R^2 = .33$). In Model 5 the Military-Family-Adaption Index still has the greatest influence (Beta = .48***), the Justice Index is the second strongest (Beta = .18***), age has a positive effect (Beta = .09***), women feel less healthy (sex: Beta = -.08***). Learning (Beta = .06*) and Leadership (Beta = .07**) both have less influence on lower significance levels.

Although recreation is a hygiene-factor and not a motivator for work-related well-being it has the most important influence on health. Health being a more narrow construct than well-being is directly related with recreation as the strongest influence and with the experience of justice. The satisfaction with leadership has an influence on health but in comparison with the two strong influencers (recreation and justice), it is one of the slight influencers (together with age, sex and learning). It is an interesting effect with leadership studies: The comparatively strong effects leadership seems to have,^[2] when the direct effect on a dependent variable is measured seems to fade when the models become more complex.

5.0 RÉSUMÉ

The first question was “What influences soldiers’ health in the Bundeswehr?” As shown in section 4.1 age and rank/service group level influence the experience of health, there is a slight bulge in the mid 40^{ies} and for the middle ranks (Or-6 to OF-2), these soldiers feel less healthy than those younger and with lower ranks or older and with higher ranks. For military family adaption the bulge is approximately ten years earlier (in the mid 30^{ies}). Learning and justice show different effects throughout ages or ranks, with a tendency toward the older soldiers are and the higher their rank is the better learning and justice are realized. As can be seen in Table 6 military family adaption has a strong direct influence on health, followed by the feeling for justice. Age, sex and learning have a significant influence but on a much lower level. The influence of the service group level in a complex model is not significant. 42 per cent of the soldiers have direct or indirect experience with occupational health management – those soldiers with more experience assess occupational health management more positively. The problem is: 52 per cent haven’t had any experience with occupational health management in 2016.

The second question, on what influences soldiers’ well-being in the Bundeswehr, has been examined in section 4.2. Well-being was introduced as a broader concept than health and refers to a state of satisfaction with the overall situation. In this survey it was measured as overall job satisfaction. As shown in Table 4 well-being in working environments is most intensely influenced by the ability to learn and develop, followed by health and justice but military family adaption doesn’t have a direct influence. These findings support the two-factor theory (Herzberg 1987) and confirms the importance of learning in working conditions for well-being (Westermayer/Band 2017). This is an influence on the broader concept of well-being, not so much directly on health (Table 5).

The third question, on what effect leadership has on soldiers’ health in the Bundeswehr, can be answered with the insight, that all leadership aspects measured directly had a significant influence on health, although the effect strength was not very high. Also in a more complex explanatory model satisfaction with leadership does have a direct influence on health – but in comparison with military family adaption and justice, it is a rather weak influence, just like age, sex and learning. Leadership seems to be a fluid institution – it is consumed by other aspects in more complex models. One might say: It is maybe not organizational culture only that eats leadership for breakfast,^[3] but complexity in general. At least that is what can be stated in conjunction with health in the military.

NOTES

[1] M_a gives the arithmetic mean for the Socio Psychological Health Index (H_I).

[2] Satisfaction with leadership does have a direct effect on the Socio Psychological Health Index ($r_{\text{pearson}} =$

,17***) as well as on well-being/job satisfaction: ($r_{\text{pearson}} = ,39^{***}$).

- [3] Peter Drucker is said to have introduced that metaphor into the discussion about leadership.

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Organizational Justice During Deployment: What Shapes Soldiers' Justice Perceptions?

Andreas Friis Elrond, Søren Bo Andersen

Garnisonen 1
4100 Ringsted
DENMARK

Vetc-vic10@mil.dk

ABSTRACT

The literature on military deployments has to a large extent focused on mental health outcomes, and their relation to the high-risk aspects of the work environment, e.g., combat. However, findings also suggest that the soldier's perception of more common work and organizational factors may be related with negative mental health outcomes [1,2]. Such common work and organizational factors may also influence other aspects of work and private life, such as stress, well-being and lost productivity [3], and these negative influences may, in turn, affect the military organization's ability to function.

Organizational Justice (OJ) is one such factor. OJ overall refers to feeling rewarded to a fair extent (distributive justice; DJ), through fair procedures (procedural justice; PJ) that are enacted fairly by the leadership (interactional justice; IJ) [4]. In a recent study on Danish Veterans deployed to the Helmand province in Afghanistan in 2009, Elrond and colleagues showed that negative perceptions of PJ and IJ in relation to the immediate superior, as measured before and during deployment to the Helmand province in 2009, was related to an increased risk of having PTSD 2½-3 years after homecoming for soldiers without own leadership responsibilities [5].

Understanding how perceptions of OJ develop in relation to Military deployments may provide the opportunity to adjust certain aspects of the leadership, which may have an impact on perceptions. However, little is known about individual, work or organizational factors that affect such perception. It is, therefore, the aim of this study to facilitate an understanding of how OJ is shaped in the Danish defence during deployment, which in turn may provide the foundation for changes in how leadership is performed.

This paper will present the theoretical background, methods and expected analyses, of a study being conducted by the Danish Veterans Centre throughout 2019-2020, on Danish soldiers deploying to international operations.

1.0 BACKGROUND

The current project on OJ in relations to military deployments has been started by the Research and Knowledge Centre, The Danish Veterans Centre. Largely based on previous results showing that there was a relation between OJ and post-deployment PTSD in Danish soldiers who deployed to Afghanistan in 2009 [5], the overall aim of this study is to make this knowledge and possible interventions available to the Danish forces. The present deployment environments, however, is not related to the same levels of risk and threats to health and safety as the previously researched deployment (Helmand province of Afghanistan). Therefore, it is not expected that the present environments will result in the same amount of mental health problems as found amongst soldiers deployed with ISAF 7 in 2009. The present study will thus mainly focus on identifying how perceptions of OJ are shaped in relations to deployment. This knowledge can then be used to make perceptions of OJ an actual changeable factor, through the incorporation of the knowledge in the Danish defence. Translation of any positive findings of this project, into actions is planned to be done in

close collaboration with the schools of the Danish Defense and the Defense organizations.

The project will overall take an explorative approach to understand how perceptions of justice are shaped in the Danish defence. Given the explorative nature, the methods for obtaining such knowledge will build upon both quantitative and on qualitative methodology. This dual approach has been chosen in order for the project to be able to explore and tests relations through the quantitative methods using questionnaires, while concurrently allowing for information on themes such as how justice perceptions are formed and how to intervene in such formation, through the use of interviews. Data will be obtained from a sample of two deployments of Danish soldiers ($n \approx 360$), through measurements before and during for one deployment, and during and after for the second deployment.

2.0 WORK ENVIRONMENT DURING MILITARY DEPLOYMENT

Soldiers deploying into conflict zones are confronted with a work environment that differs from non-deployed conditions. Overall, we may thus distinguish between factors that are unusual and related with hi-risks aspects of military deployments and common work environmental factors which military deployments have in common with most other types of work [1,2,6–9]. Results suggest that beyond the high-risk factors, factors that are generally considered a part of the common work environment during deployment may also relate to increased risks of developing post-deployment mental health problems [1,2,10]. Specifically, previous studies have found that perceptions of fair treatment in relations to superiors in military organizations, is related to the risk of developing mental health problems [5,11–14].

Conducting changes in the work environment may thus provide an avenue for aiding soldiers to cope with military deployments [6]. Contrary to changes in the hi-risk aspects of the work environment, changes in aspects of the ordinary work environment may be more easily within reach, both before, during and after deployment. Such changes, however, needs to be guided by theoretically and practically sound propositions. Leaning on existing theoretical frameworks to understanding the how aspects of the work environment during deployment, may thus provide the background to easier understanding and change those specific non-traumatic aspects of the work environment, that does affect soldiers throughout the deployment cycle.

2.1 Organizational Justice

OJ overall refers to the fairness of organizations in relation to their employees. The concept of OJ has however developed throughout several decades and has resulted in a multitude of understandings of what comprises perceptions of OJ, and how such perceptions are shaped. Overall, however, OJ is considered to be based on the subcomponents relating to fairness in relation to distributions of pay and recognition (DJ), the procedures on which the distributions are based (PJ) and the interactions that the procedures are enacted through (IJ), while IJ itself is often considered to be based on the subcomponents of informational and Interpersonal justice [4,15,16].

2.1.1 OJ, health and wellbeing

Aspects of OJ has previously been found to relate to factors such as wellbeing, mental health problems and lost work days, within non-military settings [3,17]. Within military settings, OJ has further been related to PTSD [5] while the relationship with depression may be opposite, i.e. mental health problems changing the perception of OJ [18]. A recent Danish study on soldiers ($n = 243$) deployed to combat operations in Afghanistan in 2009, found that better perceptions of PJ and IJ in relation to their immediate superior as measured before and during, but not after deployment, were related with at lowered risk of having PTSD at a diagnostic interview (Structural Clinical Interview for the DSM-4) 2½ years after homecoming [5].

2.1.1.1 *Risk and uncertainties*

Such relations between OJ and mental health outcomes may be understood through the theories and findings in relation to OJ. One such perspective is the “Alarm system perspective”. Building upon the discoveries that perceptions of organizational justice perceptions are being used for uncertainty management, the alarm system perspective suggests that in lack of information about risks in a situation, subordinates will use available information to cope with the risks and thus handle the situation. Such a substitution of information is thought to be used to reduce insecurity in alarming situations [19,20]. The alarm system perspective further suggests that the effects of fairness may be the highest when fair procedures are the most useful. Support for this notion comes amongst others from an experimental study on cues of death, that found that reminders of one’s own possibility of dying would make an unrelated justice judgement more important [21].

Given the uncertainties and risks of the military deployments into conflict zones, cues of fair treatment may thus be used as a substitution to handle the insecure environment. Further, perceptions of justice may be the most protective before and during deployment, where injustice could signal a higher risk potential for the soldier. This notion may be supported by the findings of Elrond et. al [5], that relations between OJ and PTSD were present for measures of justice before and during the deployment, but not immediately after deployment. This could suggest that any protective effect of better perceptions of fairness was present when the risks of uncertain events were most probable.

2.1.2 **OJ and organizational behaviours**

Beyond the relation with mental health and wellbeing, perceptions of OJ may, however, also relate to factors that are of importance for the organization as a whole. In military settings OJ has previously been related to self-sacrificial behaviour [22], organizational citizen behaviour [23] and sexual harassment [24]. The latter study found that better perceptions of overall OJ (ignoring the OJ subcomponents), predicted lower levels of sexual harassment. Overall OJ moderated the effects of how the two predictors of gender-similarity in the workgroup and sexual harassment climate perceptions, related to sexual harassments. Findings thus showed that the effects of these predictors were stronger when the perceptions of overall OJ was low [24].

Changing perceptions of OJ in relation to the military deployment may thus also have positive effects on the functioning of the organization.

2.2 **Affecting perceptions of OJ in relations to military deployment**

In order to intervene with such possible negative consequences in relations to military deployment, factors that are related to the formation of OJ perceptions in the military settings must be identified. This may be done by focusing both on internal and external factors for the formation of deployed soldier’s perceptions. This may allow for crafting an understanding of both the (external) factors that Defence organizations may change and (internal) factors that may be used to screen soldiers both systematically and day to day by superiors.

The following is an overview of factors that have previously been identified as shaping perceptions of justice in common work settings. These will guide the search for factors in the military settings that are identified through quantitative and qualitative methodology.

2.2.1 **Factors in the formation of justice perceptions (Quantitative perspective)**

Depressive symptoms have previously been found to exert influence on the subsequent development of OJ perception, in military settings [18], and is thus an aspect of interest. Based on the likelihood of soldiers having elevated levels of PTSD symptoms from previous deployments, PTSD symptoms may also be of interest as predictors of justice perceptions. Given the possibility of sleep deprivation during military

deployment, and a possible relation between sleep and affect [25] and affect and OJ [26] sleep is further a possible modifiable factor of interest. Finally, aspects of the work environment during deployment may be explored as factors in the development and perception of OJ during military deployment [27].

Several psychological factors may also influence how OJ is perceived. State positive and negative affect, along with aspects of personality has been suggested to influence the perceptions of OJ [26]. Further, attachment styles have been found to relate to both development of PTSD [28] and to be an antecedent the development of organizational behaviours [29] and has thus been suggested as a factor that could confound the relationship between OJ and PTSD [5]. Finally, recent research has suggested that there may be intra-individual differences in the propensity of perceiving overall justice as fair [30].

1.1.1.1 Individual and group-level perceptions

Evidence suggests that, beyond the relation between individual-level justice perceptions, there is a relation with group level perceptions and mental health outcomes [31,32]. However, it is uncertain whether such a relation between group level effects and mental health outcome is of a direct or of a moderating nature [32]. The current project does not include health outcomes and therefore replication of these results is currently not possible. However, predictors of group level perceptions especially in the shared experience of the work environment during military deployment may at a more theoretical level, be of interest.

2.2.2 Formation of justice perceptions (Qualitative perspective)

Another approach may focus on how justice perceptions are formed during deployment, and on what could change negative perceptions for the better. As the formation of justice perceptions can be studied using the qualitative methodology, the understanding of the field can be expected to develop throughout an interview and interpretation process [33]. The following description of aspects of justice formation will, therefore, serve as an inspiration to the themes that such interviews will possibly include on the soldier's descriptions of formation of justice perceptions.

2.2.2.1 Justice motives

The motives for desiring fair treatment in relation to the organization that one is working for has been suggested to fall into the four overall categories of instrumental, deontic, relational and uncertainty reducing [34]. Instrumental motives relate to the desiring a proper outcome of one's involvements, while deontic motives are driven by internal needs for righteousness. Further, relational motives are those driven by the need to be treated fairly by those important to oneself. Finally, uncertainty reducing motives relates to the sense of control with situations, that may arise from knowing that situations will be handled fairly. Knowing why soldiers desire OJ during deployment, may aid future interventions.

2.2.2.2 Formation of perceptions

Fairness Heuristic Theory suggests that perceptions of justice are shaped mainly by episodic events. Such episodes will shape the perception of justice in the organization, and such understanding will be used as a stable perception until new events reshape perceptions. The Fairness Heuristic Theory further suggests that events occurring early on in the meeting with a new work-environment will have a larger proportional effect than those experienced later [19]. Understanding how, and on which events the perceptions of justice are formed during deployment, may aid interventions. Further, the development the OJ literature has resulted in a shift in focus from justice in relations to individual events to also include more *entity-related justice perceptions*, which reflect aggregated perceptions of multiple situations of justice judgements in relation to actors, such as specific leaders or the organization as a whole [35,36]. Given the perspective of the current project on the whole deployment cycle (before, during, after), the interviews may contain traces of descriptions of justice as event or entity-based. Understanding these aspects of the formation may be important for targeting future interventions at events or at more general settings. Further, studying the degree

to which perceptions of OJ appear declarative or implicit in their description may be an area of interest. *Fairness theory* further suggests that individuals, in reaction to leader actions and decisions, form alternative “counterfactual” ideas about how things could, should and would look if alternative decisions had been taken [36]. Such an understanding of the formation and content of counterfactuals may be used to understand what may aid more positive perceptions.

Building upon the fairness heuristics theory, the theory of substitution of justice posits that people use the available information of OJ as pointers of the state of fairness when they do not have available information on the perspective they need to know about [19,20,37]. Understanding how such substitution may play out in the deployed military settings can aid the understanding of why justice is important to deployed soldiers.

2.2.2.3 *Influence of social settings*

The social settings may serve as a fundamental influence on how individuals perceive and describe OJ in their organization. Both in conditions where the individual do not have specific information on the fairness of the processes and in conditions where they do [36]. Such influence may be exerted both between peers and more broadly through social networks [36]. Social information, based on anecdotal or peers' perception of justice, may thus serve as a cue for individuals as to the state of justice in the organization. However, perceptions of justice may also be shaped by the witnessing of injustice to others [38]. The reasons for this may be both related with the individual person's needs, and since fairness to everybody secures fairness to oneself. However, it may also be out of more deontic perspectives, that one's morale requires that things are ought to play out fair [38].

The current study will further focus on traces of *default negative perceptions* of justice, that may be a part of the subordinates' military culture. This may be studied both at the individual level in the form of the *negative propensity* for justice perceptions [30], and at the social level as a consequence of the social influence.

2.2.2.4 *Organizational structure*

Finally, more top-down organizational cultural aspects may shape the OJ aspects, and thus how OJ is perceived by subordinates. Specifically, it has been suggested that top-level leaders may exert influence on DJ and PJ, while supervisory leaders mainly affect IJ [34]. A review has suggested that the structure of the organization that is being studied may influence justice perceptions and formation [39]. However, the literature does not exhibit clear rules, with regards to the influence of organizational aspects, such as centralisations and exhibition of power, that may be central to the military in general and the deployed environment specifically. However, the influence of the military structure in the deployed environment on OJ perceptions may be identified through interviews.

Understanding the influence of peer perceptions and the level of the management on perceptions of OJ in relation to the military deployment may, however, aid future interventions.

2.2.3 **Intervening in OJ perceptions**

The results of the research part of the project aim to form the foundation for future interventions aiming to mitigate any negative effects of poor perceptions of OJ in the Danish defence. While any specific interventions, e.g. teachings in the schools of the Danish defence, will be developed as a part of the project, the following may serve as a short overview to some of the approaches that may be taken.

Research in and results of OJ interventions have previously been discussed, with some researcher criticizing them for being scarce [40], while others are more positive with regards to the effects of interventions [41]. The Military systems, however, generally exert great control over the organization, through control with the schooling of soldiers and leaders, and due to the exclusiveness of the military as a workplace for military leaders. This means that leaders historically have stayed in the systems for extended periods of time. Such a

system may make more fundamental cultural changes approachable. Taken as a whole, this may make changes in cultures a viable way of approaching intervening.

One method suggested to have an effect is increases in providing *explanations and justification* to situations. Explanations and justification may be used by leaders, as a social tool, to shape the perceptions of justice by subordinates [36]. This simple intervention has been suggested to have effects, even to the extent that some caution and security of ethical use may be required [42]. A 2003 meta-analysis by Shaw et al. [43] supports this and suggested that explanations indeed may be beneficial for the perceptions of DJ and PJ specifically. However, these studies have generally focused on individual procedures, and not on the entity level perceptions that is also the focus of the present study. Still, even simple approaches such as teaching leaders about the importance of fair treatment may work. In one study such intervention did show to have an effect on perceptions of justice, however only for those with poor perceptions of justice [44].

Throughout the project, these perspectives may serve as pointers to the formation of future interventions.

3.0 AIMS OF THE RESEARCH PROJECT

The overall aim of the project is to broaden the understanding of OJ in the Danish defence. This is done through creating an understanding of how OJ is shaped in the Danish defence during deployment. Given the unusual settings surrounding the deployed military environment, and the lack of knowledge in Danish settings specifically, an overall explorative approach will be taken.

This will, in turn, provide the foundation for possible changes in how leadership is performed, and for the future work with soldiers and leaders. The study will conduct analyses of predictors that may influence perceptions of justice throughout the deployment cycle. Further, the study will analyse how justice perceptions are shaped during military deployment, based on interviews. Finally, the study aims to research which factors soldiers themselves points to, as key factors that could aid them in changing their justice perceptions.

These aims are approached through the following five sub-aims:

- Securing correct measurements of OJ in the Danish Defense, through the translation and validation of a Norwegian OJ questionnaire and a 6-item PJ/IJ questionnaire previously used in the Danish defence.
- Identify factors that may influence the perceptions of OJ through questionnaires.
- External factors related to work settings.
- Individual factors such as previous deployments, positive and negative affect, and personality.
- Identify patterns in the formation of justice perceptions through an interview process.
- Identify avenues of change within the Danish defence.
- As identified through questionnaires.
- As identified through an interviewing process.
- Make suggestions for future changes in leadership training, the work environment during deployment and possibly also in selection procedures.

4.0 METHODS

4.1 Quantitative and qualitative methodology

The project will use both quantitative and qualitative methodology. However, the integration of the quantitative and qualitative approaches into mixed methods requires these perspectives to focus on the same phenomenon [33]. Given the different focus of the quantitative and the qualitative aspects of the project, integration of the two methodologies will therefore not be a part of the analytical process. In terms of the mixed method labelling of the project it can be considered *quasi-mixed* [33], as there is no direct attempting to mix results in the research phase. However, results may still complement each other, specifically for the formation of interventions.

4.2 Population and procedure

The population will consist of two deployments of soldiers going into mission throughout 2019. One deployment ($n \approx 180$) will have data sampled during and after deployment, while the other ($n \approx 180$) will have data sampled before and after. For each sampling, questionnaires will be delivered to the full populations, while a subsample of soldiers ($n \approx 4$) will be interviewed.

Before the deployments, all soldiers will receive an information letter explaining the aim and procedure of the research project. At each sampling, they will further receive another letter informing them of the project and aim together with their rights with regards to giving information.

The questionnaires during deployment are expected to be handed out and collected by psychologist throughout their contact visit, while the questionnaires before and after are delivered through an internet service. Soldiers for the interviews will be selected randomly from the deployment list and contacted directly. To account for any fallout approximately 6-8 soldiers will be selected from each round of interviews.

4.3 Data

4.3.1 Questionnaires

4.3.1.1 Measuring OJ

Research into OJ and its subcomponents have developed throughout decades, and sampling has been conducted using a range of different questionnaires [16]. However, a 2001 questionnaire validated by James Colquitt [15,16] has since become the point of reference with regards to measuring OJ. Based on this measure a Norwegian version of the measure was developed and validated in the Norwegian armed forces in 2012 [22]. The measure is created as an entity measure, aiming at the entity perceptions within the four main OJ domains. This measure will, as a part of the project, be translated into Danish.

The Danish veteran centre has further created a short 6-item scale measuring PJ and IJ, in relation to the soldiers' immediate superior. This scale was validated using graphical log-linear Rasch models, on a sample of soldiers deployed to Afghanistan in 2009 [5].

4.3.1.2 Predictors and background factors

Background factors: Age, Gender, Position will be obtained from Danish defence data, while a number of previous deployments will be sampled in the questionnaire. PTSD symptoms will be sampled using the Post-Traumatic Checklist, civilian (PCL-C) [45] while depressive symptoms are measured with the Beck

Depression Inventory [46]. The positive and negative affect will be sampled using the PANAS [47], while personality may be measured with the 60 items NEO Five-Factor Inventory [48]. Attachment style may be measured with the 12-item Experiences in Close Relationship Scale – Short Form (ECR-S) [49]. Sleep is measured using 4 items from the Karolinska Sleep Questionnaire [50]. Finally, propensity for justice perceptions (Colquitt, 2018) may be included. However, the measure currently only exists in English, and the translation of the questionnaire is not yet planned. Finally, general work environmental factors will be studied using a newly validated Danish questionnaire [51].

4.3.2 Interviews

Interviews will be conducted as semi-structured interviews. The length of each interview is expected to be around 1 hour. Interviews will be partly or fully transcribed, depending on the material in each case. After the initial development, the questions the interview guide will be discussed with military personnel from the Danish Veteran Centre to secure the relevance and clarity of the questions for the deployed environment. Further, three pilot interviews will be conducted, to test the interview guide.

5.0 ANALYSES

5.1 Quantitative analyses

The main quantitative analysis is expected to include each of the justice scales and the subscales as outcomes of the predictors. The results of the quantitative aspects of the project are expected to show which primary aspects of the soldiers' work, and of the soldiers' personality effect etc., that are related to the perceptions of OJ.

5.2 Qualitative analyses

The interviews are expected to be analysed using the General Inductive Approach for Analyzing Qualitative Evaluation Data [52]. The choice of such a simpler approach over more established approaches is taken as the aim is to understand how OJ overall is shaped during deployment. As such the project does not aim to generate new theories as would be the aim of Grounded Theory, and neither is the project aiming at understanding how this plays out for the individual, as would be the aim of Interpretative Phenomenological Analysis.

6.0 ETHICAL CONSIDERATION

Participation in the project is not expected to be related to any risk to health and safety for the respondents. A potential risk to their position within the Danish Defence could be a valid concern if unanimous data was breached. However, the following approach is set in place to avoid this.

Before each data sampling, respondents will be made aware of the use of the data and their rights according to GDPR.

For the questionnaires these will be handled by personnel with relation to the Danish Veteran Centre only, to secure that anonymity is maintained. Handling of raw data will be conducted by personnel with relation to the Research and Knowledge Centre (unit in the Danish Veterans Centre) only.

For the interview process specifically, issues of animosity will be handled by initiating all contact directly to the soldiers. When possible the interviews will be conducted face-to-face. However, during deployment

internet transmitted interviews (VTC) can be used.

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Organizational Climate Assessment of the Bulgarian Armed Forces: Implications for the Military Leaders

Yantsislav Yanakiev

Bulgarian Defence Institute “Prof. Tsvetan Lazarov”
2 “Prof. Cv. Lazarov” Blvd., 1592 Sofia
BULGARIA

y.yanakiev@di.mod.bg

Teodora Georgieva

Defence Advanced Research Institute (DARI), G.S. Rakovski National Defence College, 82 Evlogi & Hristo
Georgievi Blvd., 1504 Sofia
BULGARIA

teodora.vitkova.georgieva@gmail.com

Teodora Grozdanova

Defence Advanced Research Institute (DARI), G.S. Rakovski National Defence College, 82 Evlogi & Hristo
Georgievi Blvd., 1504 Sofia
BULGARIA

tedy7707@gmail.com

ABSTRACT

The paper presents a methodology to assess the organizational climate in the Bulgarian Armed Forces based on a 5-year representative trend surveys. The methodology comprises scales like Organizational justice, Perceived organizational effectiveness, Job satisfaction, Commitment to organization, Intention to leave organization, Trust in the leader, Job stress, Relationships with colleagues, Motivation of military personnel, Image of the military institution, Equal opportunities for professional realization, “Family-work” conflict, etc. Data collected each year is comparative and it is representative for the Bulgarian defence organization (Army, Navy, Air Force and directly subordinated to the MoD structures, N= 1655, 2017). The data analysis gives an opportunity to identify trends over the years, to identify statistically significant difference among services and to formulate implications for improvement leadership at strategic level.

1.0 INTRODUCTION

Increasing the functionality of the administrative structures and the operability of the military formations in the Republic of Bulgaria is directly dependent on the efforts of the Ministry of Defence leadership and the command of the Armed Forces to timely diagnose and mitigate existing negative trends in the dominant organizational climate. A major tool for improving the governance practices in this direction is conducting periodic sociological surveys to assess its current status.

For the first time a study of the organizational climate in the formations and structures of the Armed Forces of the Republic of Bulgaria was conducted in 2013 by the Defence Advanced Research Institute in Rakovski National Defence College, followed by an order of the Minister of Defence to make it an annual event. By 2018, four studies were carried out, which contributed to the improvement of the applied research tools and the adequacy of the results obtained.

This report presents and analyses data from the latest representative survey conducted in 2017.

The main purpose of the sociological surveys is to establish the rate at which the Bulgarian militaries assess the various elements of the organizational climate in the formation/structure where they serve, as well as to identify the tendencies in the development of the organizational climate during the last 5 years.

The practical value and application of the study was to help develop and propose specific measures to the Ministry of Defence to increase the social and professional status of the military, to increase the importance of the military profession, and to retain and attract personnel to the Bulgarian armed forces.

This report aims to explore the relationship and influence of organizational climate dimensions on Job satisfaction, Commitment to organization, and Intention to leave organization by military personnel.

2.0 THEORETICAL FRAMEWORK

2.1 Definition of Organizational climate

In theoretical conceptualization, the organizational climate is seen as a mental abstraction of the work environment, which is based on employees' perceptions and is considered at multiple levels of analysis.

A large number of researchers highlight the global nature of employees' perception of their organizations as a key feature of the organizational climate. In the spirit of this tradition, Schneider defines the construct as: "The atmosphere that employees perceive to be created in their organizations through practices, procedures and rewards ... employees monitor what is happening to them (and around them), and then draw conclusions about organizations' priorities. Then they define their own priorities" [33]. In this context, the organizational climate is perceived as a socially interactive construct that is part of the active process of attributing meaning and helps employees understand what behaviours are expected and rewarded [21, 34, 36].

The definition of Moran & Volkwein [27] presents a more detailed version of the essential aspects of the climate: "The organizational climate is a relatively permanent feature of an organization that distinguishes it from other organizations and (a) embodies the collective perceptions of members of the organization with regard to such dimensions such as autonomy, trust, cohesion, support, recognition, innovation and justice: (b) it is the product of the interactions between its members; (c) serves as a basis for interpreting the situation; (d) reflects the prevailing norms, values and attitudes in the culture of the organization; and (e) acts as a source of influence in shaping behaviour."

The presented definitions show that measuring the organizational climate is an important means of understanding employees' attitudes and the meaning they attribute to the organizational environment in which they operate. The climate influences their assessment, emotional responses and reactions to everyday situations in the process. The extent to which a person perceives the work environment as being favourable or harmful in general (i.e. in terms of his/her own well-being) determines emotionally significant knowledge and attitudes related to the working context [20]. Employees who have positive views about their climate and believe they were well-treated by the organization are in turn more likely to behave well with their clients [33].

An alternative but dominant approach to research in recent years is to focus on the specific dimensions of the organizational climate and their relationships with different individual outcomes [29]. The most common depending variables are Job satisfaction, Commitment to organization, and employees' Intention to leave the organization [13].

It has been found that the organizational climate acts as a mediating variable to improve the relationship of Commitment to organization with Job satisfaction. Both Job satisfaction and the organizational climate play a vital role in retaining workers by increasing their Commitment to organization [24], as well as a factor preceding it [25].

The organizational climate is crucial to any process of optimizing the organization that requires significant change or innovation. It is therefore an important factor in understanding how organizations work and the effectiveness they achieve.

2.2 Organizational Climate Dimensions

There is a wide variety in the number and type of dimensions used by different authors to describe measure and to explain the organizational climate. Difficulties arise from different types of organizational contexts, practices and procedures that form relatively unique climates. To the extent that the organizational climate includes employees' perceptions of their work environment, the extraction of universal dimensions is a hard-to-reach procedure.

Regardless of the obstacles, the specification of appropriate organizational climate dimensions is an important challenge to solve because it is related to the ability to perform comparative research of different organizational environments [17]. In practice, this approach requires the identification of a limited number of dimensions that can characterize a wide range of social or working conditions [22].

Scientific literature contains numerous classifications of the organizational climate based on different contexts.

A universal, generally accepted model of organizational climate in a military context is not available either. Two examples of specifications of organizational climate dimensions in a military environment based on large scale research will be presented below.

In the past century, Jones and James [22] administered their 145-item tool on a large sample of 4,315 US Navy personnel. The analysis of the results obtained by factor analysis of the main components extracts a six factors solution: Conflict and Ambiguity; Challenge, Importance and diversity; Facilitating and supporting leaders; Cooperation, Friendly attitude and warmth; Professional and organizational spirit; Working standards.

In a recent study, McKeithen [26], in a sample of 10,000 US military and civilian personnel, relies on 13 organizational climate dimensions: Job satisfaction, Supervisor-related commitment, Job role ambiguity, Job characteristics, Job stress, "Work-family" conflict, Commute stress, Commute safety, Organizational justice, Job Fit, Workplace values, High quality relationships, Demographics.

The dimensions investigated in McKeithen's research served as a basis for choosing the dimensions of the organizational climate in the Bulgarian study.

2.3 Organizational Climate Dimensions in the Bulgarian model

In order to obtain an assessment of the maximum number of aspects of the working environment in the structures and formations of the Armed Forces of the Republic of Bulgaria, a large number of dimensions are included in the Bulgarian model for studying the organizational climate. Their initial systematization involves separating them into independent and dependent variables. Subsequently, independent primary factors were subjected to a secondary factor analysis with Varimax rotation (Appendix 1 presents the factorial solution), which grouped them into larger, meaning-recognizable blocks. The final model is

depicted schematically in Figure 1. Some of the secondary mega factors are composed of primary factors with high factor weights without significant inter-correlations with the other secondary factors (marked as rectangles in the figure), others exhibiting mixed weights of two or more mega factors (marked as diamonds in the figure). Mixed factors are considered as stand-alone variables. In Figure 1, mega factors are presented in a form that allows mixed factors to be located among the factors with which they inter-correlate.

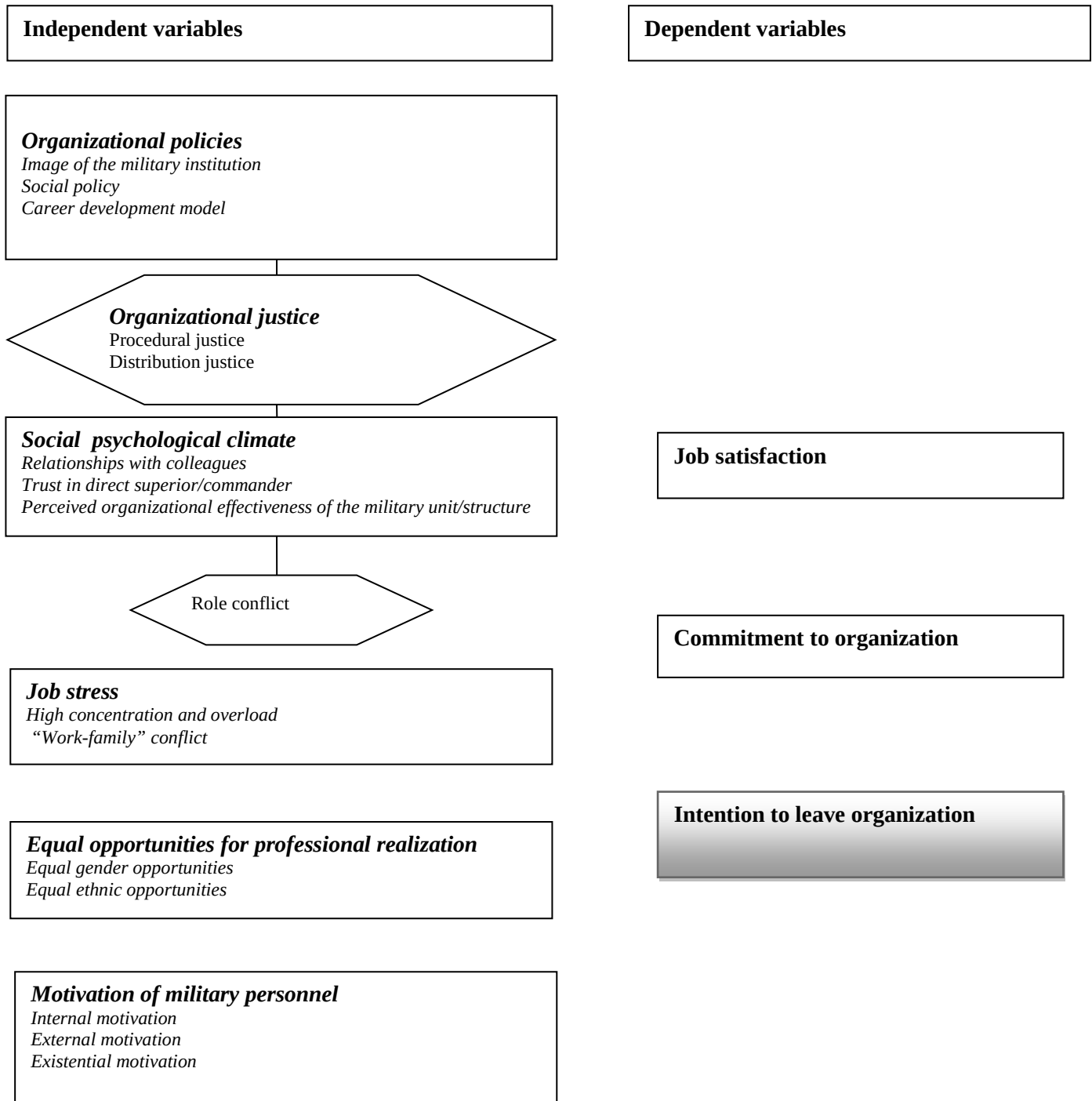


Figure 1-1: Theoretical model of the organizational climate dimensions in the Bulgarian study

2.4 Independent variables

2.4.1 Organization policies (media, social and personnel policy)

Image of the military institution - includes three primary factors, each being an important indicator of military personnel motivation, the level of identification with the organization, and the power of belonging:

Perception of the social status of the profession - the assessment of the military for the social status of the military profession gives information about the level of perceived living standard, social realization, the opportunities for social development, which the military service provides, as well as the place of the military institution in society.

Perception of work in a prestigious institution - the prestige characterizes the hierarchical arrangement of professions according to public opinion. It is determined by the objective characteristics of the professional activity, by the conditions at the workplace it offers, by the particularities of the area where it is carried out, by the remuneration it can provide, and the opportunities for personal development [1, 2]

A perception of security and predictability of work - the subjective perception of the individual that he/she is unlikely to become unemployed for a long period of time is directly dependent on certain characteristics of the organization (e.g. stress, organizational justice, social policy, equal opportunities for professional realization), which form the attitude to stay or quit work.

Social policy - a set of activities and measures that, in addition to payment, are aimed at enhancing the social status and work satisfaction of military and civilian personnel in the Bulgarian Armed Forces (BAF)' formations/structures. The following aspects of the social package have been assessed: payment for on-call duty; money for accommodation; per diem; housing; travel money; meals in mess halls; kindergartens for the children of military and civilian employees; distribution of working time; access to military recreation facilities; price of holiday packages; sports facilities; quality of uniforms; uniform prices.

Career development model - the conceptual framework that defines the process of planning, managing and realizing the potential capabilities of military service members for their development by appointing/occupying positions requiring equal or higher military ranks [6]. The Career development model of military personnel is assessed by the following elements: terms of recruitment; terms of job promotion; terms of promotion in military rank; terms of professional military training; qualification; terms of retirement; appraisal system.

Organizational justice – personnel's perception of the fairness level in the organization. Procedural justice is related to employees' perception of the accuracy and objectivity of the process of applying the organization's rules and procedures to achieve the outcomes. Distributive justice is defined as the employee's assessment of the extent to which their efforts are appropriately rewarded by the organization [14].

2.4.2 Socio-psychological climate

Relationships with colleagues - interpersonal relationships in the workplace form the immediate psychological climate in which daily work activities in an organization take place. The establishment of an organizational environment dominated by trust, support and good rapport is an important prerequisite for successful teamwork and for quality performance. Positive psychological climate is particularly important in situations typical of the military profession where risk, vulnerability and uncertainty are high and interdependent is required [15].

Trust in direct superior/commander - leadership moderates the vertical relations in organizations and is a

powerful factor in shaping the Social psychological climate in teams. Leaders at different levels have the authority to make decisions with significant impact on the quality of life of their subordinates (e.g. promotions, salaries, rewards, redundancies), which raises the question of confidence in them. The present study is based on the assumption that the relationship between military personnel and their immediate superiors/commanders, i.e. the people with whom they most frequently communicate and interact, gives us important information about the state of leadership in the BAF [3, 4, 30].

Perceived organizational effectiveness of the formation/structure - perceived effectiveness of the formation/structure is the service members' assessment of the quality of work (for example, achieving quality products with shortened deadlines, shortage of resources, heavy workload, etc.). Previous research has shown that organizational effectiveness perceived by employees is related to their productivity, adaptability and efficiency in the work environment [9, 10, 15].

Role conflict – a role conflict occurs when conflicting roles are assigned to the individual, or when the role-related expectations are incompatible. Indications of a role conflict are dysfunctionality in performing the role in the organization, which has the effect of tension, dissatisfaction, anxiety, and lower productivity [32].

Job stress - the working environment is one of the main sources of stress. Multiple factors may exceed the abilities of individuals (physical, mental, social, etc.) to deal with them and cause stress. Two sources of stress are assessed in this study. The first one is *High concentration and overload* - includes indicators - constantly maintaining high levels of concentration in work, difficulty in work due to demanding high levels of knowledge and technical skills, daily overload, labour force, 24-hour obsession with work [35]. The second source of stress is related to "*Work-family*" conflict – "work-family" conflict is a form of inter-role conflict that occurs when the demands of work and family are incompatible to a certain degree." Sources of pressure may be due to difficulties in temporal synchronization of duties, to stressors that cause tension, or to the inability to reconcile the different behavioural patterns required by these two contexts of individual life. The construct is included in the research to determine whether it is a potential source of stress that affects the effective performance of military service obligations [19, 28].

2.4.3 Equal opportunities for professional realization

Equal gender opportunities for professional realization – increasing the proportion and career opportunities of women in the armed forces of the country has led to a loss of purely male unification of the military profession and raised questions of a different nature related to gender interaction. In connection with that it is interesting to note that as a percentage we stand very well in the international environment - Bulgaria has one of the highest percentage of women within the military in comparison with other NATO members. The women in the Bulgarian armed forces are already more than 14% of the military personnel, but they represent only 1.41% of the officers, which is very unsatisfying. [5]. In order to diagnose the degree of problems in this area, the research of organizational climate in the formations and structures of the BAF includes questions about the sexist beliefs and attitudes of the service members [10, 15].

Equal opportunities for the professional realization of ethnic groups - ethnic tolerance is a term that denotes the tolerance and respect for social, cultural, historical, sexual, or religious differences between individuals from particular ethnic groups. The presence of proportions of service members of different religions and ethnicity in the Bulgarian armed forces provokes the assessment of ethnic tolerance in the context of the Bulgarian military organizational environment [10, 15].

2.4.4 Motivation of military personnel

In the present study, the two main types of motivation are measured: *external motivation* (pay, bonuses, career promotion, etc.) and *internal motivation* - satisfaction and interest in the work itself, regardless of the

material remuneration it offers [7]. The following types of military personnel's motivation are assessed: challenges of the military profession; interest in military equipment, arms and technology; interest in the particular military specialty; rate of pay; secure and guaranteed workplace; a desire to serve the country; internal propensity for leadership, command and management of others; public prestige of the military profession; possibility to use military accommodation; opportunity to participate in missions abroad; early retirement; longer annual leave; opportunity for qualification.

2.5 Dependent variables

Job satisfaction - job satisfaction is the individual's overall experience of the aspects of his/her work or career. Job satisfaction is associated with higher levels of professional performance, higher commitment to the organization and lower turnover. The following indicators of job satisfaction are included: workplace security, training opportunities, qualification and career development, public prestige of the military profession, guaranteed civil rights, medical insurance, normative base, health and safety at work, arms and technique, payment, clothing and equipment [8].

Commitment to organization – commitment to organization is the stabilizing force that keeps the individual at his present workplace despite the better alternatives in other organizations or the difficulties encountered. Thus, commitment to organization is a "pledge" to engage staff with a certain attitude towards the organization even when certain circumstances influence change [10, 15].

Intention to leave organization - Intention to leave organization is described as deliberate consideration of leaving the organization, while actual withdrawal refers to the real termination of the work contract. The intention to leave is related to negative factors in the workplace such as poor organizational climate, perceptions of job insecurity, availability of employment alternatives, interpersonal conflicts. Previous studies have shown that there is a link between the intention to leave organization and the actual withdrawal. The intention to leave organization may be detrimental to organizational results. High turnover rates are costly for the organization due to the need to recruit and train new employees. Leadership is needed to stabilize withdrawal intentions by cultivating the desired organizational climate [12].

3.0 EMPIRICAL STUDY OF THE ORGANIZATIONAL CLIMATE IN THE BAF: STAGES OF THE STUDY

This report section presents the empirical study results. The relationships between organizational climate dimensions and service members' Job satisfaction, Commitment to organization and Intention to leave organization are analysed and discussed.

3.1 Basic Research tasks:

1. To evaluate the *links* between organizational climate dimension and service members' Job satisfaction, Commitment to organization, and Intention to leave organization;
2. To identify *the influence* of organizational climate dimensions on service members' Job satisfaction, Commitment to organization and Intention to leave organization;
3. To identify *the influence of organizational climate dimensions blocks* on service members' Job satisfaction, Commitment to organization and Intention to leave organization;

3.2 We assume following Hypothesis:

1. The organizational climate sub dimensions included in the Organizational policies' block of dimensions

(Image of military institution, Social policy, and Career development model) will have the most positive impact on service members' Job satisfaction, Commitment to organization and a negative impact on their Intention to leave organization.

[The hypothesis is based on the view that the organizational climate sub dimensions included in the Organizational policies' block of dimensions embody the most important features that people believe the ideal job shall possess in order to meet their needs - prestige, security, status, stimulation, career development.]

2. Service members' Job satisfaction and Commitment to organization will show a strong negative impact on their Intention to leave organization.

[The hypothesis is based on the results of large number of studies] [18, 23].

3. The organizational climate sub dimensions included in the Social psychological climate's (Relationship with colleagues, Trust in the direct superior/commander, Perceived organizational effectiveness of the formation/structure) and Organizational justice's (Procedural and Distributive justice) blocks of dimensions will have a significant impact on service members' Job satisfaction, Commitment to organization, and Intention to leave organization, controlling for the influence of the variables included in the Organization Policies' block of dimensions (Image of military institution, Social policy, Career development model).

[The hypothesis attempts to address the practically important question as to whether and to what extent the presence of a positive Social psychological climate and high Organizational justice is capable of neutralizing a possible negative functioning of the Organizational policies.]

3.3 Sample

Four surveys were conducted on the topic during the period 2013-2017. This report presents the results of the latest study (2017). On the basis of this sample the proposed theoretical model has been further developed and refined. The sample includes 1,655 service members from 59 structures and military formations. Its development passed through *two stages* and it is *representative* of the Ministry of Defence, the structures directly subordinated to the Minister of Defence and the BAF. The representative character of the sample of the general population (the service members of the whole BAF) was achieved through stochastic (random) selection.

The realized model and the sample size ensure the extrapolation of results for all the service members from the Ministry of Defence, the structures directly subordinated to the Minister of Defence and the BAF with a maximum stochastic error rate of $\pm 2.5\%$.

By gender, service members are distributed as follows: 81.7% men and 18.3% women.

According to the category military personnel, respondents were divided as follows: senior officers - 9,4%, junior officers - 13,0%, sergeants / warrant officers - 22,9%, privates / seamen - 36,1% , and cadets – 18,5%. The share of cadets is higher as the sample is reinforced for military academies.

3.4 Methods and Procedure

The study procedure includes a group anonymous poll among the service members in the formations where each respondent individually filled out the questionnaire. After submitting the instruction, respondents answered by circling a digit on the corresponding scale that most closely matches their opinion.

The methodology presents the questionnaires, which are the original product of the research team from the Defence Advanced Research Institute. Questionnaires are the methods for measuring the various aspects of the organizational climate in military formations and structures. Table 1 presents the main psychometric characteristics of the questionnaires.

Table 1-1: Psychometric characteristics of the questionnaires included in the study.

Questionnaire name/ Construct	Author/s of the original questionnaire	Name and number of factors	Number of items on the scale	Total % explained variation	Cronbach's Alpha	Scale of responses
Career development model	Original team work	1 factor "Satisfaction with the elements of the Career development model"	7	68%	$\alpha = .92$	Five degree agreement scale
Social policy	Original team work	1 factor "Satisfaction with the Social policy aspects"	13	42%	$\alpha = .88$	Three degree agreement scale
Organizational justice	Colquitt, J. A [13]	1 factor "Procedural justice"	7	64%	$\alpha = .87$	Five degree agreement scale
		2 factor "Distributive justice"	3		$\alpha = .87$	
Equal gender opportunities for professional realization	U.S. Defense Equal Opportunity Management Institute – DEOMI (adapted for the Bulgarian Armed Forces [16]; Yanakiev, Gerganov, Petkov) [10]	1 factor "Privileges of women"	5	68%	$\alpha = .87$	Five degree agreement scale
		2 factor "Privileges of men"	2		$\alpha = .66$	
Equal ethnic opportunities for professional realization	U.S. Defense Equal Opportunity Management Institute – DEOMI [16] (adapted for the Bulgarian Armed Forces Yanakiev, Gerganov, Petkov) [10]	1 factor "Ethnic Intolerance"	4	50%	$\alpha = .66$	Five degree agreement scale
Job stress	Brief Job Stress Questionnaire -	1 factor "Role conflict"	9	51%	$\alpha = .87$	Five degree

Questionnaire name/ Construct	Author/s of the original questionnaire	Name and number of factors	Number of items on the scale	Total % explained variation	Cronbach's Alpha	Scale of responses
	BJSQ (English version) [35] and Rizo scale for role conflict [32]	2 factor "High concentration and overload"	5		$\alpha = .77$	agreement scale
Relationships with colleagues	Brown, A. L. & B. D. Adams et al.[11]	1 factor "Relationships with colleagues"	8	60%	$\alpha = .90$	Five degree agreement scale
Trust in direct superior/commander	Trust in Leader at Work Scale (in Podsakoff et al.; Allister's Trust Scale [30])	1 factor "Trust in direct superior/commander"	13	61%	$\alpha = .94$	Five degree agreement scale
Perceived organizational effectiveness of the formation/structure	U.S. Defense Equal Opportunity Management Institute – DEOMI [16] (adapted for the Bulgarian Armed Forces; Yanakiev, Gerganov, Petkov) [10]	1 factor "Perceived organizational effectiveness of the formation /structure"	5	60%	$\alpha = .83$	Five degree agreement scale
Motivation of military personnel	Original team work	1 factor "Internal motivation"	7	58%	$\alpha = .82$	Five degree agreement scale
		2 factor "External motivation"	4		$\alpha = .71$	
		3 factor "Existential motivation"	2		$\alpha = .72$	
"Work-family" conflict	Netemeyer, R. G. & R. [28]	1 factor "Work-family" conflict"	4	75%	$\alpha = .89$	Five degree agreement scale
Image of the military institution	Original team work	1 factor "Image of the military institution"	3	66%	$\alpha = .74$	Five degree agreement scale
Job satisfaction	Original team work	1 factor "Job satisfaction"	11	53%	$\alpha = .91$	Five degree agreement scale

Questionnaire name/ Construct	Author/s of the original questionnaire	Name and number of factors	Number of items on the scale	Total % explained variation	Cronbach's Alpha	Scale of responses
Commitment to organization	U.S. Defense Equal Opportunity Management Institute – DEOMI [16] (adapted for the Bulgarian Armed Forces, Yanakiev, Gerganov, Petkov) [10]	1 factor "Commitment to organization"	5	65%	$\alpha = .86$	Five degree agreement scale
Intention to leave organization	Original team work	"Do you intend to leave your current job?"	-	-	-	Three degree agreement scale

4.0 DATA ANALYSIS

4.1 Methods and Procedure

Estimation of the relationships of each primary and mega factor with each of the dependant variables is accomplished by correlation analysis and in particular by the Pearson coefficient. Table 2 shows the correlations of the independent variables with service members' Job satisfaction, Commitment to organization, and Intention to leave organization.

Table 1-2: Correlations of primary and mega factors with dependent variables - service members' Job satisfaction, Commitment to organization and Intention to leave organization.

Dependent variables→	Job satisfaction	Commitment to organization	Intention to leave organization
Independent variables↓			
Organizational policies	.76**	.38**	-.39**
Image of the military institution	.31**	.31**	-.39**
Social policy	.56**	.24**	-.29**
Career development model	.64**	.37**	-.26**
Organizational justice	.55**	.57**	-.28**
Procedural justice	.51**	.53**	-.25**
Distributive justice	.42**	.46**	-.24**
Social psychological climate	.36**	.63**	-.22**
Relationships with colleagues	.22**	.46**	-.14**
Trust in direct superior/commander	.36**	.52**	-.24**
Perceived organizational effectiveness of the formation /structure	.24**	.67**	-.09*
Role conflict	-.38**	-.35**	.28**
Job stress	-.27**	-.08*	.30**
High concentration and overload	-.06*	.11**	.11**
"Work-family" conflict	-.36**	-.22**	.35**
Equal opportunities for realization	.33**	.23**	-.22**

Dependent variables→	Job satisfaction	Commitment to organization	Intention to leave organization
Independent variables↓			
Equal gender opportunities for realization	.28**	.19**	-.24**
Equal ethnic opportunities for realization	.24**	.16**	-.09*
Motivation of military personnel	.14**	.31**	-.11**
Internal motivation	.28**	.40**	-.21**
External motivation	negligible	.11**	negligible
Existential motivation	-.05*	.13**	negligible

Links between organizational climate dimensions and service members' Job satisfaction

The correlation matrix forms a clear picture of the factors and mega factors that are associated with service members' Job satisfaction in a great extent. The Career development model ($r = .64$), Social policy ($r = .56$) and Procedural justice ($r = .51$) are the primary factors that show the strongest positive relationship with the dependent variable considered. A weaker but moderate positive relationship is provided by the Distributive justice ($r = .42$) and Trust in the direct superior/commander ($r = .36$).

Moderate negative relationships are shown by the stress factors - Role conflict ($r = -.38$) and Work-family conflict ($r = -.36$).

At Meta level, the aggregate correlation coefficient of the mega factor Organization policies shows the highest positive relationship with Job satisfaction ($r = .76$), followed by the moderate positive correlation of Organizational justice ($r = .55$) and moderate negative correlation of the Role conflict ($r = -.38$).

Correlations between organizational climate dimensions and service members' Commitment to organization

The correlation coefficients of service members' Commitment to organization show that the highest significant positive links with this dependent variable show the primary factors associated with the Social psychological climate ($r = .63$), namely Perceived organizational effectiveness of the formation/structure ($r = .67$), Trust in direct superior/commander ($r = .52$) and Relationships with colleagues ($r = .46$). High levels of positive links show both types of Organizational justice ($r = .57$), Procedural justice ($r = .53$) and Distributive justice ($r = .46$).

Correlations between organizational climate dimensions and service members' Intention to leave organization

The levels of links between individual primary and mega factors and service members' Intention to leave organization are weak to moderate. Only two primary factors show higher moderate levels, namely the Image of the military organization ($r = -.39$) and the Work-family conflict ($r = .35$). Overall, the highest correlations with the Intention to leave organization shows the mega factor Organizational policies ($r = -.39$). Table 3 shows the intercorrelations between the dependent variables in the model.

Table 1-3: Correlations between dependent variables in the model - Job satisfaction, Commitment to organization and Intention to leave organization.

Dependent variables	Job satisfaction	Commitment to organization
Intention to leave organization	-.43**	-.29**
Commitment to organization	.46**	-

* $p < .05$. ** $p < .01$.

The service members' Intention to leave organization correlates with their Job satisfaction in a moderate negative degree ($r = -.43$), and with the Commitment to organization - in a low negative degree ($r = -.29$). The correlation of Job satisfaction with Intention to leave organization is a moderately positive ($r = .46$).

4.2 Influence of organizational climate dimensions on service members' Job satisfaction, Commitment to organization and Intention to leave organization

The predictors of each of the dependent variables in the model are established by the regression analysis method. The linear regression model proves to be adequate for all subsequent regression analyses.

The results of stepwise linear regression are presented in Table 4.

Table 1-4: Correlations between dependent variables in the model - Job satisfaction, Commitment to organization and Intention to leave organization.

JOB SATISFACTION			
Independent variables with significant impact	Beta	R ²	Change of R ²
Image of the military institution	.332	.465	.465
Career development model	.325	.605	.140
Social policy	.166	.641	.036
Procedural justice	.108	.667	.026
Distributive justice	.108	.677	.010
COMMITMENT TO ORGANIZATION			
Perceived organizational effectiveness of the formation/ structure	.457	.434	.434
Image of the military institution	.130	.510	.077
Internal motivation	.177	.556	.046
Rapport with colleagues	.111	.581	.025
Distributive justice	.098	.596	.015
INTENTION TO LEAVE ORGANIZATION			
Image of the military institution	-.290	.188	.188
"Work-family" conflict	.203	.244	.056
Social policy	-.115	.253	.009
Internal motivation	-.142	.262	.009
External motivation	.112	.273	.011
INTENTION TO LEAVE ORGANIZATION			
Work satisfaction	-.216	.207	.207
"Work-family" conflict	.177	.238	.032
Commitment to organization	-.147	.254	.016
Image of the military institution	-.138	.264	.010
External motivation	.078	.270	.006

Influence of organizational climate dimensions on service members' Job satisfaction

The high value of multiple coefficient of determination (R²) of the regression model shown in the table demonstrates that predictive power of independent variables on Job satisfaction are extremely well chosen because they account for 68% of its variation. The *Beta* coefficient ranks the variables according to their predictive power. The primary factors that predict Job satisfaction in the highest extent are Image of the military institution and Career development model, followed by Social policy and the two types of Organizational justice.

Influence of organizational climate dimensions on service members' Commitment to organization

Five key factors with significant influence on Commitment to organization are identified. All of them account for 60% of the variance in the dependant variable. The *Beta* coefficients ratios show that the dimension with the strongest predictive power on Commitment to organization is Perceived organizational effectiveness of the formation/structure followed by Internal motivation, Image of military institution, Relationship with colleagues and Distributive justice.

Influence of organizational climate dimensions on service members' Intention to leave organization

The regression model shows that the included variables in the study poorly predict service members' Intention to leave organization - barely 27%. In order to achieve a higher predictive power it is necessary to consider and systematize additional factors that influence the respondents' Intention to leave organization and to explore them in future studies of the organizational climate in the formations and structures of the BAF.

As can be seen from the table, the factors with the greatest influence on the studied dependent variable are the negative Image of the military institution, the existence of "Work-family" conflict, the poor (or bad) Social policy of the organization, low Internal motivation and high External motivation of the service members.

Regarding the dependent variable Intention to leave organization, a second linear regression method is applied, where, besides the independent variables, the dependent variables Job satisfaction and Commitment to organization are also entered. The idea is to measure to what extent the insertion of these variables will form a second more powerful predictive avenue to the service members' Intention to leave organization. The results shown in the table do not support the existence of more powerful model, because the coefficient of the explained variation in the answers remains the same - 27%.

The dependent variable Job satisfaction takes the role of the strongest negative predictor of the service members' Intention to leave organization. Particularly important is the fact that the independent variable "Work-family" conflict retains its predictive power from the previous model and is more influential than the factors Commitment to organization, Image of military institution and External motivation. This result implies focusing on defining the dimensions of this type of conflict in a military environment and setting out measures in the normative documents to minimize it.

4.3 Predictive power of Social psychological climate' and Organizational justice's blocks of dimensions on service members' Job satisfaction, Commitment to organization and Intention to leave organization while controlling for the Organization policies' block of dimensions

Examining the influence of the Social psychological climate' and Organizational Justice's block of dimensions over the three dependent variables in the study while controlling the Organization policies' block of dimensions, is caused by the following presumption: The organization's policies are more stable and more difficult to change due to the fact that they are directly dependent on its budget and ideology, while the internal organizational influence of the leadership on the Social psychological climate and Organizational justice (variables that appeared to be significant in most regression models so far) seems to be a more reachable task. Thus, if the Social psychological climate' and Organizational justice's blocks of dimensions show a strong influence on the three dependent variables while controlling the Organization policies' block of dimensions, they could be considered as factors capable of neutralizing the negative performance level of the Organization policies.

Demonstration of the aggregate group influence of several dimensions in the blocks require the implementation of *multiple hierarchical regression models* in which independent variables are entered as *blocks* at different levels.

4.3.1 Predictive power of Social psychological climate' and Organizational justice's blocks of dimensions on the service members' Job satisfaction while controlling for the Organizational policies' block of dimensions

In the regression equation, the dimensions included in Organizational policies are set as the first block, the second is the Social psychological climate, and the third one is Organizational justice. Figure 2 shows the percentage of variance explained in the first, second and third steps of the model.

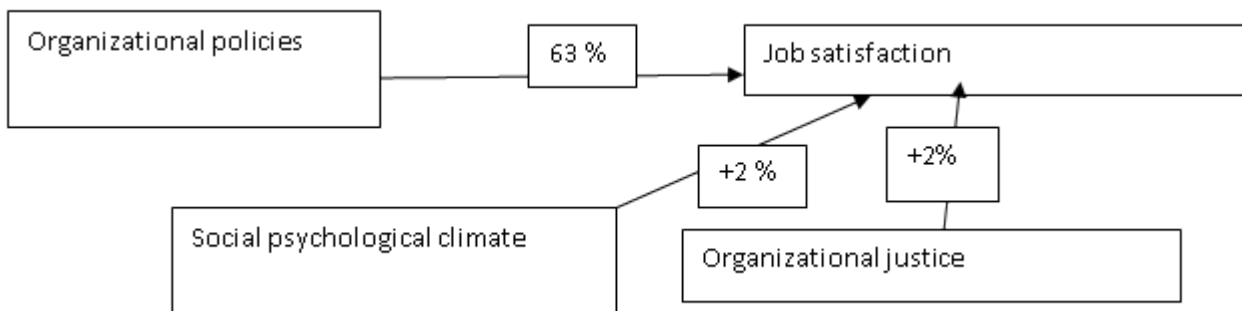


Figure 2: Influence of the Social psychological climate and Organizational justice's blocks of dimensions on service members' Job satisfaction while controlling the Organization policies' block of dimensions.

The presented on the figure coefficients show that the dimensions of the Organizational policies explain 63% of the variance in the service members' Job satisfaction, while the Social psychological climate' and Organizational justice's blocks of dimensions - only 2%.

Consequently, it can be concluded that the Social psychological climate and Organizational justice have little effect on service members' Job satisfaction even when the Organization's policies are controlled.

4.3.2 Predictive power of the Social psychological climate' and Organization justice's blocks of dimensions on the service members' Commitment to organization while controlling for the Organizational policies' block of dimensions

The coefficients presented in Figure 3 show a different picture regarding the service members' Commitment to organization.

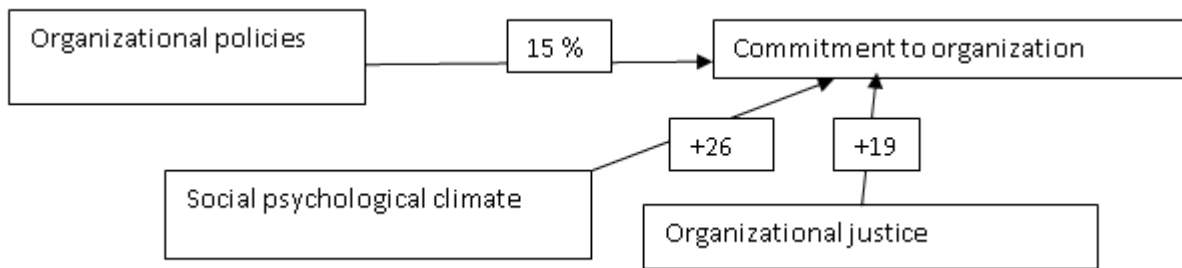


Figure 3: Influence of the Social psychological climate' and Organizational justice's blocks of dimensions on service members' Commitment to organization while controlling the Organizational policies' block dimensions.

Dimensions from the Organization policies' block account for only 15% of the variance in the dependent variable; Organizational justice adds an additional 19%, while the most influential of the three independent variables considered is the Social psychological climate – 26%. It has to be concluded that the Social psychological climate' and Organizational justice's blocks of dimensions have a stronger influence on the service members' Commitment to organization than the Organization policies' block of dimensions.

4.3.3 Predictive power of the Social psychological climate' and Organizational justice's blocks of dimensions on the service members' Intention to leave organization while controlling for the Organizational policies' block of dimensions

The influence of the independent variables on the service's members' Intention to leave organization is presented in Figure 4.

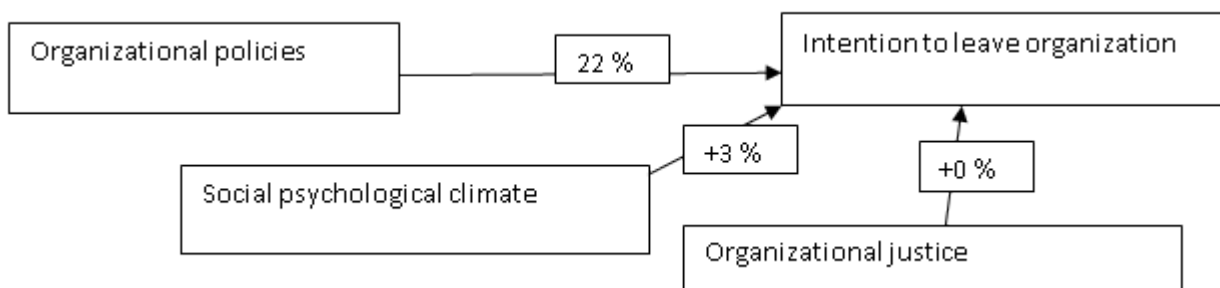


Figure 4: Influence of the Social psychological climate' and Organizational justice's blocks of dimensions on the service members' Intention to leave organization, while controlling for the Organizational policies' block of dimensions.

The figure illustrates that the Organizational policies' block of dimensions is the most powerful predictor of the service members' Intention to leave organizations (22%), while the influence of the other two blocks of dimensions is negligible. Thus, neither the Social psychological climate, nor the Organizational justice is able to keep the military from leaving the military if they perceive the Organizational policies as unfavourable.

4.3.4 Predictive power of the service members' Job satisfaction and Commitment to organization on their Intention to leave organization while controlling for the Organizational policies' block of dimensions

Figure 5 shows the second route of influence on the service members' Intention to leave organization, which is assumed to be through their Job satisfaction and Commitment to organization.

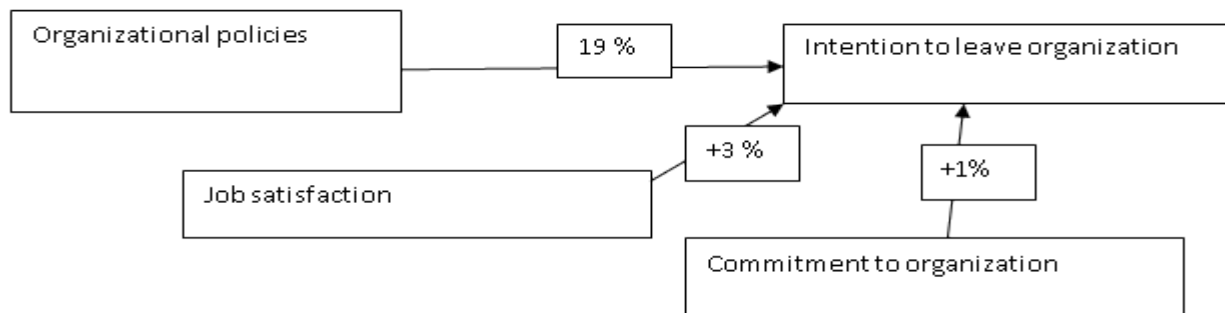


Figure 5. Influence of service members' Job satisfaction and Commitment to organization on their Intention to leave organization while controlling for the Organizational policies' block of dimensions

In the case considered, the picture again does not differ significantly from the previous one - the service members' Intention to leave organization is predicted most strongly by the Organizational policies (19%), while their Job satisfaction and Commitment to organization appear to be very weak predictors.

4.4 Examining the conformation of hypotheses

Hypothesis 1 was formulated as follows:

1. The organizational climate sub dimensions included in the Organizational policies' block of dimensions (Image of the military institution, Social policy, Career development model) will have the most positive impact on service members' Job satisfaction, Commitment to organization and a negative impact on their Intention to leave organization.

Data analysis showed that this hypothesis was partially confirmed. Dimensions included in the Organizational policies' block are the strongest positive predictors of service members' Job satisfaction, and the strongest negative predictors of their Intention to leave organization, but not of the Commitment to organization. Regarding Commitment to organization, the Social psychological climate and Organizational justice are the most influential.

Hypothesis 2 was formulated as follows:

2. Service members' Job satisfaction and Commitment to organization will show a strong negative predictive power on their Intention to leave organization.

In regressions models where the predictive power of the primary organizational climate dimensions is examined, Job satisfaction really shows the most negative influence on the service members' intention to leave organization ($r^2=20\%$), but in the hierarchical regression models, the Organizational policies' block of dimension decline the strong influence of Job satisfaction and R^2 drops to 3%. The Commitment to organization has a significant but weak influence on the service members' Intention to leave organization.

Hypothesis 3 was formulated as follows:

The organizational climate sub dimensions included in the Social psychological climate' (Relationship with colleagues, Trust in the direct superior/commander, Perceived organizational effectiveness of the formation/

structure) and Organizational justice's (Procedural and Distributive justice) blocks of dimensions will have a significant predictive power on service members' Job satisfaction, Commitment to organization, and Intention to leave organization, controlling for the influence of the variables included in the Organizational Policies' block of dimensions (Image of military institution, Social policy, Career development model).

The third hypothesis is confirmed only in terms of Commitment to organization. Even when controlling the Organizational policies' block of dimensions, the predictive power of the Social psychological climate and Organizational justice on service members' Job satisfaction and Intention to leave organization is weak.

5.0 CONCLUSIONS: IMPLICATIONS FOR THE MILITARY LEADERS

The representative study of the organizational climate in the formations and structures of the Armed Forces of the Republic of Bulgaria is a serious scientific challenge requiring a sound theoretical model that organizes the variables into a common framework of connections and influences and a reliable and valid measurement tools.

The study provided an opportunity to test the instruments as research methods in a military environment. The analyses revealed a theoretical model with considerable explanatory power in terms of the present state of the organizational climate in the formations and structures of the BAF, and possibilities for prediction for its improvement. The model has proved that the selection of variables included in the study is adequate and correct. At the same time, we have reached conclusions of considerable practical value.

Firstly, the Image of the defence institution in the perceptions of the military personnel has proved to be an extremely powerful construct with a high predictive power, both in terms of their Job satisfaction and in their Intention to leave organization. The public image of an institution is formed on the basis of its performance and significant public functions, as well as on the basis of its interaction with other entities. In this regard, the analysis of research results has led to conclusions with great practical significance both for the management of the Ministry of Defence and the basic policies of the military organization, and for future interaction with other structures in the society.

The Image of military institution has shown strong correlations with the Career development model and its Social policy, which are basic policies that affect the working conditions of an institution or organization. In other words, the perceived Image of the military institution is a constituent element of the attitude of the service members towards their job, together with such objective characteristics of the organization as a Career development model and Social policy, and at the same time is the central core of their Job satisfaction and Intention to leave organization.

Secondly, the three factors examined - the Image of military institution, the Career development model, and Social policy explain 64% of the variation in the dependant variable measuring service members' Job satisfaction. Service members' Job satisfaction is an extremely important, because of all others variables, it is most closely related to their Intention to leave organization.

It is well known that at the moment one of the main problems facing the BAF is the incompleteness of staff and turnover of trained personnel. In this context, it is extremely important to emphasize that even when the Organizational policies' block of dimensions are controlled, Social psychological climate' and Organizational justice' block of dimensions have little predictive power on service members' Job satisfaction. *The practical conclusion to be drawn is that the negative perceived Image of the military organization, the poor Career development model, and the insufficient Social policy cannot be compensated by any other factors.* If the goal is to discourage the service members from leaving the Bulgarian armed

forces, the development of these three components to a satisfactory level should become a primary, unconditional task for implementation by the military leaders.

Thirdly, Commitment to organization is the second dependent variable, which, to a lesser but significant degree, is related to the service members' Intention to leave organization. This dependant variable is predominantly predicted by the Social psychological climate' and Organizational justice's blocks of dimensions. Thus, the positive Social psychological climate and high Organizational justice could, to a lesser extent, offset the inadequate status of the Organizational policies by enhancing Commitment to organization and hence minimize the service members' Intention to leave organization. On the other hand, the fact that the service members' Internal motivation has a significant impact on their Commitment to organization* implies the possibility to use questionnaires to study this kind of motivation for the selection of those whose behaviour is more driven by interest in the specifics of the military profession, and not just by the rewards (salary, security, career development, etc.).

Fourth, the Intention to leave organization not only mediated, through Job satisfaction, but also directly (in the regression models where it is a dependent variable) is influenced to the highest degree by the Organizational Policies' block of dimensions. This result again demonstrates their key role in overcoming the problem of leaving the military. It is also important to emphasize that in the regression model, where the independent influence of the variables is studied, the "Work-family" conflict and External motivation (pay, bonuses, awards) appear as a trigger mechanism, and the high Internal motivation (interest in work per se and in the military profession) is to some extent a deterrent to leaving the service. In the indirect model in which the Intention to leave organization is predicted by the inclusion as dependent variables of Job satisfaction and Commitment to organization, it is obvious that besides them, the "Work-family" conflict again plays a noticeable role in provoking an intention to leave the organization. The consistency of the result draws attention to the definition of the boundaries of the "Work-family" conflict in the military environment and the formulation of measures to minimize its impact in the normative documents.

Fifth, it is necessary to draw the attention of the military leaders to strict observance of fairness in the application of procedures and the distribution of awards in accordance with individual contributions. Contrary to expectations, the dimensions associated with perceived Organizational justice proved to be a factor with a stronger influence on the organizational climate than the dimensions included in the Social psychological climate's block of dimensions. The two types of justice, independently or in combination, show effects of influence on the three baseline variables, which means that it is imperative to observe their precise application in the daily work of military formations and structures. The fair application of procedures and the distribution of resources in accordance with merit of everyone is an important factor for higher service members' Job satisfaction, higher Commitment to organization and, accordingly, minimization of the contingent of people who intend to leave the military profession.

Sixth, the stressors (with the exception of "Work-family" conflict) and gender and ethnic inequalities in the military environment play a weaker role in predicting service members' Job satisfaction, Commitment to organization and Intention to leave the military, compared to initial expectations. They do not participate as factors with significant influence in any of the predictive models, although they show certain correlations with the dependent variables. In other words, High concentration and overload at work, Role conflict, gender and ethnic inequality do not appear as predictive factors of the service members' Intention to leave organization.

Seventh, the low rate of variation in the response of military personnel to the service members' Intention to leave organization shows that not all the factors that provoke the desire to quit the organization are included in the model. Further efforts are needed for their complete manifestation.

* In regressions where the influence of independent variables is examined independently.

Overall, the explored explanatory effects of the developed and tested model suggest that the most important variables relevant to diagnostics and interventions to improve the organizational climate in the Armed Forces of the Republic of Bulgaria are the Image of military institution in the perception of the service members, the Career development model, Social policy, Procedural and Distributive justice. Certain significant influences manifest the “Work-family” conflict, Internal motivation for service, Relationships with colleagues and the Perceived organizational effectiveness of the formation/structure. Each of these variables requires specific treatment to achieve the planned results.

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APPENDIX 1. FACTOR STRUCTURE OF MEGA FACTORS AFTER VARIMAX ROTATION

KMO & Bartlett's Test	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					.824	
	Bartlett's Test of Sphericity					Approx. χ^2	2840,86
						df	120
						Sig.	,000
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	
Number of Initial Eigenvalues >1		5					
Initial Eigenvalues >1		4,321	2,125	1,365	1,269	1,012	
Explained variation of mega factors		27%	13%	9%	8%	6%	
Total % of explained variation		63%					
Relationships with colleagues		.77					
Trust in direct superior/commander		.75					
Perceived organizational effectiveness of the formation / structure		.66			.32		
Procedural justice		.60	.46				
Distributive justice		.54	.49				
Role conflict		-.54			.41	-.35	
Image of military organization			.80				
Career development model			.72				
Social policy			.70				
Internal motivation				.81			
Existential motivation				.80			
External motivation		.32		.62			
High concentration and overload					.89		
“Work-family” conflict			-.31		.65		
Equal gender opportunities for realization						.77	
Equal ethnic opportunities for realization						.78	



Employee Attitude Surveys as an Important Tool in the Context of Corporate Health Management in the German Armed Forces

M.A. Annika Claus

Institute for Teacher's Health at the Institute of Occupational, Social and Environmental Medicine at the
University Medical Center of the Johannes Gutenberg University of Mainz
Kupferbergterrasse 17-19, 55116 Mainz
GERMANY

annika.claus@unimedizin-mainz.de

Prof. Dr. med. Dirk-Matthias Rose

Institute for Teacher's Health at the Institute of Occupational, Social and Environmental Medicine at the
University Medical Center of the Johannes Gutenberg University of Mainz
Kupferbergterrasse 17-19, 55116 Mainz
GERMANY

dirk-matthias.rose@unimedizin-mainz.de

LtCol Ass.-Prof. Dr. med. habil. Stefan Sammito

Center of Aerospace Medicine, I 3
Flughafenstraße 1, 51147 Köln
GERMANY

Occupational Medicine, Faculty of Medicine, Otto-von-Guericke-University of Magdeburg
Leipziger Straße 44, 39120 Magdeburg
GERMANY

stefansammito@bundeswehr.org

ABSTRACT

The German Ministry of Defense (MoD) started the implementation of corporate health management (CHM) on January 1st 2016 after a pilot phase in 2015. At the end of the year 2019 CHM shall be implemented nationwide at all government departments of the MoD.

At the beginning in 2015 the evaluation phase starting with 10 military, civil, and medical agencies with different tasks and infrastructure had been scientifically accompanied and evaluated by 8 university and non-university research institutions. Aim was to customize the experiences with CHM in civil industry to the special needs of the German Armed Forces. An example of a successful transfer from civil research to an essential tool of military CHM is the web based tool of an employee attitude survey AIGScreenBw. AIGScreenBw is currently used to survey the actual status of individually perceived work and health situation. In the long term, the tool will reevaluate the status of the agencies, especially after realized measures based on the results of the first survey. AIGScreenBw has been developed from a survey to assess the individual health situation of teachers in Rhineland-Palatinate. The core questionnaire comprises several items covering the main aspects of the working conditions, individual's health, and stress responses. Further questions concerning respective circumstances and demands were added to the AIGScreenBw such as attitudes towards CHM or socio-economic characteristics. Since 2015 the survey with total 134 items was evolved and can be used as a paper-pencil-version or online survey. Each agency can use this survey. The custom-tailored reporting will be retransmitted to the agency within few working-days including reference

values from other agencies. To date (15th February 2019) 123 agencies with a total number of employees of 66,157 have been surveyed. The results in the topics “CHM”, “safety and occupational health” and “organization and leadership” will be presented exemplary.

AIGScreenBw is a scientific developed tool for employee attitude surveys to verify the occupational strain at the workplace in the German Armed Forces. It is an ex-ample how to transfer knowledge from civil research to armed forces reasonable and cost-effective.

The research project had been conducted on behalf and with approval of MoD (E/U2AD/HD003/HD001) and within a special research frame (research no.: 06KS-S-63 1619).

1.0 INTRODUCTION

1.1 Legal obligation and economic necessity of Corporate Health Management

According to the German Occupational Health and Safety Act (ArbSchG), employees are obliged to contribute actively to the protection of the health of their employees through preventive measures. This includes the prevention of harm to health through the elimination of hazards at work, the implementation of concrete measures to protect and maintain the health of employees, and the identification and assessment of hazards to its employees. Furthermore, with regard to the measures taken, there is an obligation to review the effectiveness and, if possible, the optimization of these.

In addition to the legal obligation, it makes sense for employers to pursue health promotion and management from an economic perspective. A large number of studies confirm the economic benefits of corporate health management (CHM) both from an economic perspective and for companies. For example, Baicker et al. [2] calculated in a meta-analysis that the average saving due to lost time exceeds healthcare spending by a factor of 2.7. Hochart et al. [9] showed in a longitudinal analysis that health expenditure for participants in a health program increased by less than 1% during the survey period, while non-participants increased their costs by around 22% over the same period. Chapman & Larry [6] described in his latest meta-analysis that the costs of occupational accident and disability insurance are reduced by an average of 25% through occupational health promotion.

Simultaneously, new forms of stress, which are predominantly of a psychological nature, result from the change of requirement structures of work and the emergence of new forms of work, which are often associated with catchwords such as delimitation, flexibilization, service orientation, multitasking or computerization [21]. The European Agency for Safety and Health at Work [8] reports new forms of employment contracts and job insecurity, work intensification, a poor work-life balance, and high emotional demands at work as the top emerging risks in the occupational context.

In addition, in view of an aging workforce structure in Germany, CHM is becoming an increasingly important topic for companies that want to maintain the working capacity of their employees for as long as possible [10] and remain attractive as an employer for potential applicants.

A report by the Federal Institute for Occupational Safety and Health [3], however, already noted for 2012 a discrepancy between occupational medical care requirements and available capacities in Germany and predicted a further significant divergence in demand and supply. In order to counteract the increase in this gap, the use of demand-oriented management and planning as well as the use of already available resources in the company is recommended. Therefore, the Federal Institute for Occupational Safety and Health proposes a multidisciplinary approach as one way of optimizing the use of resources regarding occupational health and safety. With the involvement of internal and external actors such as safety engineers, ergonomists, psychologists or statisticians or institutions such as universities, occupational physicians can be relieved and

concentrate more on their core task. Through the use of expert knowledge of the various disciplines, synergy effects can be used that enable a more comprehensive knowledge of needs for action and a custom-made and holistic health management. This results in a demand-oriented solution which is more cost effective compared to a “one-fits-all” approach.

1.2 Pilot Project

Due to demographic change all NATO armed forces are forced to gain and to hold enough qualified personal. This applies similarly to the German Armed Forces. Analysis of different government departments has shown, that especially the MoD has one of the oldest personal. This goes along with a high number of sick days. Against the background of this finding it was decided to implement a CHM in the area of responsibility of the MoD in 2014. For this purpose a pilot phase was executed in 2015.

The multidisciplinary approach was also applied in the pilot project to implement CHM in the area of responsibility of the German Federal Ministry of Defense. This involved occupational physicians, heads of department, military psychologists, CHM coordinators and research partners from eight Universities and research institutes with a specialization in epidemiology, social medicine, nutritional science, psychology, occupational health and safety, sports science, and survey methods.

CHM consist of „workplace health promotion” with the subtopics in “physical activity”, “nutrition”, “prevention of dependence” and “reducing of stress” and of “occupational safety issues” and the topic “leadership and organisation” (see Figure 1).

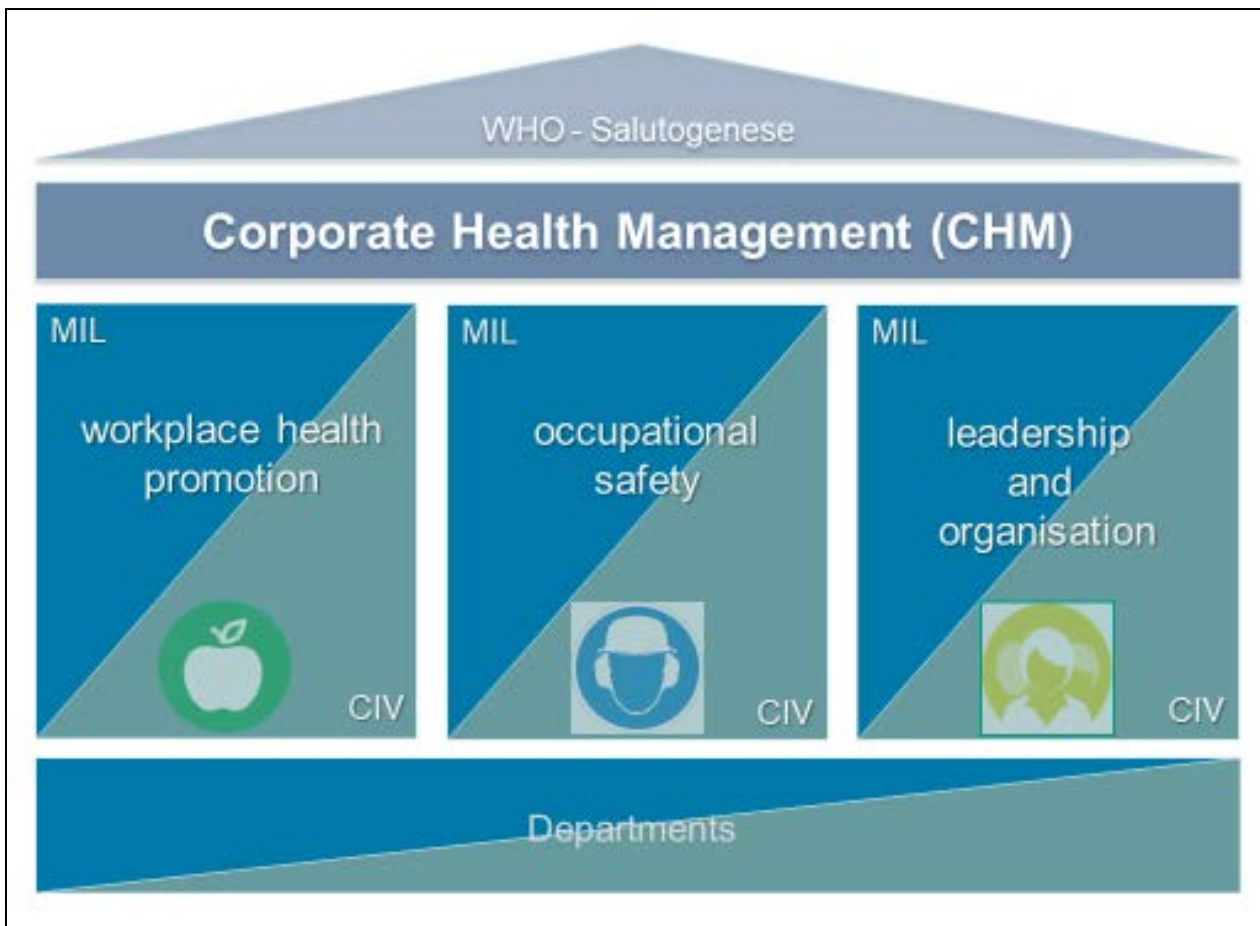


Figure 1: Corporate Health Management (CHM) in the responsibility of the German Ministry of Defense with the three main topics

The pilot project started in January 2015 at ten departments in eleven locations, which were considered to be representative for the organizational structure of all units. This includes the administration, represented by the Federal Ministry of Defense, the Federal Office for Human Resources, the Federal Office for Equipment, Information Technology and Use of the Bundeswehr and the Food Office, as well as units of the armed forces, represented by a corvette squadron, a grenadier battalion, an operations commando and a battalion for electronic warfare, and medical care, represented by the Bundeswehr Hospital Ulm [16].

During the pilot phase the CHM was accompanied by different research projects [1], [7], [11], [13], [14], [23], [24]. This projects examined relevant subtopics in the field of intervention studies. Additionally a survey was necessary to determine the situation in the different departments and for the area of responsibility of the German MoD with 250,000 employees in total. For this reason, it was necessary to gain information about the work situation, individually perceived work stress, health behaviour of the employees and their health situation as well as their needs. For this purpose, a questionnaire (“AIGScreenBw”) was developed and evaluated during the pilot phase [15], [16].

1.3 Implementation phase

After a successful pilot phase the MoD decided to implement a CHM in all departments in the responsibility of the German MoD. Hence a CHM organisation was created at the beginning of 2016. Forty-four regional CHM coordinators got the task to implement a CHM successively at the departments in their regional area. For this they took the advice of the unit commanders and the head of departments. At the end of 2019 the implementation of CHM should be finalised at all departments [5].

The employee’s survey AIGScreenBw should be used also for the implementation phase in dependence of methodical consideration of a PDCA cycle (see Figure 2). Based on the survey during the pilot phase the items in the survey were adapted and since May 2017 an improved version (2.0) was used. At the moment the survey has 134 items to the following topics:

- Eating behavior (4 items),
- Physical activities (5+3 items),
- work load, time aspects, breaks (7+1 items),
- work requirements, supervision, organisational working conditions (12 items),
- Social aspects of work (12 items),
- Main workspace environment (5 items),
- Health / diseases (20+1 items),
- alcohol and tobacco consumption (5 items),
- Stresses and strains at the workplace (8 items),
- dealing with individual health and stress (8 items),
- importance and general interest in CHM (11 items),
- Engagement Index (19 items) from Bundesanstalt für Arbeit [14],
- socio-demographic information (11 items) and
- additional free remarks (1 item)

Why a survey?

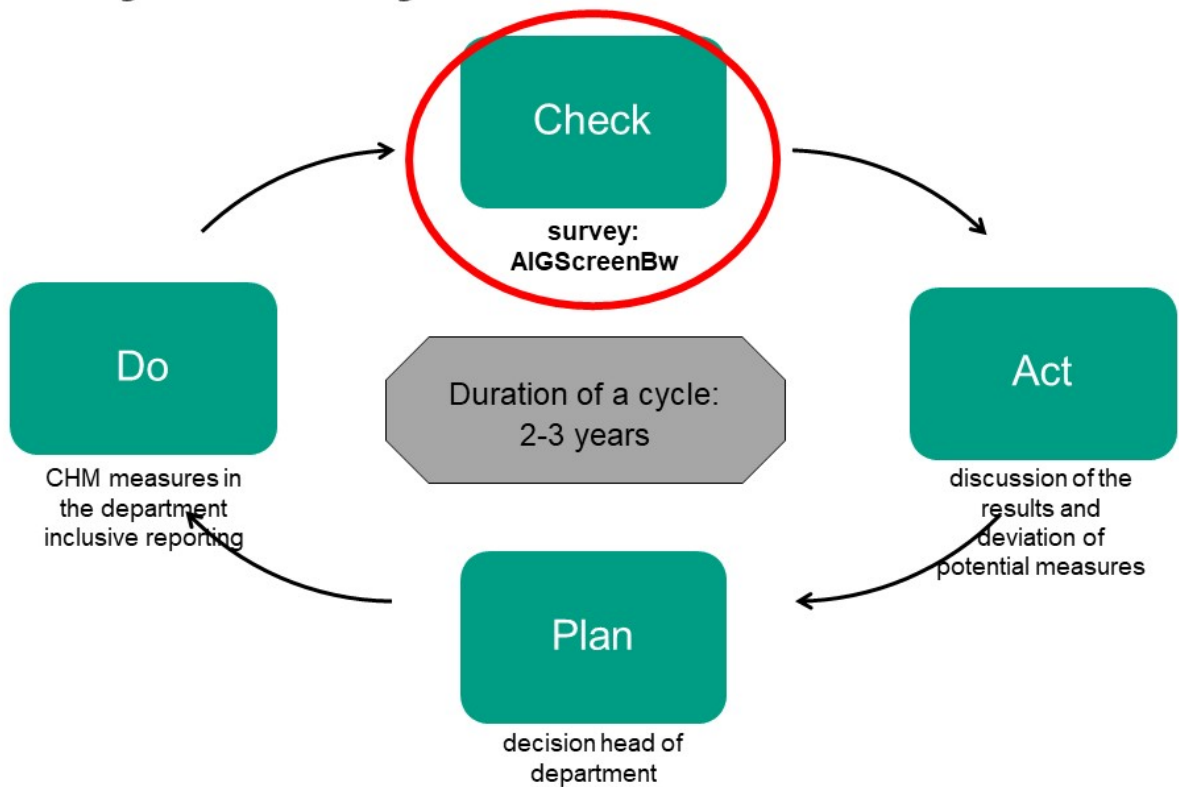


Figure 2: PDCA cycle of the CHM in the area of responsibility of the German MoD

The survey is conducted primarily online. Only in departments where not all employees have a computer access or internet connection is not possible an additional paper-pencil survey can be used. All items but the engagement index and the socio-demographic items can be answered on a four-point-likert-scale. The answers are labelled with “no”, “rather no”, “rather yes” and “yes”.

For every subject area an indicator is determined. It corresponds to the mean value of the percentages of personnel that have chosen answers from negative categories for the individual items of the subject areas. The range differs from 0% (no negative associated answer over all separate items for this indicator) to 100 % (all answers are negative associated). While combining questions under one score leads to a reduction of the level of detail, it allows addressing various sub-aspects under one indicator. Indicators were checked for internal consistency (Cronbach's alpha 0.506 – 0.906) [15].

Up to 15th February 2019 123 departments with a total of 66,157 employees were queried. 17,667 employees took part in the survey (response rate 26.7%).

2.0 RESULTS

Results from the survey were examined on department level and in addition on section or company level. The indicators are shown clearly in a One-Paper (see Figure 3).

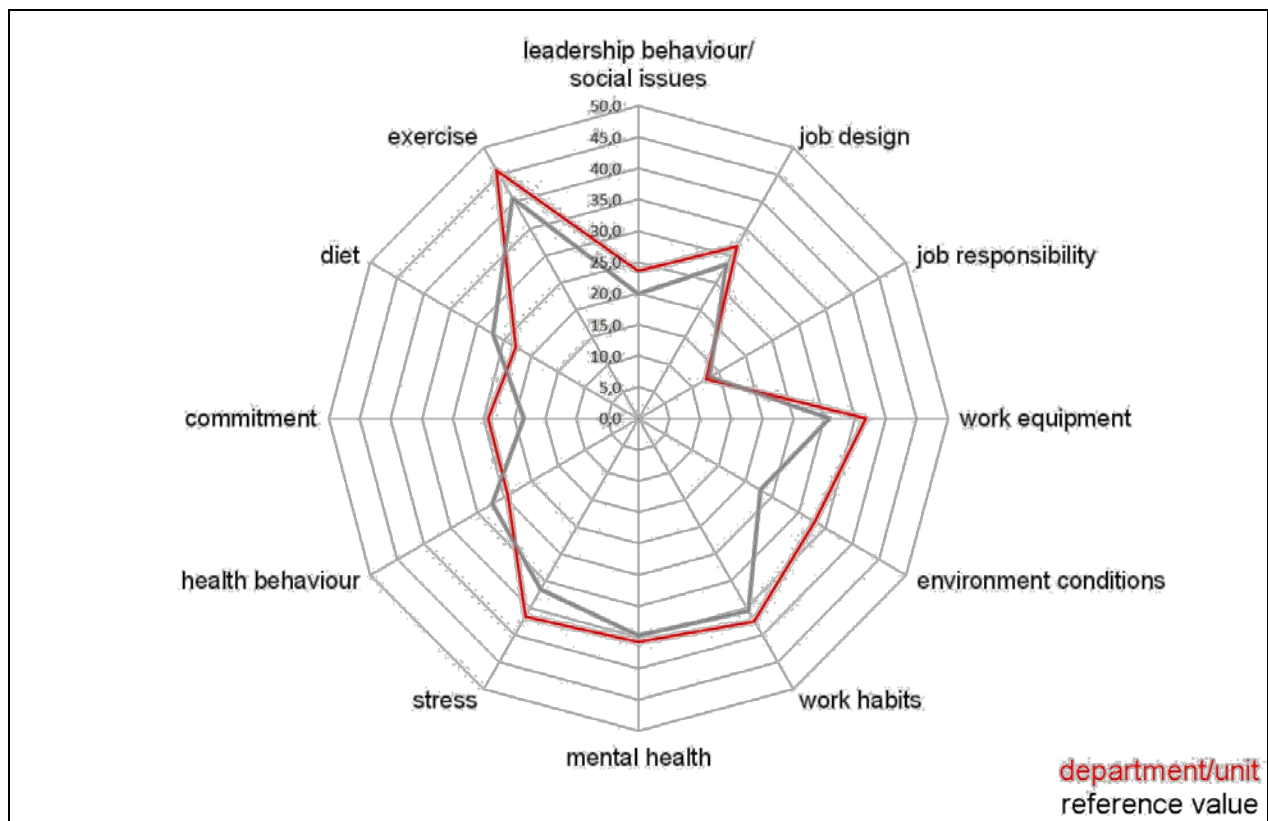


Figure 3: One-Pager result for one department as a result of a survey; black = results from the survey; red = reference vales (figure taken from [15])

For comparison, reference values for every item and for the indicators were calculated as an average from the results done before. This is shown for every survey also in the results for the head of department (see Figure 4).

stress	19,6%	(30,1% - 44,7%)
In my job, I repeatedly cannot take proper care of my health.	41,7%	(42,6% - 69,6%)
It is difficult for me to unwind after work.	15,4%	(28,7% - 47,2%)
I feel like a bundle of nerves now and then.	7,1%	(13,8% - 26,2%)
I give testy replies even though I don't want to.	14,3%	(26,8% - 44,3%)
health behaviour	50,0%	(32,5% - 46,6%)
I make important decisions mainly conditional on what they mean for my health.	50,0%	(47,5% - 69,4%)
My health is the top priority for me.	50,0%	(23,2% - 41,7%)
I watch out for health warning signs.	57,1%	(27,0% - 42,4%)
I try to live a healthy lifestyle (such as eat healthy food, not smoke, sports, sleep and recreation).	42,9%	(23,1% - 42,1%)

Figure 3: Presentation of some results for the topic “stress” and “health behaviour”

Previous published analyses have pointed out that with this survey tool the different working conditions and loads can be captured delimitable. Analyses of the survey results of the pilot phase have shown, that in eleven of the twelve indicators there are significant differences between the departments with either belong to military command, or administration, or combat units or military hospital (see table 1) [17].

Table 1: Number of participants in the survey during the pilot phase and results of indicator calculation at different departments, $p < 0.05$ shown significant difference between the four cluster of departments [17].

	total	command units	combat units	admin- stration	military hospital	range	p
number n	2,076	493	684	375	388		
leadership behaviour / social issues [%]	19.9 ± 23.5	15.7	19.6	20.9	23.6	7.9	<0.001
job design [%]	28.5 ± 23.3	28.4	31.5	23.6	31.8	8.2	<0.001
job responsibility [%]	13.3 ± 29.4	8.8	14.9	15.9	12.6	7.1	0.001
work equipment [%]	30.9 ± 38.9	16.8	44.5	21.5	36.7	27.7	<0.001
environment conditions [%]	22.7 ± 27.7	16.4	22.7	19.7	32.9	16.5	<0.001
work habits [%]	35.5 ± 26.3	29.6	39.9	34.0	37.4	10.3	<0.001
mental health [%]	34.6 ± 38.2	34.8	30.4	37.2	35.7	6.8	0.018
stress [%]	31.2 ± 31.5	28.8	31.1	30.7	36.5	7.7	0.003
health behaviour [%]	27.3 ± 30.4	28.1	27.3	27.2	24.4	3.7	0.322
commitment [%]	18.6 ± 30.9	14.2	19.3	16.5	24.3	10.1	<0.001
diet [%]	27.1 ± 27.9	24.6	32.5	27.3	22.9	9.6	<0.001
exercise [%]	40.7 ± 32.7	32.9	41.5	32.5	45.8	13.3	<0.001

3.0 DISCUSSION

With the survey implemented in the CHM in the area of responsibility of the German MoD it is possibly to identify working conditions and loads and to plan target-oriented CHM measures for every separate department. Because the survey is conducted in a regular interval (usually every two years) changes in the working conditions and loads can be identified and the measures can be adapted. Previous results have shown that the heterogeneity of the departments and the particular working conditions and loads can differ by this survey. As it be expected that CHM measures are effective and sustainable when comprehensive knowledge about the conditions on-site are known, this proves, that a CHM similar for all departments would not be useful.

A survey is one way for examined the working conditions and load of the employees. Furthermore, there are additional possibilities for evaluating the needs for CHM measures. Analysis of response rate of employees for the CHM measures or an evaluation of singular measures in addition to the survey are two possibilities and preferable. It should be kept in mind that a survey has also some restrictions. Because the participation in the survey is on voluntary base the results could have some bias in comparison to the total group of employees in the department. Especially persons who are interested in the field of health and wellness would take in such a survey. Thus, it is not surprising, that during the pilot phase women and civilian employees have took part disproportionately more in the survey than the group of men or soldiers [17]. Since the measures during the pilot phase have had a focus on exercise and health promotions measures especially for the group of civilian employees CHM measures were very attractive because the participation in the measures where possibly during the normal working hours. For soldiers who are instructed to take part in the physical fitness training during normal duty an exercise measures is less attractive [18]. Because of this, it is

surprising that the number of negative associated answers in the indicator of exercise are so high in combat units [8]. The high participation rate of women converges with the knowledge, that women are more open for preventive medicine measurement than men [12].

During the implementation phase the response rate was increased (26.7% instead of 22.4%). The goal of a survey should be a maximum recruitment of all participants. With the possibility of conducting the survey as a single online survey or as a combined online/paper-pencil survey it is possible to reach every employee in the different departments. This approach was chosen, because online survey have several benefits in comparison to other survey methods: economical with regard to time, material and personal needed, flexible with regard to time and location for the survey and in additional interviewer effects could be minimised through the automatically collection of the results [22]. Because not every employee on every department have a computer access an additional paper-pencil survey have to be conducted. Questionnaire content, design and order were the same in both survey methods. So no additional effects are expected from this proceed. On the other site without an additional paper-pencil survey a lower response rate and a high selectivity of employees who took part in the survey would be expected.

Though even with this measurement and a detailed information policy in the run-up of the survey (kick-off events, flyer, poster) only 26.7% of all employees have took part in the survey so far. In comparison to other survey in the topic of CHM this value can be classified as low, e.g. Spiegel et al. [20] shown a response rate in six Bavarian service of 34 to 60 %. On the other hand, Schmidt et al. [19] got a response rate in four hospitals of 15.0 to 16.4 % while in a parallel survey in different services a response rate of 29.5 to 52.7 % could be reached.

The indicators were designed to get a maximum acceptance and comprehensibility in the target group of employees in the responsibility of the German MoD. Because of this an adapted questionnaire for the military context was used. On the other hand, there was a challenge to address all the different aspects of the broad area of indicators in regard to a CHM and to keep the questionnaire as short as possible. Because of this, there was only a small possibility to use validated questionnaires. For this reason a validation is planned and will be conducted in 2019/20.

In summary, the designed survey of the CHM in the responsibility of the German MoD can collect important information for planning target-oriented CHM measures. It helps the military commanders and the head of departments to plan and to track the working conditions and loads and the impact of the CHM during a PDCA cycle.

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Defence Team Total Health and Wellness Strategic Framework

Gareth Doherty

Department of National Defence
101 Colonel By Drive, Ottawa, Ontario K1A 0K2
CANADA

gareth.doherty@forces.gc.ca

Major E.C. Knight

Department of National Defence
101 Colonel By Drive, Ottawa, Ontario K1A 0K2
CANADA

edith.knight@forces.gc.ca

Tzvetanka Dobрева-Martinova

Department of National Defence
101 Colonel By Drive, Ottawa, Ontario K1A 0K2
CANADA

tzvetanka.dobрева-martinova@forces.gc.ca

1.0 INTRODUCTION

Leading for health and wellness requires coordinated effort at multiple levels of the organization. It is a leadership responsibility at all levels of leadership and requires the leader's focus when balancing the needs of the individual member with those of the organization. Rooted in the Competing Values Framework^{1,2}, the *Canadian Armed Forces Leadership Doctrine* defines leadership and effective CAF leadership in relation to CAF effectiveness, the latter comprising five major dimensions: mission success, internal integration, member well-being and commitment, external adaptability, and the military ethos. It is recognized that at times these dimensions may compete for resources and attention, therefore, it is important for leaders to keep member health and wellness in mind when dealing with competing values and priorities, and managing the risks inherent in making decisions.

Leaders' responsibilities and opportunities to positively influence member's health and wellness are highlighted in the Defence Team Total Health and Wellness (THW) Strategic Framework (SF), which presents a holistic view of health and wellness by integrating multiple dimensions of the individual, workplace and personal life. As the foundation for the Defence Team Total Health and Wellness Strategy, the THW SF builds a holistic view of health and wellness at the strategic level, which allows to integrate specific tactical level health and wellness initiatives.

By focusing on the Defence Team as a whole, the Total Health and Wellness strategy recognizes the importance of keeping a holistic view of the health and wellness of the two distinct groups comprising the Defence Team: Canadian Armed Forces (CAF) members and Department of National Defence (DND) employees. Recognizing that these separate communities have unique requirements from a total health and wellness perspective, the THW SF, presented in this paper, provides the necessary overarching architecture to advance common health

and wellness goals, and create opportunities to leverage existing resources and action in an integrated and coordinated manner.

2.0 PURPOSE OF THE STRATEGIC FRAMEWORK

The THW SF was developed using a comprehensive approach to health and wellness that was informed by cutting edge research and professional practices. The Framework considers the full spectrum of health and wellness from one's personal life to the workplace and incorporates prevention activities such as health promotion and education, as well as assessment and treatment of illness and injury. THW SF presents a well-defined conception of total health and wellness to support the development of strategic priorities at different levels of the organization and to guide the development of action plans and specific initiatives. The Framework promotes developing action plans and initiatives using multidisciplinary and collaborative approaches as well as managing existing programs and tools designed to help leaders support members of the Defence Team in achieving peak health and wellness at home and in the workplace.

2.1 Total Health and Wellness is Greater than Physical and Mental Health

Individual health is impacted by both aspects of the work environment (psychosocial and physical) and of one's personal life. Thus, a comprehensive (or *total*) approach to health demands attending to the various determinants (or *contributing factors*) across both work and personal dimensions of health.³ A socio-ecological model of health⁴ recognizes the inextricable link between people and their environment and according to this view, health is, "*the extent to which an individual or group is able, on the one hand, to realise aspirations and satisfy needs; and, on the other hand, to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living; it is a positive concept emphasizing social and personal resources, as well as physical capacities.*"

3.0 WHAT IS HEALTH?

Providing clear definitions of health, wellness, and well-being is a challenging task, made more difficult by the unique nature of work and military focus of the Defence Team. In both academic and lay usage, these words are often used interchangeably, adding to the confusion. For the purpose of the THW SF, our goal is not to resolve existing debates about how best to define these terms or to legislate usage. Instead, we define each of these concepts in a way that makes them distinct from one another, ensures their utility to the development and application of the strategic framework, and captures the essential elements of each concept defined in the literature.

The World Health Organization's (WHO)⁴ 1948 definition has remained the standard adopted by healthcare and health promotion practitioners, and appears in the *National Standard: Psychological Health and Safety in the Workplace*.⁵ On this view, health is defined as, "*a state of complete, physical, mental, and social well-being and not merely the absence of disease or infirmity.*" The development of this definition was largely a recognition that prior clinical conceptions of health - as the absence of disease - failed to capture important features of health, outside of clinical contexts. The presence/absence of disease is part of our understanding of health but does not provide a complete picture.

Although the WHO's definition has been lauded for moving beyond defining health as merely the absence of illness, and its inclusion of social well-being, there is growing recognition that this definition can be improved.⁶ One technical problem is its circular use of the term *well-being* to define *health*, making disambiguation of the

terms difficult. A more substantive criticism of the WHO's definition is the demand for *complete* physical, mental and social well-being. The reality is a growing number of people live enjoyable lives while managing chronic diseases and injuries due to medical advancements in the treatment of their condition (e.g., Crohn's disease). Under the WHO's⁴ 1948 definition, these individuals would not be deemed *healthy* in spite of the fact that their condition presents few (or manageable) adverse effects, and they report feeling *well*.

By 1984, a move away from the WHO's health definition was emerging. The *Working Group on Concept and Principles of Health Promotion* in Copenhagen, 9-13 July 1984, advanced a socio-ecological model of health and the Ottawa Charter of Health Promotion (1986) announced its adoption of this definition at the *First International Conference on Health Promotion*, 21 November 1986. This more dynamic view sees health as not simply the achievement of certain physical, psychological and social *states*, but stresses the importance of the ability to *live in a certain way*, to manage one's self and adapt to stressors (physical, mental or otherwise) in the environment.

The socio-ecological conception of health finds a natural application in the workplace, and the Defence Team specifically, by emphasizing the importance of environmental (i.e., workplace) factors as key determinants in the health, wellness and safety of employees. Secondly, the focus on the importance of coping, or resilience, as a central concept of health and wellness is beneficial given its positive association with improved psychological and physical health. In our view, the two key resources for everyday life captured in the Ottawa Charter definition of health are *fitness* and *resilience*, discussed below.

3.1 Fitness

Fitness can be defined broadly as *the capability of an individual (or group) to perform required tasks, functions or missions within a given domain (physical, mental, or spiritual) on a spectrum ranging from poor to optimal performance*. In common usage, fitness describes our ability to perform physical tasks. However, it is also used in other domains, such as law, where it describes an individual's mental or intellectual capacity to stand trial – *fit for trial*. In aviation, *fit to fly* describes an individual's physical and mental capacity to perform the function of operating an aircraft free from physical or cognitive impairment.⁷ All of these applications of the concept of fitness share the core notion that fitness is the ability to perform some set of tasks or functions, whether they are biological/biomechanical functions as in the case of health related fitness, or work-related functions as in the case of operational fitness. As such, they are aligned with the general definition of fitness we have adopted for the THW SF.

Although fitness assessments, such as the FORCE Fitness Profile, establish thresholds to determine whether someone can perform the required tasks or functions, fitness is not an all or nothing concept. Fitness comes in degrees, with some individuals being 'more fit' than others. This broad approach coheres with Antonovsky's⁸ expanded view of health, such that fitness can be conceptualized as a continuum, ranging from poor to optimal levels.

3.2 Resilience

The concept of resilience is also aligned with the Ottawa Charter of Health Promotion definition of health and constitutes an important instance of health as a resource for everyday life. In short, resilience is a key component of health that enables us to cope with life stressors in positive ways. In the interest of accommodating a variety of applications across the dimensions addressed in the THW SF, we have adopted the following general definition: resilience is "*the sum total of dynamic psychological processes that permit individuals to maintain or return to previous levels of well-being and functioning in response to adversity*" (see Sudom and Lee⁹).

Building and maintaining a resilient workforce helps sustain operations in stressful working environments. Stressors can be multitudinous in the workplace and may include: workload, time pressure, incivility, bullying, harassment, and even sexual assault. For CAF members additional stressors may include separation from family, and trauma experienced as a result of witnessing or taking part in violent activities during deployed operations. Research has shown that not everyone responds to stressors in the same way.³ Certain personality characteristics are associated with one's ability to remain resilient in the face of stressors. For example, positive personal characteristics associated with resilience include conscientiousness, emotional stability, mastery, and positive social interactions.³ Therefore, selecting for these characteristics as well as providing resources and training to support personnel will help sustain an environment that fosters a positive psychosocial workplace. While the focus of much research is on psychological (mental) resilience, the THW SF will include applications of the resilience concept to physical, mental, and spiritual dimensions of the THW SF.

4.0 DIMENSIONS OF HEALTH

The THW SF recognizes that whereas personal health is impacted by psychosocial and physical aspects of an individual's work environment, work can also be affected by aspects of an individual's personal life. Thus, a comprehensive approach to health demands attending to the various determinants across both work and personal dimensions of health. Figure 3-0, below, provides a representation of health dimensions associated with work life (on the left), personal life (on the right) and the individual (in the centre) – comprised of physical, mental and ethical/spiritual dimensions



Figure 3-0: Total Health and Wellness Dimensions.

4.1 Workplace

The work environment, represented in green in Figure 3-0 consists of psychosocial and physical dimensions with underlying determinants that impact health. Psychosocial determinants consist of the social aspects of the work environment that affect feelings, attitudes, and behaviours (e.g., work load, job stress, co-worker relationships, leadership, perceived organizational support, etc.). The physical environment captures those physical determinants typically related to occupational health and safety (e.g., adhering to safety standards, identification of hazards in the workplace, safety education, etc.) as well as infrastructure supports, such as the availability of gyms, walking paths, healthy food choices, spaces to socialize/meet, etc.

4.1.1 Psychosocial Work Environment

Psychosocial factors at work include aspects of the design and management of work, and the social and organizational contexts that have the potential to influence (positively or negatively) an employee's well-being.¹⁰ Most people can relate to the impact interpersonal relationships at work (e.g., co-workers, leaders) have on shaping the workplace environment (e.g., climate). There is a great deal of research on the effects of social dynamics (e.g., cohesion, team psychological safety, incivility, leadership, culture, etc.) in the workplace on employee satisfaction and productivity. More specifically, job characteristics such as skill variety, task identity and task significance, enhance meaningfulness of work and contribute to positive organizational outcomes such as performance, and reduced turnover and absenteeism.¹¹ Employees who perceive their work as meaningful are more likely to be engaged in their work and have feelings of self-worth.¹² Moreover, feeling a great sense of purpose (e.g., a calling) in one's work is associated with positive affect, well-being, health satisfaction, life satisfaction, job satisfaction, desire for challenge, engagement, and organizational affective commitment.^{13,14}

Within the domain of the psychosocial work environment there are a number of underlying determinants that affect health, wellness and productivity in the workplace. The *Unit Morale Profile V2.0 Model of Psychological Health and Safety in the Workplace* developed by military and civilian researchers within Director General Military Personnel Research and Analysis (DGMPRA) provides a conceptual representation (see Figure 3-2) of the relationship between positive workplace factors (i.e., resources such as role clarity, job competence, and organizational support), negative factors (i.e., demands such as workload, and job stress), and indicators of individual well-being in the workplace (i.e., outcomes such as morale, and job burnout). This conceptual model is grounded in Canada's *National Standard for Psychological Health and Safety in the Workplace*⁵ and is the foundation of the Defence Workplace Well-being Survey (DWWS).

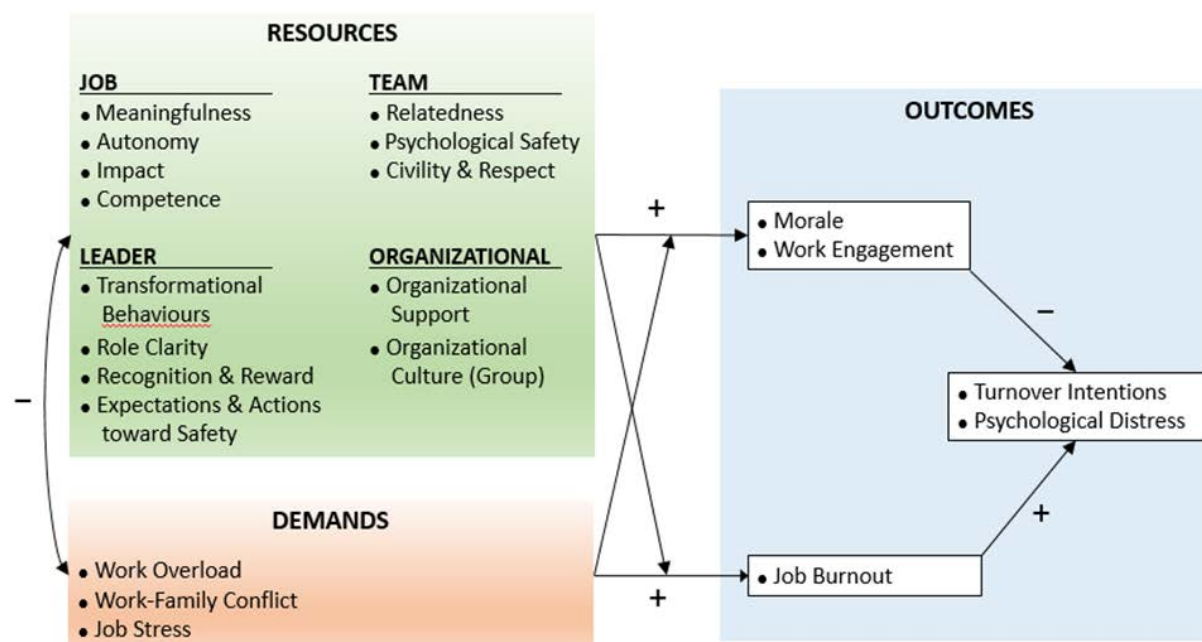


Figure 3-2: UMP v2.0 Model of Psychological Health and Safety in the Workplace.^a

4.1.2 Physical Work Environment

The physical work environment consists of the material (or tangible) workplace elements that constitute the physical workplace conditions of employees/members including but not limited to the physical components of the building and workspace. Aspects to consider are: whether or not the workspace environment is controlled or uncontrolled (e.g., heated/air conditioned); work stations (e.g., ergonomic design for desk tops, confined spaces of vehicles, ships, and aircraft); workshops (e.g., safety systems and protocols for use of tools, machines, and equipment); air and water quality; and biological contaminants and hazardous substances or energy (e.g., in the presence of radiation, ammunition, etc.). The components of the physical work environment related to hazards and risks fall under the auspices of occupational health and safety in the workplace. The physical environment also consists of positive supports that, beyond avoidance of risk and safety issues, provide a net benefit to the health and wellness of members of the Defence Team. These include the design of physical spaces, such as gyms, meeting/social spaces, and cafeterias, to provide opportunities for activity, socializing and healthy eating. Many of these items are considered in the CAF Physical Performance Strategy. The design of the physical environment also includes aesthetic choices such as the presence of natural light, artwork, and landscaping to improve the enjoyment and use of those spaces. Design choices, such as ergonomic design of work stations, are focused more on the improvement of productivity and worker satisfaction than on addressing safety issues. Modifications to the physical environment to improve health and wellness outcomes should include both harm avoidance/reduction measures as well as changes that support improvements to physical and psychological performance.

^a Adopted from Ivey, G.W., Blanc, J-R.S., Michaud, K., & Dobrev-Martinova.¹⁵

4.2 Personal Life

Personal life, represented in orange in Figure 3-0 above, consists of family, social/cultural, financial, and physical environment with underlying determinants that impact health. The family dimension refers to persons intimately involved in one's life, such as co-habitual partners, dependants, extended family, in-laws, and/or close friends who are perceived as family. The social/cultural dimension captures larger social circles that individuals participate in such as community and special interest groups, sporting and cultural groups, etc. The financial dimension refers to one's financial life, including financial literacy, financial management ability, and personal net worth. The physical environment dimension refers to the type and quality of housing one lives in (rents, owns, lives in military quarters, etc.) and the quality of the neighbourhood (gated community, remote region, or city centre) that determines one's level of safety, security and access to essential community services such as police, fire stations, hospitals, and medical clinics. Other important amenities impacting the quality of one's neighbourhood can include schools, sport and recreation facilities, banks and shopping centres.

4.2.1 Family

Aspects of one's personal life can serve a supportive or hindering function to total health and wellness. In times of crisis, family, friends, and community can often be critical sources of support, providing a buffering effect that enables individuals to function well, despite major stressors in their lives. On the other hand, personal issues, such as poor health, marital discord, and demands of dependants can be significant stressors impacting psychological health¹⁶, and productivity at work.¹⁷ Finally, workplace stressors can spill over into one's personal life, causing work-family conflict.¹⁸ Being preoccupied with stressors, whether originating in the home or in the workplace, can contribute to sleep loss and fatigue - both associated with cognitive errors which, in turn, are associated with accidents at work.^{19,20}

Resilient families contribute to the success of the employee/member, the mission, and the organization as a whole.²¹ Family resilience and successful adaptation to stressors involves family participation in celebrations, routines, traditions, financial management, and social support networks.²¹ However, family resilience is also dynamic and can be expected to evolve across life stages in response to different stressors and available supports.

The demands of military life present unique challenges to military families. Frequent relocations can be stressful for families managing the complex tasks of setting up new accommodations in a different region, accessing necessary services (e.g., childcare and healthcare, seeking new employment opportunities for spouses/partners, and re-building new social networks). Separations during deployments also present unique challenges, with the risk of injury (physical, psychological or moral) or death to the partner/parent. The stresses of military life, left unmanaged, can increase relationship problems with spouses, partners, children and friends.

4.2.2 Social/Cultural

Developing social networks and having a diverse set of relationships can have a positive impact on health and wellness. Physical recreation activities in the community, for example, can contribute to health and wellness through improved fitness and socialization outside of the workplace. At work, social relationships can have both positive and negative impacts on morale and productivity.²² For example, an obnoxious employee may disturb concentration of other co-workers, thereby hindering productivity, whereas a polite and conscientious employee may contribute a more productive and socially pleasant work environment. Lack of social support can result in loneliness and research suggests loneliness and social isolation may be a greater public health threat than obesity.²³ For many years, science has revealed the importance of social relationships both at work and in our personal lives. For example relatedness (social connectedness or belonging) is one of three basic psychological

needs required for optimal well-being and positive motivation, as explained by Self-Determination Theory (SDT).²⁴

4.2.3 Financial

The financially literate have confidence and knowledge to efficiently manage their financial assets, and the financially responsible do so by budgeting and planning for the future in accordance with their personal priorities. However, not everyone who is financially literate, is financially responsible. Having knowledge is not sufficient to motivate people to do what they know is prudent and the same can be said for health. For example, people engage in maladaptive behaviours such as smoking (or accumulating consumer debt), despite knowing the negative consequences of doing so. Further, despite one's best efforts, sometimes situations arise that are difficult to control and hard to plan for (e.g., serious illness, divorce), and may contribute to significant financial strain.

Statistics Canada reported that among the employed population in Canada aged 20-64, who participated in the General Social Survey (GSS), the largest life stressors were work (64%) followed by finances (12%).²⁵ Financial problems can have severe consequences for families and are a source of marital instability and dissolution.²⁶ If the general population has problems with work and financial stress, members of the Defence Team may have similar concerns. Moreover, CAF members have unique financial needs, as they must incorporate posting cycles into their financial planning. For those military members who experience financial difficulties, the Service Income Security Insurance Plan (SISIP) provides many services to help, including financial counselling, management and education, term life insurance plans, long term disability, travel insurance, term life insurance, CAF savings plans, and a CAF group retirement savings plan.²⁷

4.2.4 Physical Home Environment

The physical environment related to one's personal life may be dictated by choice or necessity, depending on one's personal financial situation. Geographically, the cost of owning a home can vary significantly from province to province. These provincial differences have implications for CAF members who relocate during the annual posting season (APS) and must decide whether to buy or rent. When considering where to live, one must consider a number of factors that may affect quality of life, and even personal safety and security. Some considerations should include spousal job opportunities, crime rates in the area, proximity to essential services, such as police and emergency health care, as well as proximity to schools, recreation facilities, community services, financial institutions and shopping centres. For many, childcare requirements are essential to consider since cost and availability can vary significantly from place to place. Being physically located close to amenities and services can result in less commuting time, but may also result in higher living costs. Ultimately, individuals must balance personal priorities and make choices with respect to physical environmental needs (shelter) that will impact personal security, quality of life, and cost of living.

4.3 Individual

The individual dimensions are depicted in the centre of Figure 3-0 straddling dimensions in both the personal and work environment to make clear that both work and personal factors affect an individual's physical, mental, and ethical/spiritual health.

4.3.1 Physical

In general terms, the physical domain of the personal dimension refers to those factors relating to the functioning

of an individual's physical body. Traditional medical indices of physical health include the functioning of various bodily systems (e.g., cardiovascular, respiratory, digestive, immune system, muscular, renal etc.). From a fitness perspective, bodily system functioning can be understood in terms of concepts like cardiovascular endurance, muscular strength and endurance, flexibility and body composition, as they relate to general health and wellness.²⁸

Overall physical health is a complex phenomenon that has genetic, environmental, psychophysiological, and behavioural components. At any given point in time, an individual's physical health is the result of the interaction of these components over time. Though subject to epigenetic factors, genetic traits are considered reasonably stable characteristics, whereas environmental psychophysiological, and behavioural factors are more susceptible to change, and therefore are a better focus for interventions to improve physical health outcomes. Psychophysiological factors can be managed through stress reduction techniques, such as those taught in *Strengthening the Forces* workshops. More acute cases (e.g., hypertension) may need to be treated through Canadian Forces Health Services (CF H Svcs) for CAF members and through provincial health care systems for DND employees. Lastly, the behavioural component requires that individuals stay motivated to eat healthy, exercise regularly, and refrain from unhealthy behaviours. To encourage healthy behaviours, the CAF developed *The Physical Performance Strategy* that identifies four contributing factors to overall physical health and wellness: 1) physical activity; 2) injury reduction; 3) nutrition; and 4) sleep hygiene.

Though genetics plays a role in determining one's risks for some diseases, proper nutrition and fitness can increase quality of life and extend life expectancy by enhancing the immune system, thereby improving resilience and the ability to repel illness and disease. There are many benefits of regular exercise, and research evidence demonstrates that physical fitness prolongs life, contributes to positive mental health, and serves a protective role against the most common killers: cancer, heart disease and stroke.²⁹ A physically healthy Defence Team is vitally important to its ability to productively carry out its work. This need is even more pronounced for CAF members, as physical health is essential to the maintenance of a readily deployable force. Medical fitness to deploy and the *FORCE Fitness Profile* help define in practical terms the physical health standards required for a ready force. Canadian Forces Health Services provide a full spectrum of high-quality health care to ensure CAF members are medically fit to deploy. Modern fitness facilities, fitness coaching, and fitness education provided through Personnel Support Programs (PSP), play an equally important role in motivating CAF members to maintain the high levels of fitness and health required for optimal performance in garrison and on operations.

4.3.2 Mental

The mental dimension, broadly understood, consists of cognitive (i.e., thinking, intellect, sensorimotor, language, etc.), affective (emotional) and behavioural sub-domains. All of these domains are implicated in mental health in a variety of ways. Mental health is similar to physical health in complexity in that it involves genetic, environmental, psychophysiological and behavioural components. In cases of genetic predispositions to mental disorders, a combination of monitoring, preventative behavioural change and treatment can help address disease onset and manage symptoms. For example, Cognitive Behavioural Therapy combats mental health issues by targeting patterns of thinking, feeling and behaving (e.g., negative thoughts, negative feelings, and maladaptive behaviours that can contribute to depression).³⁰ The environment can impact mental health through both physical and psychosocial factors. For example, lighting in the physical environment may contribute to or reduce Seasonal Affective Disorder³¹, whereas, trust among co-workers, an aspect of the psychosocial work environment, may contribute to positive mental health. Promotion of mental health initiatives helps support a stigma-free environment, thereby reducing barriers to care.

For the most part, enabling individuals to cope positively with the challenges of daily life can lead to good

mental health. However, chronic or acute stressors exacerbated by distorted thought processes (e.g., pervasive negative thoughts) or maladaptive coping mechanisms (e.g., such as reliance on drugs or alcohol) might give rise to mental illness that can take the form of anger, anxiety, depression, panic disorder, obsessive compulsive disorder, or bipolar disorder.³² To reduce stress and prevent mental illness, the PSP *Strengthening the Forces* workshops are offered to CAF members and their families, as well as to DND employees when space and resources permit, and contribute to positive mental health by encouraging healthy behaviours.

Health Canada estimates that 20% of individuals will experience a mental illness in their lifetime, and the remaining 80% will be affected by the mental illness of someone they know.³³ The CAF developed the Mental Health Continuum Model (see Figure 3-3-2) to explain the temporal nature of mental health that fluctuates depending on one's ability to cope with life's stressors at any given time. The model demonstrates bidirectional movement symbolizing the constant potential to move from one end of the spectrum to another. The Mental Health Continuum Model is part of an education program designed to reduce stigma surrounding mental illness, called the Road to Mental Readiness (R2MR) and is delivered to both CAF members and their families at various times throughout a member's career, such as during basic training, before deployment, and during the reintegration process (i.e., third location decompression).

The importance of mental health in the workplace is emphasized by the Government of Canada in its direction for all government departments to implement the *National Standard* for Psychological Health and Safety in the Workplace and the Federal Public Service Workplace Mental Health Strategy, the latter having three strategic goals: 1) changing culture to be respectful to the mental health of all colleagues; 2) building capacity with tools and resources for employees at all levels; and 3) measuring and reporting on actions.

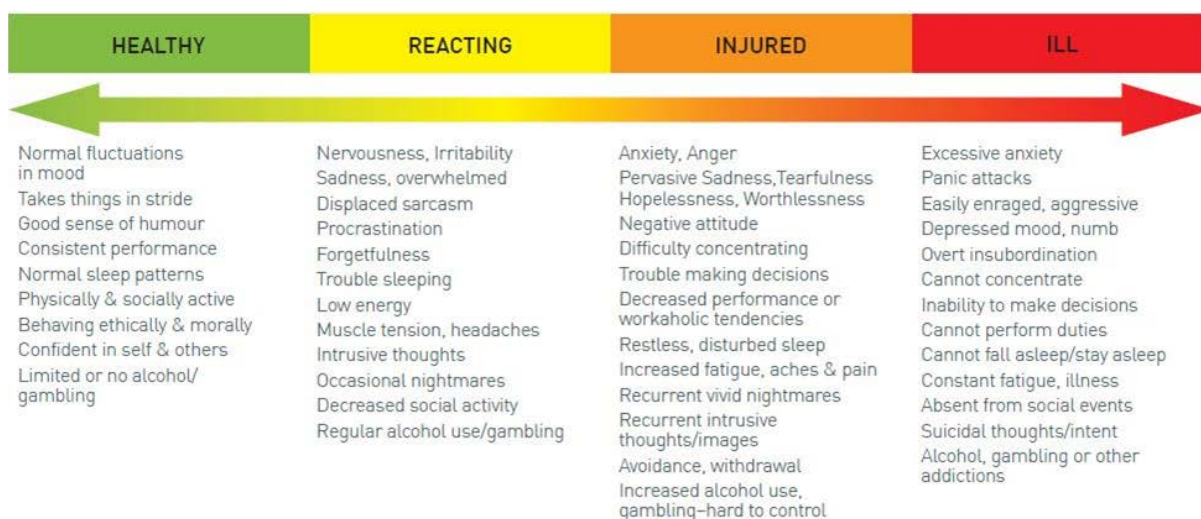


Figure 3-3-2: Canadian Armed Forces Mental Health Continuum Model.

4.3.3 Ethical/Spiritual

Ethics refers, in part, to the set of moral beliefs (the 'right' and the 'good') and assumptions held by an

individual or group that govern our behaviour.³⁴ A key feature of the practice of personal ethics is the process of exploring the foundations and justifications of moral beliefs: ethical awareness – which implies reasoned reflection.³⁵ Ethical readiness and wellness thus involve a learned skill or capacity for such awareness, which can be enhanced by support (such as education) within one's institutional and professional setting, in order to understand both the unique, necessary ethical context of the institution, and the character of ethics in general. Ethical reflection should inform one's morality. Given the necessary and difficult moral choices and experiences sometimes confronted in life (especially work in support of the profession of arms), ongoing ethical reflection is one more vital support to morale and spiritual wellness, and to coping with morally difficult experiences. The promotion of ethical readiness and wellness through training and education is necessary to reduce the risks of moral injury and support ongoing ethical development of the Defence Team.

Spirituality is, for many, aligned with traditional religious traditions, but a growing number of individuals identify as holding spiritual beliefs and values without being religious.³⁶ The question of meaning or life purpose is central to our self-identity. This holds true both for those who have traditional religious beliefs and those who hold non-religious or more philosophical perspectives. One's beliefs are an important factor that shapes how individuals face existential issues and other challenges of life (e.g., major life transitions such as career change, personal loss etc.). For example, one's ability to derive meaning from stressful life events is associated with reduced PTSD symptoms, depressive symptoms, suicide ideation, and suicide attempts.³⁷ Perceiving meaningfulness in life is associated with reduced symptoms of PTSD.³⁸ Other research has demonstrated that having a sense of purpose in life and feeling satisfied with life both serve as protective factors against suicidal ideation.³⁹ Furthermore, having purpose in life is associated with reduced incidences of suicide ideation for those who also suffer from depression.⁴⁰

The phenomenon of moral injury provides an important lens on the key features of the ethical/spiritual dimension of health and wellness. When there is incongruence between an individual's actions and their beliefs about how they ought to behave, either from their own perspective or based on how it may be perceived by others, it may lead to feelings of shame or guilt, when their behaviour is judged to be outside of ethical norms. For example, people are said to experience moral injury when they feel shame, guilt, or anger as a result of witnessing atrocities or taking part in them and can manifest in many ways including lack of interest in social activities or questioning of moral or spiritual beliefs. Litz and colleagues explain, that for a moral injury to occur, it requires, "an act of transgression that severely and abruptly contradicts an individual's personal or shared expectation about the rules or the code of conduct, either during the event or at some point afterwards."^{41(p700)} Examples of transgressions include violence or other inhumane acts that cause suffering or death.⁴²

Those who have difficulty finding meaning after traumatic or stressful experiences may seek mental health services to restore or reconcile thoughts and beliefs. Those who suffer from moral injury may struggle with ethical conflicts, guilt, self-condemnation, lack of purpose, and struggles with spirituality. Consequently, a *Spiritually Oriented Cognitive Processing* therapy has been suggested as a potential treatment for those with inner conflict related to spiritual or religious beliefs.⁴³ The Royal Canadian Chaplain Service's Spiritual Wellness Strategy, *Called to Serve 2.0*, defines the concepts of spiritual resiliency and spiritual fitness and identifies seven key indicators of spiritual fitness: 1) engaging in life's meaning/purpose; 2) integrating morals, values, beliefs; 3) being hopeful; 4) forgiving others; 5) respecting diversity; 6) cultivating relationships; and 7) connecting to personal beliefs.

5.0 SPECTRUM OF INTERVENTIONS

In addition to ensuring coverage of the core dimensions of total health and wellness, another foundational

element of the THW SF is the belief that maximizing the improvement of health and wellness outcomes requires the development of programming that targets the full spectrum of interventions: assessment, promotion, empowerment and prevention, and care and support.

5.1 Assessment

In the context of total health and wellness, assessment activities are focused on the systematic evaluation of a variety of health and wellness status indicators across the work and personal dimensions of health and wellness. The aim of assessment is to identify needs and opportunities for health and wellness improvement for individuals and for specific groups (e.g., deployed CAF members), and to support the development of strategies and interventions to improve health and wellness outcomes. Assessment activities are not limited to individual assessment/diagnostic tools and should include monitoring relevant organizational records such as usage of sick leave, disability and injury rates, organizational assessments, evaluation of the care and support system, and its impact on the performance of the organization as a whole.

5.2 Promotion, Empowerment and Prevention

Addressing the root causes of poor health can improve health and wellness outcomes and prevent illness before it happens (e.g., preventative medicine). This broader definition of health promotion includes communication campaigns and education and training programs directed at improving awareness and understanding such as those offered by Health Promotion's *Strengthening the Forces* workshops. However, it also includes prevention activities and programs aimed more directly at addressing the root causes (personal, psychosocial and physical) of health and wellness issues.

5.3 Care and Support

Although it is always preferable to prevent health and wellness issues before they emerge, even with the most concerted health promotion efforts there is always a need for care and support. Across the Defence Team a range of care and support services that span the dimensions of total health and wellness are available to military members, their families and civilian employees. The care and support available to an individual does, however, depend on the entitlements of the individual as defined by their need, employment status, and relevant legislative and policy direction. Some examples of the resources available include medical care from the CAF Health Services for CAF members. It also includes services provided to members and their families through Chaplain and Morale and Welfare services (e.g., Financial Services and Military Family Support Services). Civilian employees rely on provincial medical care systems, and have access to the Employee Assistance Program (EAP) and Office of Disability Management.

6.0 SPHERES OF INFLUENCE

Supporting behaviour change toward the adoption of healthier lifestyles and creating a health oriented workplace environment and culture is a shared responsibility. The THW SF targets all levels of the organization, with members/employees at the core, and all other spheres of influence supporting members/employees and the work they do for the organization. Canada's Defence Policy – *Strong, Secure, Engaged* (SSE) – echoes this sentiment with people at the top of the agenda.

Individual health and wellness outcomes are affected by a myriad of influences inside and outside of the workplace. These factors can stem from employee personal issues/co-worker interpersonal relationships,

leadership style, job design, executive decisions, organizational systems, processes and procedures, and influences external to the organization. Figure 5-0 (below) provides a representation of the main spheres of influence affecting the workplace. Each of these spheres of influence has a unique role that can impact employee health and wellness, as well as organizational effectiveness and productivity. The dotted line between Member/Employee represents the various intermediaries including unions and bargaining agents, the Integrated Complaint and Conflict Management (IC2M), etc. The line is dotted to indicate that these intermediaries are not a barrier to member/employee and leader/manager relations, but an enabler in developing positive working relationships. The remaining spheres of influence aim to support positive decisions by creating a supportive work environment.

6.1 Members/Employees

Military members' and civilian employees' health and productivity at work is affected by the workplace physical environment (e.g., air quality, lighting, ergonomics), psychosocial environment (e.g., job stress, co-worker relationships, work-family conflict), as well as personal factors. Personal factors vary widely and can range from one's genetic disposition, disabilities, lifestyle choices (e.g., nutrition, physical activity), to social relationships and activities with family and friends. Individual employees ultimately have the greatest control over their personal health, through the choices they make and the lifestyle they adopt. The importance of individuals' choices to engage in a healthy lifestyle cannot be overstated. The concept of *Health Leadership* intends to capture the idea that, when it comes to health, individuals' behaviours and the resultant influence on their co-workers are as important as organizational leadership. Every individual in the organization, regardless of rank or role, can also lead by example through their choices and behaviours. Research demonstrates that co-workers play an important role in influencing perceptions, attitudes and behaviours of work colleagues.⁴⁴ The THW SF aims to capitalize on these concepts to transform workplace culture by encouraging Defence Team members to be *Health Leaders* by modelling and promoting healthy behaviours.

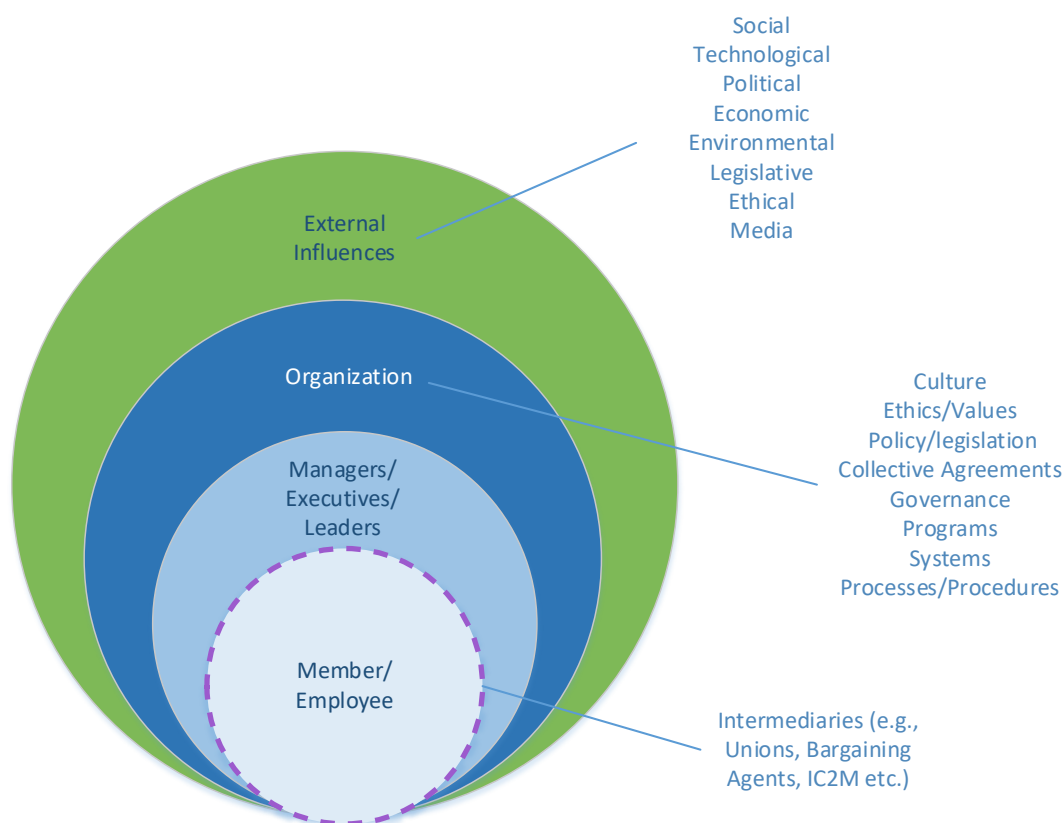


Figure 5-0: Spheres of Influence in the Workplace.

6.2 Managers/Executives/Leaders

Leaders play a central role in shaping the behaviour of their subordinates and they contribute a great deal to the quality of the workplace environment through their management style, role-modelling, coaching, and their capacity to inspire employees/members in the workplace.⁴⁵ The example they provide, the expectations they set, and the work conditions (e.g., workload management and team dynamics) they create are important components of the psychosocial health and wellness in the workplace. Beyond managing workloads through task assignment and deadline setting, leaders are in the unique position to ensure employees/members are motivated, and engaged with meaningful work. Important in this regard is the leader's ability to provide clear direction and entrust various levels of autonomy, authority and responsibility to their employees. In doing so, they ought to consider the needs and individual capabilities of each employee when assigning tasks in order to best manage available resources to meet the needs of the organization.

6.3 Organizations

Organizations can be complex and include systems, processes, procedures and policies that impact employees in the performance of their jobs. Examples of systems are Human Resources (HR) and Information Technology (IT). The HR system impacts pay, rank progression/promotion, compensation, benefits, and incentives, directly impacting quality of life, and therefore employee perceptions of organizational support which, in turn, contributes to employee motivation, engagement, and commitment.⁴⁶ IT systems impact security and efficiency

of the organization and can help or hinder the work of employees. Programs should be formulated based on scientific evidence, industry standards, and inputs from subject matter experts, and must align with the organization's strategic vision. Policies and procedures, also in line with the strategic vision, help guide and influence employee behaviour. Organizations also need grievance systems and performance evaluation systems to hold employees and leaders accountable, so when issues of unfairness or lack of transparency are brought forward, both employees and leaders can have confidence and trust in the measures put in place to protect them and the work they do. Governance includes oversight of programs and systems through their validation and adherence to mission, ethics, and values.

6.4 External Influences

In a broader context, external political, legislative, social, cultural, ethical and economic influences, among others, impact organizations. External events, such as war and natural disasters can affect national priorities that shape the focus of organizations' mandates. The Government of Canada policy framework and governance structures take these external factors and immediate priorities into account when providing direction to the Defence Team.

7.0 WELLNESS

As laid out previously, the concepts of health, wellness, and well-being historically have not been clearly defined and there is no consistently agreed upon usage in the research literature. The wellness literature, in particular, reveals enormous variance and inconsistency in the way it is defined and applied in practical contexts. The concept of wellness was developed as a result of dissatisfaction with the medical/clinical understanding of health as merely the absence of disease. There was recognition that either the concept of health or an alternative concept needed articulating to capture features outside of the strict health-illness dichotomy. Dunn⁴⁷, credited as the originator of the modern wellness movement, described wellness as a dynamic notion involving the integrated and balanced functioning of physical, mental and spiritual factors, with the aim of maximizing individual potential. This more holistic and dynamic concept is an important departure from previous clinical view of health which was characterized as a passive state—merely being free from illness.

Antonovsky⁸ (as cited in Harari, Waehler and Rogers⁴⁸) expanded this view, conceptualizing health as a continuum, rather than as a simple dichotomy, with disease at the lower end and wellness at the upper end of the continuum. Movement along the continuum is the result of positive factors (e.g., sleep, nutrition, etc.) that contribute to improved health outcomes.⁴⁸ This approach defines wellness as a multidimensional and synergistic construct associated with a positive state oriented towards maximizing individual potential. It goes beyond the clinical focus on specific pathologies by including positive factors that contribute to enhanced functioning. Across the wellness literature there is consistency between models and definitions. As Roscoe⁴⁹ points out in her literature review on the topic, there are five common features of wellness definitions: 1) wellness is not merely the absence of illness, as outlined in the WHO definition of health; 2) wellness is a synergistic concept, involving the dynamical integration of a complex set of factors, the sum of which is greater than the parts; 3) wellness depends on the maintenance of balance or dynamical equilibrium across all dimensions; 4) wellness is the positive end of a continuum, with disease on the lower end; and 5) improved wellness involves movement towards higher levels of functioning and improved health outcomes that are partially dependent on individual responsibility and motivation.

8.0 WELL-BEING

To avoid confusion with the definitions of health and wellness offered above, we have opted to refer to well-being in the psychological tradition, explained by Hattie, Myers and Sweeney⁵⁰, as one's subjective evaluation of life satisfaction. Seligman⁵¹ added that well-being is a positive condition of existence characterized, in part, by positive emotion, engagement, meaning, identity (sense of self), positive relationships and accomplishment, from the perspective of the individual. How individuals perceive their own health and wellness is as important as objective indices of the same. Further, the concept of well-being lends itself more closely to a psychological perspective than other health and wellness definitions. Consistent with this approach, Diener⁵² suggests that any theoretical definition of well-being should include three components: it should 1) be subjective, capturing the individual's perspective/assessment of their state of being; 2) focus on positive indices of an individual's sentiments regarding their life; and 3) be a global assessment, encompassing all facets of an individual's life. In contrast with health and wellness, well-being is fundamentally a subjective judgement of how one's life is going.

9.0 WHAT IS TOTAL HEALTH AND WELLNESS?

The total health and wellness approach recognizes that a complex set of factors impact personal health. There are three core elements that define what it means to take a total approach to health and wellness. First, the development of health planning and interventions need to consider all the dimensions to health and wellness: psychosocial workplace, physical workplace, and personal factors.⁵³ Second, developing a comprehensive approach to health and wellness is a collective responsibility across the entire institution and must include the full spectrum of interventions from assessment, promotion, and prevention, to care and support. Finally, effective interventions need to take a holistic approach that targets all the main spheres of influence inside of the institution (the employee, intermediaries, executive leadership and managers, organizations and their systems, and external influences), where possible, to improve health and wellness outcomes.

The concept of Total Health and Wellness in the workplace is 1) complex because it considers elements of the workplace influenced by the organization, such as the physical working conditions (e.g., buildings, equipment, etc.) and psychosocial factors (e.g., workload, job stress, leadership, culture, etc.), and it includes individual factors, such as mental, physical, spiritual, social and financial health. Total Health and Wellness is also 2) dynamic because situations, environments and conditions for both the organization and individuals change and evolve over time, requiring constant adaptation. Finally, elements of Total Health and Wellness are often 3) interdependent, such that one factor can impact other factors. For instance, poor air quality in the workplace might affect employee physical health, thereby negatively influencing other factors such as employee engagement, and job stress. Figure 8-0 below displays the total health and wellness dimensions captured within the THW SF, with nine health dimensions contributing to overall wellness.



Figure 8-0: Dimensions of Total Health and Wellness.

10.0 COMMON GUIDING PRINCIPLES

The Defence Team THW SF guiding principles provide direction for the development of the Total Health and Wellness Strategy, anchored in the SF, and consequently for the development of action plans within the different spheres of influence. . These guiding principles have been developed based on best practices and stem from a number of sources, including the Defence Policy: *Strong, Secure, Engaged*, input from stakeholders, and industry best practices for program intervention design and implementation. Participants/stakeholders in the Total Health and Wellness strategy development process are expected to adhere to these guiding principles in their work related to THW SF.

- Maintain Defence Team commitment. We comprise a single Defence Team and, as such, we share a continued commitment to the health and well-being of both DND employees and CAF members, and to the provision of a safe, supportive, and respectful work environment;
- Ensure alignment with relevant GoC policies and strategies. The THW SF is guided by two key documents: Defence Policy: *Strong, Secure, Engaged*, and the Federal Public Service Workplace Mental Health Strategy;
- Account for differences between CAF members' and DND employees' requirements and obligations. While respecting differences (e.g., unlimited liability, and Bona Fide Occupational Requirements for CAF members), the THW SF should look for opportunities to align programs and services for the benefit of all Defence Team members, where practicable;
- Utilize a comprehensive analysis. THW SF requires a comprehensive approach. Efforts should span the entire spectrum of interventions, across all dimensions in the THW SF and, to the extent possible, leverage all spheres of influence across the organization. This can be accomplished by:
 - Using evidence-based approach to decision making. Where possible empirical evidence should be used to inform the development of policies, plans, programming, budgeting, implementation, operations, evaluation and management;
 - Utilizing Gender Based Analysis+. GBA+ will be used throughout the planning lifecycle from needs analysis to program evaluation;
 - Seeking out best practices from subject matter experts. Strategic planning, design and implementation of THW SF strategies and initiatives should, where possible, be founded on

evidence-based best practices;

- Engaging stakeholders. Promote member/employee participation in the design process to ensure comprehensiveness, discussion, and buy-in;
 - Engaging unions. Unions are key stakeholders, and their contribution and support is critical in the development and implementation process; and
 - Recognizing the importance of family to well-being. The well-being of the family is key to the well-being of the Defence Team and their needs should be considered in all stages of analysis.
- Leverage and align existing strategies, policies and initiatives. The Defence Team already has a large number of health and wellness strategies and initiatives that are delivering on the health requirements of Defence Team members. The Defence Team strategies and initiatives should be aligned, consistent with THW SF and coordinated to ensure such efforts are mutually supportive and address gaps wherever they are identified;
 - Incorporate flexibility into strategies and initiatives. The design of THW strategies and initiatives will need to take into account the comprehensive health determinants outlined in the THW SF from a systemic perspective. However, each individual will have unique and specific requirements that will influence one's health and wellness. As such, there is no one solution that will fit everyone, and the strategy must be flexible and agile enough to meet the needs of a diverse Defence Team;
 - Engage and enable leadership at all levels. Leadership commitment is one of the most important conditions for success. Leaders must model behaviours that demonstrate concern for the wellness of members of the Defence Team and work to create strong support networks that promote a culture of health and wellness;
 - Emphasize resilience as a core component of health. Selection of resilient personnel, and improving resilience of Defence Team members through training and services offered to them will ensure efforts continue to foster resilience;
 - Promote health and wellness as a shared responsibility. Individual health and wellness is a shared responsibility. Whereas the THW SF places an emphasis on leadership and organizational responsibility to improve services and promote a healthy workplace environment, it also recognizes the responsibility of individuals to behave in a healthy and respectful manner and to contribute positively to their environment, while taking responsibility for their own personal unique health and wellness needs;
 - Remove obstacles to health practices. The organization must create an environment free from obstacles to positive health practices. Leaders can help by ensuring they support and encourage the use of services and training that support health and wellness; and
 - Take a continuous improvement approach. The development and review of existing THW strategies and action plans will identify the desired total health and wellness outcomes within each domain of the THW SF. Performance measures embedded in an ongoing monitoring and evaluation based management system, like that envisioned by the National Standard, will inform improvements to identified total health and wellness outcomes.

10.0 CONCLUSION

This paper described the recently developed Defence Team THW SF, its purpose and components, as well as its role as a holistic framework for guiding specific health and wellness-focused action plans and interventions. The THW SF recognizes that the health and wellness of an individual is impacted by the psychosocial and physical aspects of their work environment and also by dimensions and events in their personal life. It also recognizes that

at times these dimensions may compete for the resources and attention of the individual. Therefore, it is important to maintain a holistic view of total health and wellness in order to make informed decisions and manage competing demands.

The THW SF extends this holistic view of health and wellness to the whole Defence Team, comprising CAF serving members and DND civilian employees. It provides the necessary overarching architecture to advance common health and wellness goals, and create opportunities to leverage existing resources and action in an integrated and coordinated manner. The strategic view of total health and wellness captured in the Defence Team THW SF, along with the identified spheres of influence and common guiding principles, provide the structure and space for specific, tactical level action through which leaders could drive positive health and wellness outcomes.

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Assessment-to-Solutions Approach to Psychological Health and Safety in Defence

Cindy Suurd Ralph, LCol, Tzvetanka Dobрева-Martinova and Gary Ivey

Director General Military Personnel Research and Analysis
Department of National Defence
CANADA

Cindy.SuurdRalph@forces.gc.ca

Tzvetanka.Dobрева-Martinova@forces.gc.ca

Gary.Ivey@forces.gc.ca

ABSTRACT

We describe an assessment-to-solutions approach to psychological health and safety in Defence, grounded in the Defence Team Total Health and Wellness Strategic Framework. The assessment part of our approach was accomplished through the Defence Workplace Well-being Survey (DWWS), which was administered in spring/summer 2018 to a large sample of Canadian Armed Forces members serving in the Regular Force and Primary Reserve, as well as civilian employees working for the Department of National Defence. The sample was representative of the Defence Team and its three core segments. The main purpose of the DWWS was to establish a baseline for psychological health and safety across Defence and to inform the development of specific and targeted change strategies across organizational levels that support well-being in the workplace and prevent harm. An important component of our assessment-to-solutions approach was engaging stakeholders and key change agents early in the process, prior to survey administration, and soliciting their commitment to the survey and to post-survey action. The solutions aspect of our approach is focused on primary intervention at the group/unit level or higher. It targets the work conditions that provide the psychosocial resources necessary to cope with work demands, foster optimal individual and group functioning, and help prevent foreseeable psychological injury.

1.0 INTRODUCTION

In 2017, the Department of National Defence (DND) and the Canadian Armed Forces (CAF) released *Strong, Secure Engaged – Canada’s Defence Policy*.¹ Strong, Secure, Engaged (SSE), places a focus on personnel. In fact, nearly 25% of SSE initiatives are personnel-related. SSE commits to a comprehensive approach to care referred to as *Total Health and Wellness*, which includes preventative consideration of employees’ psychological and physical health along with commitment to care and treatment.

Indeed, initiatives and policies, such as SSE, reflect a growing body of knowledge that has shown that negative workplace factors (e.g., work overload, poor leadership) are associated with a variety of adverse outcomes, including psychological (e.g., depression, anxiety) and physical disturbances (e.g., cardiovascular disease).²⁻⁴ Similarly, poor employee health (both psychological and physical) accrues costs to the organization in numerous ways, for example, through reduced job performance, increased absenteeism and increased turnover.⁵⁻⁹

1.1 Context: The Total Health and Wellness Strategic Framework

The Total Health and Wellness Strategic Framework¹⁰ was developed to identify and integrate the key dimensions of the *Total Health and Wellness* approach, to which SSE committed. These dimensions are: the physical work environment; the psychosocial work environment; and individual dimensions, including mental, physical, ethical/spiritual, social/familial and financial. The Framework supports the analysis of existing health and wellness programs across these dimensions and ensures alignment between the various lines of effort regarding health and wellness in the joint DND/CAF context, i.e., that the assessment, promotion, prevention and treatment efforts, identified in the Framework, work together to promote well-being for all members of the Defence Team.¹¹ By building a holistic view of health and wellness at the strategic level, the Framework allows leaders to develop and integrate specific tactical level health and wellness initiatives. Overall, leaders are an important enabler to Total Health and Wellness initiatives as organizational leadership has been linked to a wide variety of employee workplace outcomes (e.g., safety, physical health and mental well-being)¹² and also because leaders can influence the workplace conditions that are associated with positive well-being outcomes (i.e., enable primary interventions to improve employees' lives. For a review see Kelloway and Barling¹³).

1.2 The Psychosocial Work Environment

Psychosocial factors in the workplace can include a variety of workplace conditions such as high workload, role stressors and relationships at work.¹⁴ In Canada, the enactment of a *National Standard for Psychological Health and Safety in the Workplace*¹⁵ (referred to herein as the Standard) has offered a framework to help organizations identify, control and eliminate psychosocial hazards that threaten well-being, and to proactively set conditions for psychological health.

Drawing from motivation-hygiene theory¹⁶, self-determination theory¹⁷, positive psychology,¹⁸ and positive organizational scholarship,¹⁹ the Standard highlights thirteen workplace resilience and risk factors that impact mental health.²⁰ The 13 factors include psychological and social support, organizational culture, clear leadership and expectations, civility and respect, psychological competencies and requirements, growth and development, recognition and reward, involvement and influence, workload management, engagement, balance, psychological protection (from violence, bullying, and harassment), and protection of physical safety.^{15,21} To facilitate the interpretation of the Standard in relation to psychological health, Ivey, Blanc, Michaud and Dobrev-Martinova²² applied the Job-Demands Resources^{23,24} framework to the thirteen factors, classifying them as either a job demand or a job resource. Job demands, the physical or emotional stressors at work that deplete employees' mental and physical energy, and may lead to thwarted well-being²⁴ include factors such as workload management and balance. In contrast, job resources are the physical, social and organizational factors that promote goal achievement, stress reduction, growth and well-being.^{24,25} In Ivey et al.'s model,²² these resources include factors such as recognition and reward, civility and respect, and organizational support.^{15,21} Key organizational outcomes (burnout, psychological distress, morale, engagement, and turnover intentions), against which progress could be measured, were also included in Ivey et al.'s model.²²

1.3 The Positive Psychology Approach

Positive psychology highlights that individuals actively respond to their environments whether at work, at home or in the community.¹⁸ Rather than viewing individuals as passive recipients of the stimuli in their environment, this approach sees them as "decision makers, with choices, preferences and the possibility of becoming masterful, efficacious".^{18(p8)} Thus, if our goal is to optimize human functioning in the workplace, we must aim to discover the factors that promote employees' flourishing within their organizations.²⁶ From positive psychology

perspective, complete mental health is conceptualized as a state where individuals feel high levels of positive emotion, rather than the mere absence of mental illness.²⁷

Positive psychology would suggest that we should focus on interventions that increase “the positive experience of work”^{28(p433)} rather than solely focusing on interventions designed to reduce stressors. Some of the resilience factors described in the Standard promote such increases in positivity in the workplace including opportunities for growth and development, social support and recognition and reward.

2.0 THE DEFENCE WORKPLACE WELL-BEING SURVEY

Inspired by the publication of the Standard and adopting a positive psychology approach, military and civilian researchers from Director General Military Personnel Research and Analysis developed the Unit Morale Profile version 2 (UMP v2.0) survey battery to assess the 13 psychosocial risk and resilience factors identified in the Standard,^{15,21} along with the organizational outcomes identified in the Ivey et al.’s model.²² See Figure 1 for the risk and resilience factors and psychosocial outcomes measured in the UMP v2.0. Integrating the 13 factors of the Standard into the job demands-resources framework^{23,25} allows for the survey results to inform specific action, for leveraging external research to inform positive change initiatives, and also for assessing progress and sustainability of workplace well-being over time. The UMP v2.0 was originally administered as a census style survey to a formation or unit, at the Commanding Officer’s (or equivalent) request. Between 2014 and 2018, the UMP v2.0 was administered to over 90 DND/CAF units, with participation from over 16,000 military and civilian personnel.

The growing interest in the UMP v2.0, along with the development of the Total Health and Wellness Strategic dimension of the Total Health and Wellness Strategic Framework,¹⁰ highlighted a pressing need in Defence to



Figure 1: DWWS: Measuring psychological health and safety.

look at workplace well-being more broadly – at the strategic level. Thus, the UMP v2.0 survey battery was adapted for strategic-level assessment and rebranded the Defence Workplace Well-being Survey (DWWS), which was then used to assess the psychosocial workplace dimension of the Total Health and Wellness Strategic Framework¹⁰ and to establish a baseline for psychological health and safety in Defence for future assessments and benchmarking with other organizations.

2.1 DWWS: from Assessment to Solutions

During a visit to the Defence Equal Opportunity Management Institute (DEOMI), the second and third authors were introduced to DEOMI's concept of assessment to solutions,²⁹ used for Defence Organizational Climate Surveys administered to United States military units. The DWWS represented an opportunity to design our own assessment-to-solutions approach, inspired by DEOMI. To develop the DWWS in light of assessment to solutions²⁹ and as part of the Total Health and Wellness Strategic Framework,¹⁰ we used insights gained from organizational interventions research.³⁰⁻³³ In the pre-assessment phase of the DWWS (see also initiation/preparation phase of organizational interventions^{30,33}), we considered the spheres of influence in the Total Health and Wellness Strategic Framework, depicted in Figure 2 below, as well as the key stakeholders and change agents for the workplace psychosocial domain of the framework.

From assessment to solutions in health and wellness

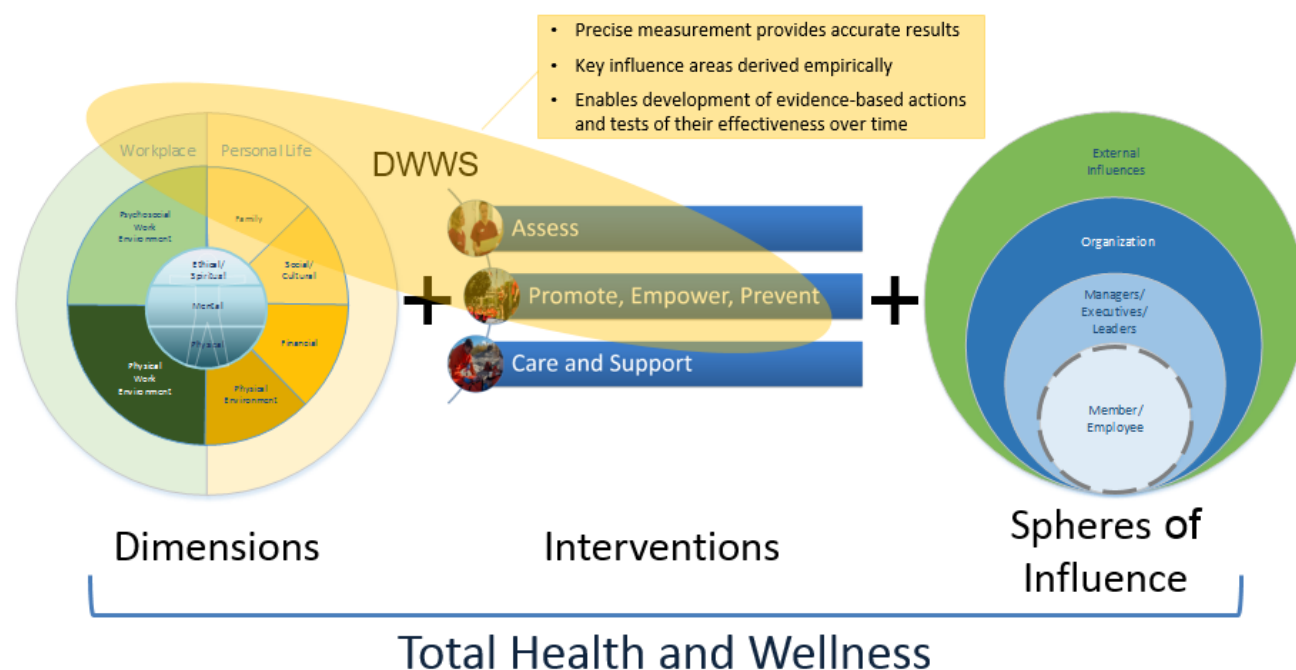


Figure 2: From assessment to solutions in health and wellness.

We consequently developed a complex sampling plan for DWWS that is representative of the Defence Team – specifically, across environments, positions, levels, genders, ranks and status groups (i.e., Regular Force, Primary Reserve and civilian employees). This allowed us to establish an accurate baseline for psychological health and safety across the Defence Team and each segment, and also to provide rigorous empirical evidence for the

solutions component of our assessment-to-solutions approach (see also action planning and implementation phases of organizational interventions^{30,33}) within the respective spheres of influence.

2.2 Stakeholder Engagements

Understanding the critical importance of engaging stakeholders and change agents early in the process and soliciting their commitment to post-survey action to support well-being in the workplace and prevent harm, we began stakeholder consultations for the DWWS eight months prior to survey administration. We obtained endorsement from relevant committees within the DND and the CAF; we sought the support and engagement of Occupational Health and Safety stakeholders including Unions and Bargaining Agents as well as the Total Health and Wellness stakeholders. We held consultations with the departmental organizations identified as the key agents of change for the psychosocial work domain, engaging them in the sampling design and the planning process, and building capacity for and commitment to post-survey action. They championed the survey for their respective organizations, encouraging participation prior to and during survey administration. We also developed a communication strategy for all Defence Team members and for stakeholders. Maintaining regular communication was a key part of the pre-survey and survey administration phases of our assessment-to-solutions approach. Several reminder communications in the form of behavioral nudges were developed to boost survey response rates.

2.3 Preparing for Post-Survey Action

Workplace initiatives/interventions can be focused at three different levels (primary, secondary and tertiary).^{34,35} Primary interventions target, for example, the source of the stress (i.e., stressor reduction), secondary interventions target individuals' abilities to cope with their stress and tertiary interventions are focused on treating problems that have progressed beyond prevention.^{36,37} Primary interventions are perhaps the least utilized by organizations.³⁶ However, incorporating a positive psychology approach to primary intervention suggests that individuals could benefit from organizational efforts that target both stressor reduction and changing the level of positivity experienced in the workplace (e.g., through transformational leadership training programs).^{28,38} Overall, primary interventions for psychological health and safety in Defence could focus on establishing/maintaining the work conditions that help prevent psychological injury, foster workplace well-being and optimal functioning, and provide the psychosocial resources necessary to cope with work demands.

With the DWWS completed, and the results being analyzed,³⁹ we are preparing for Defence Team and stakeholder re-engagement for action planning and developing solutions in our assessment-to-solutions approach (see also action planning and implementation phases of organizational interventions^{30,33}). Our focus will be on the application of positive psychology¹⁸ to primary interventions³⁶ (i.e., targeting the workplace conditions that are associated with positive functioning at work and workplace well-being).

3.0 DISCUSSION

3.1 Summary

For the first time within DND/CAF, we are conducting a complex survey-based research project using an assessment-to-solutions approach within a strategic-level, department-wide initiative that involves a wide and diverse range of stakeholders. There have been many challenges but, we would argue even more anticipated benefits. The observed benefits of the approach, thus far, include its ability to pro-actively address the “so what” question for the organization during pre-assessment, allowing us to solicit engagement and commitment to action

that will ultimately be informed by the DWWS results. By positioning the DWWS to ensure that the results can inform organizational objectives for follow on action, our next steps will involve moving into the solutions space. We expect to be able to work with organizational stakeholders to formulate action plans that are specific and precise. We are committed to encouraging our stakeholders to take ownership of solutions that reflect their needs and, to the extent possible, are grounded in existing organizational initiatives.³²

In terms of lessons learned thus far, we emphasize that early engagements to solicit commitment and build capacity for action are extremely important. We also assert that it is key to manage organizational stakeholders' expectations throughout the process. This lesson learned underscores the critical role of communications in the assessment-to-solutions approach.

3.2 Next Steps

Analysing the results of the DWWS involved cutting-edge advanced statistical analyses (e.g., latent profile analysis, dominance analysis, language and gender invariance testing).³⁹ Our goal was to produce scientifically rigorous and actionable empirical evidence to inform the development and prioritization of workplace well-being solutions in collaboration with key stakeholders. This combination of analysis will highlight areas of strength as well as areas of concern for the organization. We expect the results of the DWWS to inform the identification of strategic priorities and associated action plans aimed at establishing/maintaining the work conditions that foster workplace well-being and optimal functioning. As an organization, DND/CAF will continue to strive to provide the psychosocial resources necessary to allow the Defence Team to manage their work demands. The results of DWWS will also help establish the initial baseline for the psychosocial domain for the Total Health and Wellness Strategic Framework, informing the development of programs, initiatives and tools to help leaders and Defence Team members support and enhance psychological health and safety in the workplace.

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Leader Interventions for Psychological Health and Safety Solutions

Ann-Renée Blais, Glen Howell, Zhigang Wang, and Caitlin Comeau

Director General Military Personnel Research and Analysis
Department of National Defence
CANADA

ann-renee.blais@forces.gc.ca

glen.howell@forces.gc.ca

zhigang.wang@forces.gc.ca

caitlin.comeau@forces.gc.ca

ABSTRACT

In this paper, we describe the Department of National Defence's approach to informing leader-driven actions for positive change based on the results of the 2018 Defence Workplace Well-being Survey (DWWS). The DWWS was designed to provide a baseline assessment of the workplace well-being of the Defence Team (DT; i.e., Regular Force members, Primary Reserve Force members, and civilian employees) and of its associated resilience and risk factors. The analyses resulted in the identifications of four Psychological Health (PH) profiles based on five indicators of PH (i.e., Morale, Job Engagement, Burnout, Psychological Distress, and Turnover Intentions) and of reliable predictors (i.e., social-demographic characteristics, resilience and risk factors) of membership in these profiles. Its limitations notwithstanding, the current study employed state-of-the-art techniques to (a) investigate the dimensionality of PH, (b) identify PH profiles in the DT, and (c) examine the relationships between membership in these profiles and the aforementioned predictors. In closing, we discuss the practical implications of this work for the DND, especially how the findings can inform leader-driven actions.

1.0 INTRODUCTION

The World Health Organization¹ defines *psychological health* (PH) as an integrative concept based on both the presence of positive health symptoms (i.e., well-being) and the absence of negative health symptoms (i.e., distress).^{2,3} A critical assumption of this conceptualization is that well-being and distress are distinct states that vary independently from one another within the same person rather than end points on a continuum.⁴ In fact, empirical evidence has shown that well-being measures (e.g., involvement) assess more than the opposite of distress measures (e.g., anxiety, depression) and provide relevant yet complementary information towards the conceptualization of PH.⁴

Decades of research in several areas of the social sciences have highlighted the importance of PH to organizations.⁵⁻⁷ For example, psychologically healthy employees show both increased engagement and resilience at work, and they are more creative and innovative.⁸⁻¹¹ In contrast, reduced PH has been associated with outcomes such as suboptimal job performance, absenteeism, turnover, increased health care expenditures and, in Canada in particular, approximately \$50 billion in lost annual productivity.¹²⁻²¹

1.1 Approaches to the Investigation of PH

In light of the increasing awareness of PH in organizations and its linkage to key organizational outcomes, an in-depth exploration of this construct has become critical.^{4,22} Traditionally, PH research has taken a *variable-centered* approach to investigating this construct and its associations with key predictors, correlates, and outcomes, where these relationships are explored and averaged across respondents.²³ However, this approach overlooks the possibility that the combination of PH dimensions may differ – in meaningful ways – in subgroups of participants.^{24,25}

Complementary *person-centered* techniques overcome this limitation by identifying distinct and homogenous subgroups of individuals presenting qualitatively and quantitatively distinct PH profiles across multiple variables.²⁶ Consequently, methodologists have identified these techniques as more appropriate for the investigation of research questions pertaining to the combination of PH dimensions in unique ways across individuals.^{4,22} Furthermore, relative to the variable-centered approach, not only does person-centered research seem better suited to leaders' proclivities to categorize their employees, but it also offers a more complete picture of employees as whole persons.⁴

Among the various person-centered approaches available (e.g., median-split, cluster analysis), *latent profile analysis* (LPA) is the most flexible and, arguably, the most psychometrically robust.²⁶ In LPA, latent profiles refer to subpopulations that are prototypical in nature, with individuals having a probability of membership in a given profile based on their degree of similarity with the profile's specific configuration on the indicators.²⁷ An additional strength of LPA is the possibility of including auxiliary variables (e.g., predictors, correlates, or outcomes of PH) in the analysis to determine their relation to profile membership.²⁸

To date, only a limited number of studies have examined PH from a person-centered perspective using LPA.^{4,22,24,29-31} These studies identified between four^{24,30,31} and six²⁹ PH profiles. Notably, common to all studies is the presence of three profiles: (a) *High-Functioning* (i.e., high levels of well-being); (b) *Normative* (i.e., average levels of well-being and distress); and (c) *At-Risk* (i.e., high levels of distress and low well-being). Across studies, the High-Functioning profile consisted of approximately 2% to 46% of the respondents, the Normative profile included approximately 28% to 68% of the respondents, and the At-Risk profile comprised approximately 6% to 47% of the respondents. In addition to identifying PH profiles, some of these studies have examined the relationships between membership in these profiles and potential predictors and outcomes of PH. For example, Gerber et al.²⁹ and Makikangas et al.³² found that job control, a supportive organizational climate, and physical activity are all associated with an increased probability of belonging to a High-Functioning profile, whereas Bietry and Creusier²⁴ identified associations between high levels of turnover intentions and exhaustion and an increased probability of belonging to an At-Risk profile.

Of note, the aforementioned efforts have been exclusively directed to investigating PH profiles in civilian settings, and, to date, this research has not yet been extended to military or mixed military and civilian contexts. In fact, published studies that explore PH in the military remain relatively rare³³⁻³⁵ with only 3% of occupational health psychology studies between 2010 and 2014 using a military sample³⁶, reinforcing Chen's³⁷ call for more diversity in worker populations represented in occupational health psychology research. The limited military research that does assess PH has generally focused on the association between PH indicators and extreme stressors specific to the military, such as combat exposure, peacekeeping and disaster missions.³⁸⁻⁴⁰ Despite the notion that the military work environment consists of the full range of occupational characteristics, it appears that little formal inquiry has been done to explore PH in a routine military work environment.^{41,42}

1.2 Resilience and Risk Factors as Key Drivers of PH

In 2013, the Mental Health Commission of Canada (MHCC) launched a voluntary standard, the *National Standard for Psychological Health and Safety in the Workplace* (referred to herein as the Standard).⁵ The Standard highlights 13 resilience and risk factors in the workplace that reflect the academic literature and that organizations can monitor and influence to promote PH.⁵ While interest in the Standard is high, Canadian organizations still struggle with implementing practices to support PH.⁴³ Reasons for this disparity stem from long-standing organizational limitations, such as lack of funding, time, and personnel necessary to implement MHCC's comprehensive PH strategy.⁴³ Given that organizations are interested in directing their limited resources toward areas that have the largest return on investment⁴⁴, it is critical to identify the resilience and risk factors most strongly associated with PH.

1.3 Leader Interventions for PH

Empirical research on PH interventions and first-hand experience from organizational change programs indicate that obtaining intended change is often more difficult than expected.⁴⁵⁻⁴⁷ If messages from upper echelons of authority regarding organizational interventions do not match actual leadership actions, the dissonance between these communicated messages will inhibit intervention success^{48,49}, because “leaders set the tone for the entire organization, and employees look to them for cues about what constitutes acceptable conduct”.⁵⁰ Specifically, organizational leaders play an important role in defining an environment in which employees can experience psychological well-being or distress.⁵¹⁻⁵⁴ That is, they can make decisions that create additional stressors for their employees, such as assigning tasks in a way that increases or diminishes the experience of role overload.⁵² Additionally, unfair, hostile and abusive management practices are all linked to adverse employee outcomes such as feelings of helplessness, reduced self-efficacy, and burnout.⁵⁵⁻⁵⁷

Conversely, when managers engage in *transformational leadership* behaviours such as consideration as well as support for employee needs, employees can demonstrate increased optimism, happiness, and motivation, and reduced job stress, strain, burnout, and depression.⁵⁸⁻⁶¹ With these findings in mind, it then follows that leadership training and development programs aimed at enhancing leadership behaviours can also serve as an indirect method to facilitate subordinate PH.⁵² As such, leadership training should be considered a viable and effective primary intervention to promote employee PH.⁵²

Additionally, organizations with leadership that is supportive of worksite health promotion programs are almost four times more likely to report substantial improvement in employee health.⁶² When leaders are actively engaged and supportive of PH interventions, employees are likely to perceive their PH as a priority.⁶³ In this case, employees may perceive psychological well-being programs as an integral part of overall organizational health and effectiveness, rather than an external program that has been imposed upon them.⁶⁴ Moreover, managerial involvement also facilitates a shared understanding of the causes and consequences of psychological distress, which plays a critical role in fostering an environment that supports the transfer of skills obtained within the intervention program to the workplace.^{65,66}

1.4 The Present Study

In conducting the current study, our aims were to: (a) investigate the dimensionality of PH in the Canadian Defence Team (DT; i.e., Regular Force and Reserve Force members and civilian personnel), based on a mixture of positive and negative indicators of PH; (b) identify PH profiles; and (c) relate membership in these profiles to the workplace resilience and risk factors identified in the Standard⁵ in order to identify key levers for leader-driven actions for positive change.

2.0 METHOD

2.1 Study Design

A stratified random sample of the target population (i.e., the DT) was selected from a sampling frame (i.e., a total of 100,018 military and civilian personnel) available via the Defence Resource Management Information System. This sampling frame was stratified into 67 organizations covering the military commands of the Canadian Armed Forces (CAF; e.g., Army, Air Force, Navy, Military Personnel Command) and the organizations of the Department of National Defence (DND; i.e., the Assistant Deputy Ministers).

Random samples were drawn from each stratum with proportional allocation for component (i.e., Regular Force, Primary Reserve, and civilian personnel), sex, rank group for military members (i.e., non-commissioned members [NCMs] and officers), and years of service for civilian personnel. This proportional allocation increased the probability of good representation of survey respondents along these variables. The random samples yielded a total sample of 41,387 personnel (after necessary exclusions such as undeliverable emails) with a small expected margin of error (< 1%) for DT estimates.

The survey administration received approval from the DND/CAF Social Science Research Review Board. Selected personnel were invited to participate in a Defence Workplace Well-Being survey (DWWS) via email or post-cards, and the survey was live from May to August 2018. The respondents provided informed consent and were assured that only aggregate data would be reported. After data cleaning, 13,112 respondents remained, for an overall response rate of approximately 32%.

2.2 Sampling Weights

Respondents within each organization were post-stratified by component and rank group (i.e., junior NCM, senior NCM, junior Officer, and senior Officer) for military personnel and age group (i.e., up to 34, 35 to 54, and 55+ years of age) for civilians. Sampling weights were calculated so that respondents would represent the target population with respect to the original stratification variable (i.e., organization) and post-stratification variables (i.e., component and rank group for military personnel and age group for civilians). The discrepancies between the population estimates for other key demographics obtained from applying the sampling weights and the true population totals from the sampling frame were examined. The population estimates for sex and first official language (FOL) were close to the correct population totals (i.e., within 5% for sex and 1% for FOL) suggesting that the weights also produced reasonably accurate estimates along these demographics. Except where otherwise noted, we conducted the subsequent analyses on the weighted data.

2.3 Respondent Characteristics

Eighty-two percent of the DT completed the DWWS in English (vs. in French). Fifty-five percent of the DT were members of the Regular Force, 20% were members of the Primary Reserve, and 25% were civilian employees. Nineteen percent of the military members were officers, whereas 26% of the civilian employees occupied a managerial or supervisory position. Seventy-six percent of the DT were male, and 74% identified English (vs. French) as their FOL. Thirty-seven percent of the DT were younger than 35, 50% were between 35 and 54 years of age, and 13% were older than 54. Thirty-nine percent of the DT had served with the CAF or the DND fewer than 11 years, 33% between 11 and 20 years, and 29% served for 20 years or more.

Table 1: DWWS scales, factors, and associated sources.

Study Variable	Factor(s)	Scale	Source(s)	# Items
Demands				
1. Work Overload	Workload Management	Reilly Role Overload	[69,70]	6
2. Work-Family Conflict	Balance	Work-Family Conflict Subscale of the WFCS	[71]	5
3. Job Stress	Workload Management	Stress in General Scale	[72,73]	8
4. Abusive Supervision	Clear Leadership and Expectations, Psychological Protection, Civility and Respect	Abusive Supervision	[74,75]	5
Resources				
<i>Job</i>				
5. Autonomy	Involvement and Influence	Autonomy Subscale of the WRBNS	[76]	6
6. Impact	Involvement and Influence	Impact Subscale of the PES	[77]	3
7. Meaningful Work	Growth and Development	Meaning at Work Scale	[77]	3
8. Competence	Psychological Competencies and Requirements	Competence Subscale of the WRBNS	[76]	4
9. Role Clarity	Clear Leadership and Expectations	Role Ambiguity Scale	[78]	6
<i>Team</i>				
10. Relatedness	Psychological and Social Support	Relatedness Subscale of the WRBNS	[76]	6
11. Psychological Safety	Psychological Protection	Team Psychological Safety Scale	[79]	7
12. Civility and Respect	Civility and Respect	Interpersonal Justice Subscale of the OJS	[80]	4
<i>Leader</i>				
13. Transformational Leadership	Clear Leadership and Expectations	Global Transformational Leadership Scale	[81]	7
14. Supervisor's Safety Behaviors	Protection of Physical Safety	Group Safety Climate Scale	[82]	5
15. Supervisor's Safety Expectations	Protection of Physical Safety	Group Safety Climate Scale	[82]	5
<i>Organization</i>				
16. Organizational Support	Organizational Support	Perceived Organizational Support	[83]	8
17. Group Culture	Organizational Culture	Group-Oriented Organizational Culture Subscale of the OCP	[84,85]	4
18. Recognition and Reward	Recognition and Reward, Growth and Development	Contingent Reward Subscale of the JSS	[86]	4
Outcomes				
<i>Positive</i>				
19. Job Engagement	Engagement	Job Engagement Scale	[87]	18
20. Morale	N/A	Military Morale Scale	[88]	6
<i>Negative</i>				
21. Burnout	N/A	Oldenberg Burnout Inventory	[89]	8
22. Psychological Distress	N/A	Kessler Psychological Distress Scale	[90]	10
23. Turnover Intentions	N/A	Turnover Intentions	[91]	3

Note. WFCS = Work-Family Conflict Scale; WRBNS = Work-Related Basic Need Satisfaction Scale; PES = Psychological Empowerment Scale; OJS = Occupational Justice Scale; OCP = Organizational Culture Profile; JSS = Job Satisfaction Survey.

2.4 Measures

The DWWS included 23 scales reflecting both the resilience and risk factors included in the Standard and the positive and negative indicators of PH. Table 1 presents these scales, their source(s) and their number of items (for more detail on some of these scales, see Ivey, Blanc, Michaud, & Dobрева-Martinova⁶⁷). The internal consistency reliability estimates (i.e., Cronbach's alphas) reached a desirable value of .80 or greater, with the exception of the Supervisor's Safety Behaviors' estimate ($\sigma = .70$).⁶⁸ Table 2 displays weighted descriptive statistics for each of the study variables.

2.5 Analytic Strategy

2.5.1 The Dimensionality of PH

We examined the dimensionality of PH via confirmatory factor analysis (CFA) and exploratory structural equation modeling (ESEM) with *Mplus* (Version 8; Muthén & Muthén⁹²) by means of its robust maximum likelihood (MLR) estimator. This estimator provides “maximum likelihood parameter estimates with standard errors and a Chi-square test statistic (when applicable) that are robust to non-normality and non-independence of observations when used with TYPE=COMPLEX”.⁹² With MLR, the default is to estimate models under missing data theory using all available data.⁹² This method, full information maximum likelihood (FIML), works reasonably well under various patterns and rates of missing data¹ (e.g., > 50%).^{93,94}

We report the Satorra-Bentler scaled Chi-square with its degrees of freedom (*df*) and *p* value. However, because this statistic can be overly sensitive to sample size^{95,96}, we interpreted the following approximate fit indices, corrected for non-normality and non-independence of observations: (a) the Steiger-Lind root mean square error of approximation (RMSEA)⁹⁷ and its 90% confidence interval (CI); and (b) the comparative fit index (CFI).⁹⁸ Values close to .06 and .95, respectively, suggest excellent data-model fit, and values close to .08 and .90, respectively, indicate acceptable fit.⁹⁹

In line with Morin and colleagues'¹⁰⁰⁻¹⁰² approach to the investigation of *construct-relevant psychometric multidimensionality*, we first set out to compare the results from the CFA and ESEM on the indicators of PH. We selected this approach because the indicators of PH represent *conceptually-related* or potentially overlapping constructs.^{100,101} We then contrasted the retained CFA or ESEM solution with its matching bifactor model to test the presence of construct-relevant psychometric multidimensionality due to the assessment of a *hierarchically-superior* – here, Global PH (GPH) – construct.^{100,101} In the case of the resilience and risk factors, given the potentially overlapping nature of these constructs, we explored both a CFA and an ESEM representation of the data.

We conducted the LPAs on the factor scores^{103,104} from the retained factor solution with *Mplus*⁹² MLR estimator and FIML. We examined one to eight profiles, based on our review of the PH literature to date, which points to the potential existence of between four and six profiles. In all LPAs, we freely estimated the means and variances of the factor scores.²⁵ We used 10,000 random sets of start values and 1,000 iterations for each random start, and we retained the 500 best solutions for final stage optimization.¹⁰⁵ All models converged on replicated solutions.

¹ In the current study, listwise deletion would have resulted in $n = 9661$ or approximately 74% of the initial sample.

Table 2a: Study variables: Weighted descriptive statistics.

Variable	Unweighted <i>n</i>	Potential range	<i>M</i>	95% CI		<i>SD</i>
				<i>LL</i>	<i>UL</i>	
Demands						
1. Work Overload	12,704	1-7	3.66	3.63	3.70	1.39
2. Work-Family Conflict	12,949	1-7	3.73	3.69	3.78	1.85
3. Job Stress	12,869	0-2	1.00	0.98	1.01	0.62
4. Abusive Supervision	12,927	1-5	1.42	1.40	1.44	0.81
Resources						
<i>Job</i>						
5. Autonomy	12,758	1-5	3.06	3.04	3.07	0.75
6. Impact	13,055	1-7	4.26	4.22	4.30	1.68
7. Meaningful Work	12,946	1-7	5.41	5.37	5.45	1.51
8. Competence	12,915	1-5	4.05	4.03	4.06	0.68
9. Role Clarity	12,915	1-7	4.97	4.93	5.00	1.49
<i>Team</i>						
10. Relatedness	12,874	1-5	3.57	3.55	3.59	0.83
11. Psychological safety	12,938	1-7	4.95	4.92	4.98	1.25
12. Civility and Respect	13,046	1-5	3.90	3.88	3.93	0.95
<i>Leader</i>						
13. Transformational Leadership	12,848	1-5	3.58	3.55	3.61	1.14
14. Supervisor's Safety Behaviors	12,971	1-5	3.34	3.33	3.36	0.65
15. Supervisor's Safety Expectations	12,893	1-5	3.65	3.63	3.67	0.79
<i>Organization</i>						
16. Organizational Support	12,882	1-7	4.69	4.66	4.73	1.43
17. Group Culture	12,789	1-5	3.46	3.44	3.49	1.00
18. Recognition and Reward	12,848	1-6	3.71	3.68	3.74	1.25
Outcomes						
<i>Positive</i>						
19. Job Engagement	12,770	1-5	3.88	3.87	3.90	0.68
20. Morale	12,997	1-5	3.39	3.37	3.42	0.97
<i>Negative</i>						
21. Burnout	12,830	1-4	2.46	2.44	2.47	0.65
22. Psychological Distress	13,112	10-50	18.29	18.09	18.49	8.22
23. Turnover Intentions	13,037	1-5	2.45	2.42	2.48	1.16

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit

2.5.1 PH Profiles

To guide our selection of the optimal number of PH profiles, we considered the following indices, which are particularly helpful in choosing the model that best recovers the sample's true parameters:^{105,2} the Bayesian Information Criterion (BIC)¹⁰⁶ and the Sample-Adjusted BIC (SABIC)¹⁰⁷, where lower values signify better

² The bootstrap likelihood ratio test⁸⁶, equally effective, is not available with TYPE=COMPLEX in *Mplus* (Version 8, Muthén & Muthén⁷⁰).

Table 2b: Zero-order correlations.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Demands																							
1. Work Overload	-																						
2. Work-Family Conflict	.64	-																					
3. Job Stress	.65	.59	-																				
4. Abusive Supervision	.21	.26	.28	-																			
Resources																							
5. Autonomy	-.42	-.49	-.49	-.42	-																		
6. Impact	-.02	-.05	-.08	-.22	.45	-																	
7. Meaningful Work	-.10	-.14	-.09	-.22	.47	.37	-																
8. Competence	-.10	-.10	-.11	-.08	.24	.26	.30	-															
9. Role Clarity	-.34	-.32	-.32	-.29	.53	.34	.34	.35	-														
10. Relatedness	-.23	-.25	-.26	-.28	.49	.35	.34	.25	.41	-													
11. Psychological Safety	-.30	-.36	-.40	-.49	.64	.42	.34	.21	.49	.59	-												
12. Civility and Respect	-.24	-.29	-.34	-.52	.55	.37	.32	.18	.40	.50	.70	-											
13. Transformational Leadership	-.28	-.28	-.33	-.51	.54	.34	.30	.13	.46	.43	.62	.58	-										
14. Safety Behaviors	-.23	-.18	-.23	-.38	.38	.29	.23	.10	.36	.36	.42	.40	.58	-									
15. Safety Expectations	-.26	-.27	-.27	-.41	.43	.24	.27	.11	.39	.35	.48	.43	.55	.55	-								
16. Organizational Support	-.39	-.46	-.43	-.44	.65	.38	.37	.14	.48	.47	.64	.57	.57	.44	.51	-							
17. Group Culture	-.29	-.35	-.37	-.45	.57	.37	.33	.14	.44	.45	.63	.64	.59	.45	.48	.73	-						
18. Recognition and Reward	-.37	-.38	-.40	-.34	.55	.28	.28	.06	.43	.40	.54	.48	.56	.39	.44	.62	.55	-					
Outcomes																							
19. Job Engagement	-.07	-.15	-.09	-.23	.49	.40	.65	.41	.40	.40	.38	.37	.35	.30	.30	.40	.40	.30	-				
20. Morale	-.35	-.36	-.36	-.30	.60	.40	.53	.35	.48	.51	.51	.48	.48	.37	.38	.57	.55	.47	.70	-			
21. Burnout	.53	.54	.56	.37	-.67	-.31	-.41	-.23	-.46	-.47	-.55	-.48	-.46	-.34	-.43	-.62	-.54	-.54	-.50	-.70	-		
22. Psychological Distress	.40	.40	.45	.39	-.50	-.26	-.30	-.24	-.40	-.43	-.48	-.41	-.36	-.26	-.32	-.50	-.43	-.39	-.35	-.56	.69	-	
23. Turnover Intentions	.34	.37	.35	.39	-.55	-.28	-.45	-.16	-.40	-.38	-.44	-.37	-.39	-.30	-.34	-.51	-.44	-.41	-.48	-.58	.60	.45	-

Note. For zero-order correlations, *n* ranged from 12,367 to 13,112. Correlation coefficients greater than .02 are significant at the .05 level (two-tailed).

fit.¹⁰⁸ As sample sizes become larger, however, these indices may point to an ever-increasing number of profiles.¹⁰⁹ Thus, we depict, in an *elbow* plot the decreasing values of the BIC and SABIC as the number of profiles increases.^{25,110} The point at which the slopes flatten suggests the optimal number of profiles.²⁵ For descriptive purposes, we also report the entropy, which ranges between 0 and 1 and provides a summary of the classification accuracy, where higher values indicate greater accuracy.

2.5.2 Key Levers for PH

In order to identify key levers for leader-driven actions for positive change, we explored the relative importance of the associations between the workplace resilience and risk factors identified in the Standard and membership in the latent profiles through a series of logistic regression analyses in SAS (Version 9.4; SAS Institute Inc, 2014). These analyses took into account the following six social-demographic characteristics: gender, FOL, age group, organization, component, and disability status. We considered these specific characteristics to account either for their relationships with the outcome variable (i.e., disability status) or the sampling design (i.e., gender, FOL, age group, organization, component), because the logistic regression analyses could not include the sampling weights. To evaluate the relative importance of the associations between the factors and the outcome variable, we relied on the change in the Akaike Information Criterion (AIC) between the full logistic regression model and the model that excluded each factor in turn.^{111,112} A decrease in the AIC suggests that, in comparison to the other associations, the association between the factor of interest and the outcome variable is of greater importance.¹¹³

3.0 RESULTS

3.1 The Dimensionality of PH

The ESEM showed an acceptable data-model fit ($\chi^2[773] = 16,275.71$, $p < .001$, RMSEA [90% CI] = .039 [.039, .040], CFI = .91; vs. $\chi^2[933] = 36,962.21$, $p < .001$, RMSEA [90% CI] = .054 [.054, .055], CFI = .79 for the CFA model), generally well-defined factors (with the exception of the Turnover Intentions factor) with standardized factor loadings greater than .50 ($|\lambda| = .19-.94$; $M = .62$), and small-to-moderate cross-loadings ($|\lambda| < .01-.45$; $M = .12$).^{102,3} The ESEM resulted in a clearer differentiation between the factors ($|r| = .13-.59$, $M = .35$) relative to the CFA model, $|r| = .35-.74$, $M = .60$.

Compared to the ESEM, the subsequent bifactor ESEM showed an improved and excellent fit to the data, $\chi^2(733) = 10,072.12$, $p < .001$, RMSEA [90% CI] = .031 [.031, .032], CFI = .95. The GPH factor was generally well defined, $|\lambda| = .25-.87$; $M = .57$. The Morale items, the Job Engagement items pertaining to Emotional Engagement, and the Turnover Intentions items, as well as the large majority of the Burnout and Psychological Distress items, presented fully satisfactory standardized factor loadings in the expected direction on the GPH factor. With the exception of Turnover Intentions, the specific factors retained a meaningful level of specificity ($|\lambda| = .01-.75$; $M = .45$), especially the Job Engagement factor, where the items pertaining to Cognitive and Physical Engagement all had standardized factor loadings greater than .50. Lastly, the superiority of the bifactor ESEM is also apparent from the reduced cross-loadings ($|\lambda| < .01-.34$; $M = .07$) relative to the ESEM.¹⁰²

³ The complete set of results is available upon request from the first author.

3.2 PH Profiles

When conducting LPA on a hierarchically-superior construct such as GPH, Morin et al.²² suggested incorporating this construct as an additional profile indicator in the LPA. After controlling for this general tendency shared across all indicators, unique variance may remain at the indicator level that allows for the identification of patterns across indicators.²² Failure to incorporate the hierarchically-superior construct makes identification of well-differentiated profiles significantly more challenging.²² Accordingly, we included the GPH factor along with the specific factors in the LPAs.

Table 3: Results from the Latent Profile Solutions

Profile	LL	#fp	CF	BIC	SABIC	Entropy
1	-105453.60	12	3.12	211020.98	210982.84	1.00
2	-99906.41	25	2.65	200049.85	199970.40	.68
3	-97410.85	38	3.30	195182.00	195061.24	.79
4	-95303.34	51	4.34	191090.23	190928.15	.82
5	-94188.20	64	3.74	188983.19	188779.81	.83
6	-93101.84	77	3.75	186933.75	186689.05	.81
7	-92074.85	90	3.56	185003.02	184717.00	.82
8	-91212.51	103	3.5	183401.60	183074.28	.83

Note. LL = loglikelihood; #fp = number of free parameters; BIC = Bayesian information criterion; SABIC = sample-size adjusted BIC.

We report the goodness-of-fit results from all LPAs in Table 3, the factor score means and variances associated with the four-profile solution in Table 4, and the elbow plot in Figure 1. The elbow plot points to the superiority of the four-profile solution. Furthermore, the five-profile solution simply split the fourth profile from the four-profile solution into two smaller profiles, resulting in a very small profile (1%) that only differed from the fourth profile on its levels of Burnout.

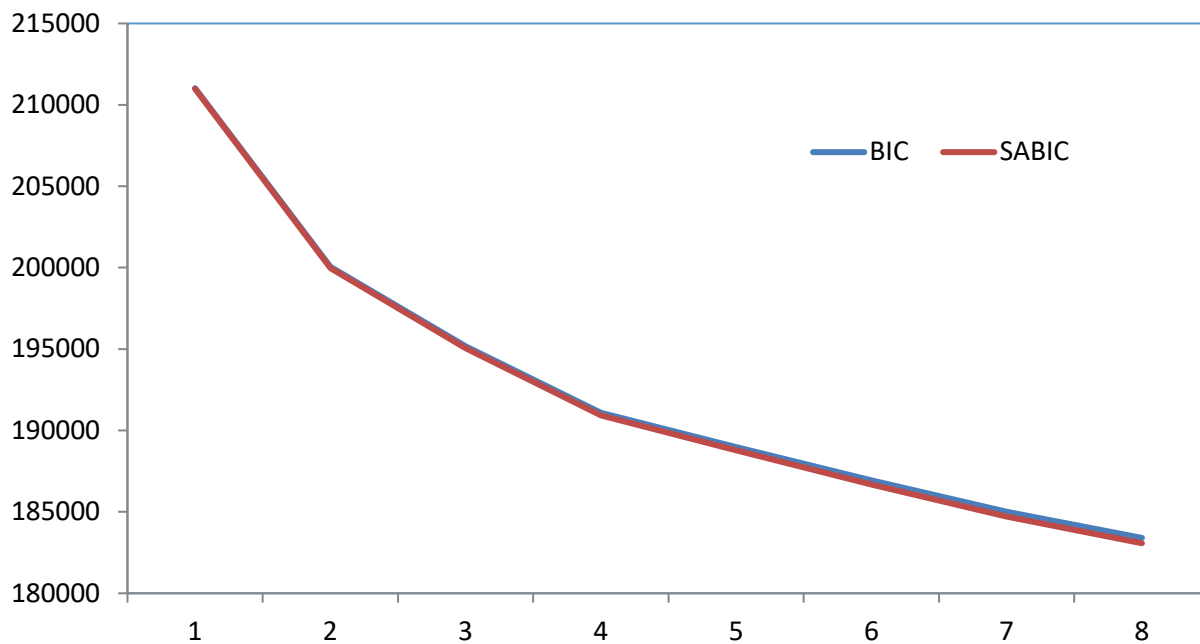


Figure 1: Elbow plot

Table 4: Profile-Specific Factor Scores [and 95% Confidence Intervals] on the PH Indicators

	Profile 1 Struggling (34%)	Profile 2 Normative (55%)	Profile 3 Coasting (6%)	Profile 4 Thriving (5%)
Within-profile means				
Global Well-Being	-0.92 [-1.04, -0.80]	0.38 [0.30, 0.45]	0.57 [0.54, 0.60]	1.43 [1.37, 1.48]
Morale	-0.01 [-0.07, 0.05]	-0.06 [-0.09, -0.03]	0.25 [0.12, 0.38]	0.44 [0.38, 0.49]
Job Engagement	0.01 [-0.05, 0.08]	-0.04 [-0.08, 0.01]	-0.35 [-0.37, -0.33]	0.84 [0.81, 0.87]
Burnout	-0.05 [-0.12, 0.03]	0.10 [0.05, 0.15]	-0.11 [-0.22, 0.01]	-0.66 [-0.89, -0.44]
Psychological Distress	0.30 [0.23, 0.37]	-0.15 [-0.20, -0.11]	-0.36 [-0.39, -0.34]	0.15 [0.12, 0.17]
Turnover Intentions	< .01 [-0.06, 0.06]	-0.02 [-0.05, 0.01]	0.11 [0.09, 0.13]	0.11 [0.07, 0.15]
Within-profile variances				
Global Well-Being	0.88 [0.81, 0.94]	0.35 [0.30, 0.41]	0.02 [0.01, 0.04]	0.02 [0.01, 0.03]
Morale	1.43 [1.28, 1.58]	0.56 [0.51, 0.60]	0.10 [-0.17, 0.37]	0.07 [0.03, 0.11]
Job Engagement	1.75 [1.56, 1.94]	0.56 [0.49, 0.63]	0.01 [0.00, 0.02]	0.01 [0.01, 0.02]
Burnout	0.97 [0.91, 1.04]	0.67 [0.63, 0.71]	0.22 [0.00, 0.44]	0.55 [0.37, 0.72]
Psychological Distress	1.96 [1.78, 2.14]	0.31 [0.23, 0.39]	0.03 [0.02, 0.04]	0.02 [0.01, 0.03]
Turnover Intentions	1.41 [1.22, 1.60]	0.54 [0.46, 0.61]	0.02 [0.00, 0.03]	0.03 [0.01, 0.04]

Turning to the four-profile solution, a *Struggling* (34%) profile shows low levels of GPH and moderately high levels of psychological Distress (see Figure 2). This profile's standing on the other specific indicators of PH is

average. A *Normative* (55%) profile experiences moderately high levels of GPH along with an average standing on the specific indicators of PH. A *Coasting* (6%) profile also displays moderately high levels of GPH along with slightly elevated levels of Morale and moderately low levels of Psychological Distress. Compared to the Normative profile, this profile shows moderately low levels of Job Engagement, where Physical and Cognitive Engagement largely define this specific factor. This profile's standing on Burnout and Turnover Intentions is average. Lastly, a *Thriving* (5%) profile experiences high levels of GPH, in line with moderately high levels of Morale, high levels of Job Engagement, and moderately low levels of Burnout. This profile's standing on Psychological Distress and Turnover Intentions is average.

3.3 Key Levers for PH

An excellent data-model fit ($\chi^2[4,560] = 358,057.85, p < .001$, RMSEA [90% CI] = .015 [.015, .016], CFI = .97), reduced factor correlations ($|r| = .01-.70, M = .24$; vs. $|r| = .02-.80, M = .43$), small-to-moderate cross-loadings ($|\lambda| < .00-.43; M = .03$)⁴, and, with the exception of the Autonomy factor, well-defined factors ($|\lambda| = .03-.98; M = .67$) largely supported the ESEM relative to the CFA model, $\chi^2(4,311) = 30,065.38, p < .001$, RMSEA (90% CI) = .021 (.021, .022), CFI = .93. Prior to running the logistic regression analyses, we conducted Box-Tidwell tests on the workplace resilience and risk factor scores to examine whether or not they were linearly related to the outcome variable (i.e., membership in the Struggling profile).¹¹⁴ Some of these tests did not meet the linearity assumption. Hence, to address this concern, we built a semiparametric logistic regression model with a parametric component that included the social-demographic characteristics and a nonparametric component that included the factors.¹¹⁵ The parametric component of the regression analysis assumed linear relationships between the social-demographic characteristics and the outcome variable, whereas the nonparametric component did not. Because there were no large dependencies amongst the resilience and risk factor scores, we included all of them in the regression model simultaneously.

⁴ The complete set of results is available upon request from the first author.

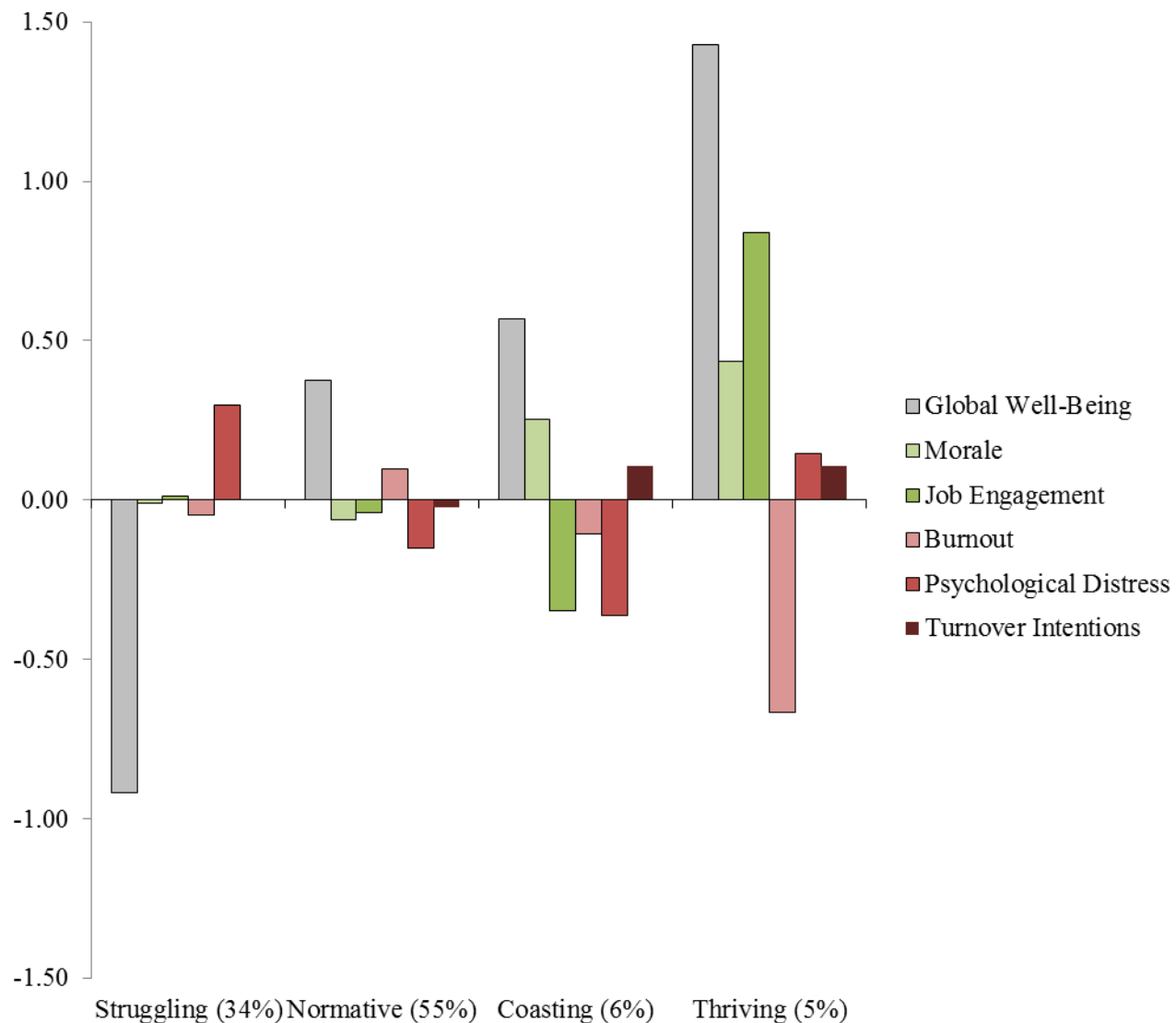


Figure 2: Defence Team's PH profiles.

Adjusting for multiple tests with a Bonferroni correction, Meaningful Work ($\chi^2[8] = 703.92, p < .001$), Relatedness ($\chi^2[3] = 157.49, p < .001$), Job Stress ($\chi^2[6] = 113.63, p < .001$), Organizational Support ($\chi^2[4] = 57.13, p < .001$), Work-Family Conflict ($\chi^2[7] = 51.29, p < .001$), Competence, ($\chi^2[4] = 50.95, p < .001$),

Recognition and Reward ($\chi^2[4] = 49.11, p < .001$), Abusive Supervision ($\chi^2[6] = 29.68, p < .001$), Role Clarity ($\chi^2[3] = 29.30, p < .001$), Work Overload ($\chi^2[5] = 22.48, p < .001$), Civility and Respect ($\chi^2[8] = 21.06, p = .007$), Impact ($\chi^2[2] = 19.03, p < .001$), disability status ($\chi^2[1] = 55.95, p < .001$) and FOL ($\chi^2[1] = 10.67, p = .001$) were significantly related to membership in the Struggling profile. Adding Meaningful Work ($\Delta AIC = 727.69$), Relatedness ($\Delta AIC = 150.81$), Job Stress ($\Delta AIC = 98.55$), Competence ($\Delta AIC = 58.91$), Recognition and Reward ($\Delta AIC = 39.53$), Organizational Support ($\Delta AIC = 33.88$), disability status ($\Delta AIC = 30.61$), and Work-Family Conflict ($\Delta AIC = 26.09$) to the model in turn led to sizable changes in the AIC. However, adding

the other social-demographic characteristics and workplace resilience and risk factors in the model in turn led to either small changes in the AIC (i.e., $0 < \Delta AIC < 20$) or to a worsening of the model fit.

4.0 DISCUSSION

4.1 Summary

As previously stated, our aims in conducting the current study, were to: (a) investigate the dimensionality of PH in the DT based on a mix of positive and negative indicators of PH, (b) identify PH profiles of the DT, and (c) relate membership in these profiles to the workplace resilience and risk factors identified in the Standard in order to identify key levers for leader-driven actions for positive change. In doing so, we provided noteworthy contributions to the study of PH in the workplace in general, and in military settings in particular. Notably, the present study relied on a state-of-the-art integrated variable- and person-centered framework for the investigation of the underlying dimensionality of PH. In line with Morin and colleagues' findings,^{4,22} variable-centered approaches (i.e., CFA, ESEM, and bifactor ESEM) revealed the presence of two distinct sources of construct-relevant psychometric multidimensionality underlying the indicators of PH in the current study. Specifically, the results pointed to Morale, Job Engagement, Burnout, Psychological Distress, and Turnover Intentions as conceptually related constructs subsumed under a GPH factor. The adoption of this representation of PH makes it possible to explicitly represent the global overarching PH construct while also taking into account the information associated with the specific PH dimensions.

The results of a series of LPAs, a person-centered methodology, using the best-fitting variable-centered measurement model (i.e., the bifactor ESEM) as a starting point, showed that meaningful specificity remained in the PH dimensions after accounting for global levels of PH. Precisely, four distinct PH profiles emerged from the data that revealed both different levels of GPH and patterns of results on the specific PH dimensions. This finding suggests that relying on a single overarching PH score to describe DT members would result in a loss of information. For example, two of the four uncovered profiles had moderately high levels of GPH, but their patterns of results on the specific PH dimensions were quite different. Reporting only a GPH score to characterize these profiles would fail to recognize their unique characteristics.

On the positive side, moderately high levels of GPH along with average scores on the specific factors characterized the dominant (55% of the DT) Normative profile. Similar to the Normative profile, the Coasting (6%) profile presented moderately high levels of GPH, but compared to the Benchmark profile, it showed moderately low scores on the Job Engagement factor. Individuals in this profile may bear a resemblance to Grant's¹¹⁶ "happy but disengaged" employees who are present but not actively engaged with the organization's goals or its daily work. The relative prevalence of high levels of GPH was low (5%), a finding that aligns with several past studies.^{24,100,101} Last, the relatively large size (34%) of the Struggling profile, characterized by low levels of GPH and moderately high levels of Psychological Distress (yet average scores on the other specific factors) also parallels past findings.^{24,100}

4.2 The Way Ahead

As Suurd Ralph, Dobрева-Martinova, and Ivey noted, the DWWS team is now getting ready for stakeholder re-engagement for the action planning and implementation phases of its assessment-to-solutions approach, taking a positive psychology slant and focusing on primary interventions (e.g., transformational leadership training programs).¹¹⁷ At the unit- or organization-level, the results of the DWWS will inform the development and prioritization of actions in collaboration with leaders to address well-being in their workplace. Considering that approximately one third of the DT reported experiencing low levels of PH coupled with moderate levels of

Psychological Distress, leaders should prioritize actions for positive change that promote an evolution from the Struggling profile to the Normative profile. By highlighting the critical factors associated with PH, our findings can provide a starting point for developing such actions. For example, across the DT, Meaningful Work, Relatedness, and Job Stress were amongst the strongest predictors of membership in the Struggling profile. Specifically, lower levels of Meaningful Work and Relatedness and higher levels of Job Stress were associated with greater odds of belonging to the Struggling profile. Thus, leaders could focus their efforts on those key levers for PH that are also areas of concern –unit- or organization-level reporting will highlight these areas, as well as areas of strength – for their unit or organization.

4.3 Study Limitations

Despite its notable contributions, the current study presents limitations. In addition to its reliance on self-report data (associated with social desirability and common method biases), it is based on a cross-sectional design, thereby making it impossible to reach clear conclusions regarding the probable causal effects of the workplace resilience and risk factors on PH profile membership. We simply situated the factors as predictors of profile membership based on theoretical expectations of their expected role in relation to PH.⁶⁷ Future research would, thus, benefit from a longitudinal design and the investigation of the stability of the profiles over time, and of the directionality of relationships between the profiles, their predictors, and their potential outcomes.

In order to mitigate survey fatigue, we left out important individual differences (e.g., Big Five personality traits) that are likely predictive of PH profile membership. Emotional stability, for example, has been shown to be negatively associated with health impairment (i.e., physical and psychological symptoms) directly and indirectly through perceptions of job demands (i.e., work overload and work-family conflict).¹¹⁸ Aspects of extraversion and conscientiousness (i.e., assertiveness and industriousness) have been shown to be positively associated with work engagement directly and indirectly through perceptions of meaningful work.¹¹⁹ Openness to experience, conscientiousness, and emotional stability measured in CAF NCM recruits prior to basic military qualification (BMQ) have been shown to be negatively associated with turnover intentions and actual attrition after BMQ.¹²⁰ Given the involvement of the five-factor model of personality in one or more of the well-being outcomes, as well as the levers of action, future research would benefit from examination of the personality correlates of profile membership, particularly to better understand the role of durable traits in lower workplace well-being and to potentially design person-treatment studies to help those more likely to struggle.

Although previous findings showed that the measures included in the DWWS were largely equivalent across their English and French versions¹²¹, comprehensive measurement invariance testing of the entire DWWS is currently underway to ensure that responses from both versions of the DWWS can be pooled together for reporting and/or for meaningful comparisons. Lastly, future research may attempt to replicate our findings in other organizations, both nationally and internationally. It would be worthwhile to investigate whether or not the dimensionality of PH, the profiles, and the relationships between the profiles and their predictors hold across diverse organizations and in other countries/cultures.

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Testing Mindfulness in Military Aviation

Anders Meland

Institute of Aviation Medicine
Sem Sælandsvei 2b, 0371 Oslo, Norway
NORWAY

Anders.meland@flymed.uio.no

ABSTRACT

Periods of persistent and intensive stress due to high work demands are known to compromise health and well-being. In addition, the physical and psychological demands associated with technological developments and deployments may pose an extra challenge to military personnel. Due to the inherent risk involved in flying, the military aviation community is particularly focused on finding ways to optimise performance and reduce the negative consequences of stress, fatigue and high workloads.

However, it is far from clear which strategies work best to conserve energy, maximize recovery, health and well-being without reducing outer workload. One method that might be useful in this respect is Mindfulness Training (MT). MT has been found to reduce systemic arousal and increase parasympathetic activity and well-being without changing workload or compromise alertness. The method has successfully been used as a personal stress management tool for people working in stressful working environments, but less is known about how the method applies to military aviation.

To address this gap in the literature this manuscript sheds light on the potential benefits and costs of implementing MT in military aviation. We review the findings of two published and two unpublished studies on the use of MT in military aviation contexts.

1.0 INTRODUCTION

There has been a growing concern about the long-term effects of unpredictable working hours and long duty periods with limited time off in long haul flying operations (J. L. Caldwell, Chandler, & Hartzler, 2012) and around-the-clock military missions. A report by the Rand Corporation states that deployments are longer and more frequent than in former conflicts such as the Vietnam and Persian Gulf wars and that there are shorter intervals between deployments (Tanielian & Jaycox, 2008). It is well known that repeated, excessive, or prolonged energy mobilization without sufficient rest contributes to deficits in alertness, physical disease, increased mortality and reduced well-being (Cohen, Janicki-Deverts, & Miller, 2007; Liston, McEwen, & Casey, 2009; McEwen, 1998).

Fatigue-related events is an area of concern in military operations, especially as elevated levels of fatigue are sometimes unavoidable due to mission completion (J. L. Caldwell et al., 2012). Fatigue is particularly challenging in aviation, as flying includes high risk, is cognitively demanding and can involve moving across time-zones. Fatigue related risk is well known in aviation and there has been implemented a range of fatigue countermeasures. This includes rest- and duty guidelines and a variety of inflight strategies and pre- and post-flight interventions (J. A. Caldwell et al., 2009). These measures aim at limiting the maximum hours of work and ensure time off task for recovery, which in part have shown promising effects on safety records of existing flight operations (J. A. Caldwell, Caldwell, & Schmidt, 2008). Aviators also develop more informal methods such as task slowing, task rotation, physical activity and caffeine to reduce risk while continuing to work while fatigued (Dawson, Cleggett, Thompson, & Thomas, 2015).

Another challenge in military environments is that the stressors occur in circumstances which are uncontrollable to the individual, which is known to intensify the stress-response (Lazarus & Folkman, 1984). Military psychologists commonly rely upon cognitive reappraisal methods and relaxation techniques to help soldiers regulate emotions and arousal levels (DeWiggins, Hite, & Alston, 2010). However, these countermeasures afford awareness and attentional control which is a scarce human resource when fatigued (Eysenck, Derakshan, Santos, & Calvo, 2007) and several of the strategies are not available when time is of the essence (e.g., task slowing). Thus, interventions that “automatically” lowers the stress-response and economizes energy expenditure would be welcomed. Particularly because they do not afford awareness and could prevent fatigue from occurring in the first place.

Mindfulness Training (MT) is a psychological intervention that has been found to reduce systemic arousal and increase parasympathetic activity without changing workload or compromise alertness (Ditto, Eclache, & Goldman, 2006; Tang, Holzel, & Posner, 2015). Acceptance based strategies such as Mindfulness-training (MT) may be especially helpful in situations when stressors cannot be changed or controlled (Baer, 2003; Bishop et al., 2004). This is the reason MT and other acceptance based strategies have become increasingly popular in sports the last decade showing promising effects (Bernier, Thienot, Codron, & Fournier, 2009; D. Birrer & Morgan, 2010; Daniel Birrer, Rôthlin, & Morgan, 2012).

2.0 MINDFULNESS

Mindfulness-training (MT)

Mindfulness is commonly defined as “paying attention in a particular way, on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1994). Baer and colleagues (2006) proposed a five-component model of mindfulness including five trainable skills. *Observation* (i.e., noticing or attending to internal and external experiences). *Description* (i.e., labelling internal and external experiences). *Acting with awareness* (i.e., attending to current activities). *Nonjudgement* (i.e., taking a non-evaluative stance towards inner experience). *Non-reaction* (i.e., allowing thoughts and feelings to come and go without overreacting or getting caught up in them). Mindfulness training (MT) refers to all activities that can improve the level of mindfulness (Kabat-Zinn, 2003).

Mechanism of change

MT is linked to health and well-being in several ways. Some found that a broadening of perspective on experience explains the beneficial effects MT has on well-being, because it opens up for constructive thought and leads to a positive-spiralling-effect in mood and well-being (Garland, Kiken, Faurot, Palsson, & Gaylord, 2016). Others found that MT promotes adaptive patterns of affective experiences by inhibiting maladaptive coping styles (Keng & Tong, 2016). Another possibility is that being mindful involves having more positive response outcome expectancies (PROE), which is linked to stress reduction in all species (Eriksen & Ursin, 2002; Ursin & Eriksen, 2004). A review of the neurological evidence suggests that changes in emotion- and attention regulation strategies seem to be of particular importance in MT (Tang et al., 2015).

Emotion regulation refers to strategies that can influence which emotions arise, when and how long they occur, and how these emotions are experienced and expressed (Gross, 2002). Emotion regulation can happen in several overlapping ways, and can be categorised into at least two neurologically separable strategies: top-down or bottom-up. The former is thought to manipulate the input to the emotion-generative systems such as the amygdala, through prefrontal brain regions (Quirk & Beer, 2006). An example of a top-down strategy is cognitive reappraisal, where emotions are regulated by actively reinterpreting stimuli to modify their emotional impact (Gross, 2002). The latter strategy has been termed bottom-up because it can involve a direct modulation of emotion-generative brain regions without necessarily involving an active recruitment of

higher order brain regions (Chiesa, Serretti, & Jakobsen, 2013). A pure bottom-up strategy would be exposure to stressful stimuli, which over time could promote adaptation and lowering of the activation response to emotional stimuli (Hölzel et al., 2011). Adaptation effects in relation to stress-reduction may be particularly important in high performance environments because after successful adaptation, it takes no additional effort or processing capacity to lower the response, unlike active reappraisal strategies.

Since MT is an example of a bottom-up strategy, the way to regulate one's emotions in MT is to openly direct attention to emotionally salient stimuli without actively trying to change anything (Goldin & Gross, 2010). Over time, this perceptual openness can facilitate a non-evaluative contact with moment-to-moment experience resulting in an awareness of stimuli with less reactivity related to emotional valence (Brown, Ryan, & Creswell, 2007). Adaptation effects of mindful awareness during stressful situations have been found, suggesting that attending to interoceptive afferents results in greater adaptation. A recent study demonstrated that, compared to their less-mindful counterparts, mindful adults presented with arousing unpleasant images, revealed brain states associated with a lower stress-response, but also higher sensitivity to the images (Brown, Goodman, & Inzlicht, 2012). This suggests that being mindful involves increased resilience towards the negative effects of stimuli with emotional valence, without reductions in situational awareness. This may be highly adaptive in elite groups exposed to extreme environments, where relevant cues may have substantial emotional potential.

MT should not be confused with reappraisal strategies, or any method that prescribes manipulating the content of thoughts or feelings. Still, being mindful is linked to changes in top-down cognitive processing (Segal, Wittmann, & Teasdale, 2002). For example, observing a thought such as 'I cannot stand this' without judgement or reaction may lead to a belief that it is 'just a thought' not worth an expanded activation response. Such pauses in the flow of thoughts gives an individual the possibility to choose how to respond in helpful and nonreactive ways (Goldin & Gross, 2010). In addition, a shift from a daily mode of automatic mind-wandering to restful present moment awareness may be stress-reducing in itself, because it involves spending less resources refocusing and/or ruminating about past and future events (Roemer et al., 2009).

Empirical evidence

Mindfulness research indicates that individuals with naturally higher levels of mindfulness report feeling less stressed, anxious, and depressed, and more content, vital, and satisfied with life, in comparison with individuals who score naturally lower on mindfulness measures (Greeson, 2009). In general, the beneficial link between MT and stress-reduction in healthy adults is well-established (Chiesa & Serretti, 2009; Conley, Durlak, & Dickson, 2013; Ditto et al., 2006; Khoury, Sharma, Rush, & Fournier, 2015; Regehr, Glancy, & Pitts, 2013; Sedlmeier et al., 2012; Tang et al., 2015; Virgili, 2013). However, the research on elite cohorts is lacking, and despite mounting evidence of the stress reducing effects of MT, there are some mixed findings. For example, a recent review including studies with active control conditions showed no stress-reducing effects of MT, with small to moderate effect sizes for anxiety, depression and pain (Goyal et al., 2014). In another review, only four out of eight studies found beneficial changes in cortisol-levels after engaging in MT-interventions (Matousek, Dobkin, & Pruessner, 2010). Some have argued that MT has a stress-buffering effect (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010), suggesting that one would only expect stress-reducing effects in cohorts already experiencing stress or who are being exposed to stressful environments. Indeed, the most consistent stress-reducing effects of MT have been found in highly stressed cohorts, such as community workers (Nyklicek, Mommersteeg, Van Beugen, Ramakers, & Van Boxtel, 2013), nurses (Klatt, Steinberg, & Duchemin, 2015), and patient populations exposed to prolonged stressors e.g., patients with HIV, psoriasis, pain, or chronic inflammation (Cohen et al., 2007).

While the empirical base of the use of MT in the workplace is steadily growing, the evidence from military and aviation environments is still lacking. Exceptions are the studies on US military personnel (Jha et al., 2015; Jha, Morrison, Parker, & Stanley, 2017; Jha et al., 2010) and one study on cadets during flying selection (Fornette et al., 2012). Bearing in mind that what works in one workplace may not prove

generalizable to all workplaces, this chapter sheds light on the potential benefits and cost of implementing MT interventions of different length and formats in military aviation contexts. We review the findings of two published papers together with unpublished results from another two studies.

INTERVENTION

The Institute of Aviation Medicine designed the MT intervention following the guidelines of the Mindfulness Based Stress Reduction program (Kabat-Zinn, 1994) and the Mindfulness Based Cognitive Therapy program (Segal et al., 2002). The basic structure was 25% theoretical lectures and 75% guided MT. Theoretical lectures discussed why and how MT could be helpful. Guided practice consisted of the three basic exercises:

1. Sitting meditation: Sitting on a chair while practicing being present with one's breath and noticing thoughts, feelings, and bodily sensations.
2. Body scan: Lying down while practicing awareness of one part of the body at a time.
3. Mindful movements: Simple movements such as standing, sitting, or lying down to practice being present and paying attention to movements.

The duration of each exercise varied from 10 to 45 min. After plenary sessions, participants were invited to share experiences and problems from their personal practice in discussion groups with two to four participants. Each group then gave an informal summary presentation to the larger group. The intervention started with a 10-hour introductory course to give participants an introduction to the practical and theoretical elements of MT so they could start their own practice immediately. 2.5 hours of plenary sessions were scheduled every third week for 12 months in the combat aircraft unit and weekly for four months in the helicopter unit. Participants were offered a two-day retreat (three days for the combat aircraft cohort) towards the end of the intervention period to deepen their practice and understanding of MT. Participants received pre-recorded soundtracks with guided MT to personally practice outside of class for 10-20 minutes three times per week. To increase the amount of MT, participants were encouraged to add mindfulness to everyday activities that they usually did on 'autopilot', such as working out, talking, listening, eating, walking, and driving. To further stimulate integration of MT into daily life, the participants' respective partners were offered the 10-hr introductory mindfulness course.

To make MT more readily acceptable to the population, we designed the intervention to fit a high-performance military environment, adopting some of the mental preparation activities used by elite athletes. MT instructors had a minimum of 10 years of meditative practice and were formally accredited mindfulness training instructors at the Scandinavian Centre for Awareness Training, Oslo, Norway. One of the MT instructors was a military officer, and one could assume he facilitated programme acceptance due to knowledge of the military community and culture.

Participation in data-collection was voluntary and we followed strict, informed consent procedures.

Differences between the interventions

Study 1: 12 months – F-16 fighter aircraft environment

The intervention for the combat aircraft cohort contained six elements that were not included in the shorter four-month interventions. First, six of the plenary sessions included an additional 1.5 hours, spent on being mindful during physical exercise. Learning ways to be mindful during physical exercise was an important asset in study 1, because this was potentially an important future application of MT. They received a lecture from a former Norwegian Olympic champion in Alpine skiing, on the importance of commitment,

motivation and patience. The fighter-aircraft cohort also received a one-on-one session with an MT instructor the day after plenary sessions. Here the participants could ask questions or discuss their practice. The main aim of the one-on-one sessions was to reinforce motivation to continue practice outside the classes. Participants received six text messages reminding them of their daily practice and eight e-mails with theoretical and inspirational information related to mindfulness and MT. Finally, spouses and partners in the combat aircraft cohorts were offered evening classes in mindfulness every third week during the first six months of the intervention, in addition to the 10-hour introductory course. The plenary training sessions every third week were mandatory for all personnel, and the individual training in between was voluntary.

Study 2 & 3: 4 months – Bell 412 helicopter environment

The four-month intervention at the Bell-412 units did not include mindful movement during the weekly plenary practice. Due to space limitations at the squadron headquarters, they did the body scan sitting instead of lying down. The personnel did not receive on-to-one sessions, but spouses and partners were invited to participate on the introductory course. The weekly plenary training sessions were mandatory for all personnel, and the individual training in between was voluntary.

Study 4: 12 months – P3 Orion environment

The 12 months intervention at the P3 Orion Air-base did not include introductory course, retreat, experience sharing or one-to-one sessions. The intervention included only four two-hour lectures with three months separation. The personnel did daily sessions of 10 minutes plenary sitting meditation prior to their morning briefings. The training was organized by the mission support element or a designated point of contact and obligatory for all personnel the first six months, and voluntary the last six months.

SUMMARY OF THE STUDIES

Study 1

Aim: This study tested the feasibility and value of MT in a military combat aircraft squadron. **Assessments:** We administered subjective measures of mindfulness, mental skills, and performance-related anxiety before and after the intervention, including a semi-structured interview at the conclusion of the intervention. We collected qualitative feedback and measures of mindfulness via e-mail at 12 and 24 months during follow-up. **Results:** During post-training, there was a reduction in somatic anxiety related to performance and improvements in self-perceived skills associated with mindfulness, attention regulation, and arousal regulation. Mindfulness scores remained higher throughout the follow-up. Participants reported MT having operational benefits, and that the body scan and sitting meditation were the most useful elements of the intervention. We found time-consuming plenary sessions and the amount of recommended out-of-class training to be potential drawbacks of MT. **Conclusion:** The implementation of a 12-month MT program could be a feasible and acceptable method for implementation in a military combat aviation environment. For more details on the study (Meland, Fonne, Wagstaff, & Pensgaard, 2015).

Study 2

Aim: This study sought to determine if a 4 month MT intervention has a measurable impact on stress and attentional control in a military helicopter unit exposed to a prolonged period of high workload. **Assessments:** We compared MT participants to a wait-list control group on levels of saliva cortisol and performance on a computerized go-no go test and a test of stimulus-driven attentional capture. Participants reported mental demands on the go-no go test, time of wakeup, sleep duration, quality of sleep, outcome expectancies, physical activity level, self-perceived mindfulness, and symptoms of depression and anxiety. **Results:** The results from a mixed between-within analysis revealed that the MT participants compared to

the control group had a larger pre to post increase in high- and low-cortisol slopes, and decrease in perceived mental demand imposed by the go-no go test. Again, we found time-consuming plenary sessions and the amount of recommended out-of-class training to be potential drawbacks of MT. **Conclusion:** MT could alleviate some of the physiological stress response and the subjective mental demands of challenging tasks. For more details on the study (Meland, Ishimatsu, et al., 2015).

Study 3

Aim: This study sought to clarify how personnel in a military helicopter unit experienced interpersonal changes concerning their participation in an MT intervention. **Assessment:** Adhering to Grounded Theory, we conducted post-intervention interviews with 42 programme participants. We selected the 30 interviews with evidence of interpersonal effects for in-depth analyses to build a theoretical model of the pathways through which interpersonal effects might develop. **Results/conclusion:** The majority of the interviewees (30/42 = 71 %) experienced significant interpersonal effects from MT both at home and at work. The in-depth analyses revealed an increase in the common theme “Sense of Fellowship” (SOF). SOF comprised three primary change processes: “Attention to others”, “Self-observation” and “Reflection”. In addition, five behavioural changes emerged: “Direct communication”, “Increased patience”, “Decreased anger expression”, “Calmness”, and “Acceptance”. Finally, four additional contextual factors appeared to have particular importance for the development of SOF: “Plenary sessions”, “Sharing experiences”, “Doing something new together”, and “Sitting in silence” (manuscript in review).

Study 4¹:

Aim: This ongoing study aim to test the value of applying an MT intervention with limited amount of facilitator support on a large group. **Assessments:** We plan to collect qualitative feedback via e-mail at post-intervention and at 12 months during follow-up. Informal feedback from the participants and the leaders at the Air-base were collected throughout the intervention period. **Results:** Informal feedback from the leaders at the Air-base indicate that the intervention has beneficial effects on stress-reduction, recovery and well-being. The leaders report that increased awareness is an important mechanism behind the benefits. They also report operational benefits, such as more focused and efficient briefings and feeling more rested after flying longer sorties. Potential drawbacks of not having trained MT personnel readily available were: “A lack of understanding of the rationale for the training, and a lack of help to overcome the basic obstacles (i.e. some become more stressed, fall asleep, unsure whether they do it right (i.e. the MT))”. **Conclusion:** Interventions with limited facilitator support from MT experts may be worthwhile if planned carefully and with strong support from local leadership.

DISCUSSION

The overall aim of these studies was to test the implementation, feasibility and effects of MT interventions with different formats in military aviation environments, highlighting aspects related to stress-reduction, recovery and attention. A mix of subjective and objective measures were used to assess the level of mindfulness, mental skills, stress and attention before and after MT programs of similar structure but of different duration and facilitator support from mindfulness experts. Overall, the findings indicate that MT might be a viable complement to existing mental training for health and well-being in military aviation populations. The method did not seem to trigger unnecessary scepticism, and were effective in reducing stress and increase recovery, attentional control and the quality of interpersonal relationships.

Finding that the MT programs did not trigger much unintended scepticism among the participants is an important finding, as some performance environments might be hesitant to apply MT, because they were concerned it could trigger scepticism in their group. Overall, we found that MT could be a useful strategy for

¹ The intervention period was not completed at the time of publication of this report.

protection against stress-related fatigue and attrition effects in periods of high workload, with unpredictable stressors and emotional load. This confirms previous research showing that being mindful and engaging in MT can act as a preventive buffer towards the negative effects of high stress contexts (Cohen et al., 2007; Klatt et al., 2015; Nyklicek et al., 2013). We cannot rule out that merely sitting or lying down regularly is responsible for the stress-reducing effects of the intervention, and not the specific MT skills per se. However, we observed changes in self-perceived mindfulness in the groups, with no evidence that these effects could be attributed to changes in outer workload, physical activity, or sleep. This strengthens the probability that some of the beneficial effects also were due to adoption of specific mindfulness skills.

In other words, MT could have reduced the impact of thoughts and feelings tied to past and future events through a non-evaluative present centred awareness. Instead of striving for control or manipulating and changing thoughts, the MT participants may have learned to identify unhelpful thoughts and started to respond reflectively to them, rather than reactively (Bishop et al., 2004). All other things being equal, this could have lessened systemic arousal by reducing the proportion of daily life experience (i.e. inner and outer events) perceived as stressful to the MT participants. Similar to previous research on MT (Tang et al., 2015) we also found indications of improvement in attentional control. Since controlling attention is an energy-intensive (Warm, Parasuraman, & Matthews, 2008), finite resource (Schneider & Shiffrin, 1977), letting the attention ‘rest’ on an object or task and gently bringing it back when focus is lost, as instructed in MT, is a less energy demanding mental strategy than forcefully holding the attention in place and judging oneself when focus is lost.

Adaptation and bottom-up emotion regulation strategies may be a beneficial way to improve stress-resilience in military settings where time is of the essence and stressors are sometimes uncontrollable. However, it may also be a strategy that takes the largest investment, as studies of MT show that habituation and adaptation effects may require long-term practice (Chiesa et al., 2013). Finding the time to do the prescribed training was a challenge to our program participants. This may pose a similar problem in other groups with highly regulated schedules. Another problem is that the strategy of attending to potentially stressful internal events with greater openness may feel counterintuitive to some. It could even be detrimental to people with previous unresolved emotional issues who have previously relied on top-down governed distraction strategies to keep emotions in check. We had a psychologist tied to our projects to take care of participants who faced these kinds of reactions.

Finding that MT also had prosocial effects in our groups at work is an important finding as strong relationships and collaboration abilities among crewmembers are vital components in aviation settings (Burke, Wilson, & Salas, 2003; Wiener, Kanki, & Helmreich, 2010). The fact that it also improved relationship quality at home is also noteworthy, bearing in mind how important a well-functioning home arena is for well-being (Bakker, Lieke, Prins, & van der Heijden, 2011). Based on the in-depth interviews with 30 MT participants, we derived a Grounded Theory-based model proposing the overall construct of “a sense of fellowship” (SOF). Our suggested model of how psychosocial effects arise and develop can also help tailor future interventions that aim to target interpersonal functioning. Moreover, the interpersonal benefits and our demonstration (study 4) that MT interventions can be successfully conducted with limited facilitator support, adds to the individual benefits and makes the cost-benefit equation of implementing MT more acceptable to stakeholders.

LIMITATIONS AND FUTURE RESEARCH

Although these findings are new and intriguing, we acknowledge that our research is limited in multiple ways. Due to a lack of an active control group we cannot say anything about whether MT was more efficient than other mental training methods. MT has been found to be superior to physical relaxation for healthy adults (Sedlmeier et al., 2012), but they found no evidence suggesting MT was more effective than other meditation practices. Another issue is to evaluate the size of the ‘group-effect’, which is believed to be

particularly large in MT interventions (Imel, Baldwin, Bonus, & MacCoon, 2008). This entails randomized controlled trials (RCTs), in which one compared MT groups with groups that receive an intervention that is similar in layout and time spent with the participants, but based on different meditation principles delivered both individually and in group settings. Although we found indications of between-individual benefits of MT, future experimental studies should establish thoroughly whether MT actually influences cohesiveness in an aviation context and the exact organisational benefits tied to this.

We applied comprehensive interventions of different lengths, but we cannot give clear recommendations based on our research on what might be the optimal length of an MT program. For that, we would need to compare our interventions with shorter interventions. This is a particularly important area to pursue, because the time spent on MT could be spent on other important tasks. Although most participants seem to benefit from MT, some individuals did not. It is important to track all individual and temporal trajectories to maximize effects and reduce the costs of future interventions. To improve cost-effectiveness, MT interventions delivered by technology (i.e., web-based and via smartphones) without facilitator involvement may also be a fruitful path to investigate as preliminary evidence supports its effectiveness (Fish, Brimson, & Lynch, 2016).

We lack direct performance measures in our studies, meaning it is uncertain how our findings apply to actual job or flying performance. The use of a mindfulness questionnaire measuring only general mindfulness during daily life could also be a limitation, as it would not capture how ‘mindful’ an individual is during high stake performance situations (Thienot et al., 2014). It is also worth mentioning that the lack of a reliable measure of the quality of training is a limitation to most research on MT and should be addressed in future studies.

Applying the current findings to other military groups should also be done with great caution. Military aviation personnel might be different to other military groups in some way and may thus respond differently to the intervention. For example, military aircraft personnel constitute a unique population, as they, in addition to the requirements of being in the military, have to cope with the risk involved in flying.

Moreover, the field is still in its infancy and we have only investigated a small portion of the potential benefits of being mindful and engaging in MT for military groups. There are several other potential reasons to implement MT in a work environment, which we have not commented in this manuscript. For an overview of possible applications to pursue, see (Good et al., 2016).

CONCLUSION

We found restorative effects of MT in all studies, with indications that the benefits could be long lasting. The reported interpersonal benefits suggest MT facilitates both private and professional relationships in positive and unique ways. A few potential limitations to MT interventions were uncovered, but could be overcome or minimized by careful planning. We further demonstrated that an intervention with limited external facilitation could be worthwhile if daily training is organized in plenary sessions with strong support from local leadership.

Overall, the findings indicate that MT might be a viable complement to existing leader interventions for health and well-being in military aviation populations. MT adds to the toolbox of military aviators, by helping dampen unnecessary stress activation by learning to turn towards inner potential stressful stimuli instead of using more short-lived and energy intensive distraction and reappraisal strategies.

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Performance and Resilience Coaching for Military Leadership

Ms. Kimberly Guest, MSW

Department of National Defence
CF H Svcs GP HQ/ D MH Carling Campus, Building 9
101 Colonel by Drive
Ottawa, ON K1A 0K2
CANADA

Kimberly.Guest@forces.gc.ca

LCol Suzanne Bailey, MSW

Department of National Defence
CF H Svcs GP HQ/ D MH Carling Campus, Building 9
101 Colonel by Drive
Ottawa, ON K1A 0K2
CANADA

Suzanne.Bailey@forces.gc.ca

Ms. Sara Khan, MSc Epidemiology

Department of National Defence
CF H Svcs GP HQ/ D MH Carling Campus, Building 9
101 Colonel by Drive
Ottawa, ON K1A 0K2
CANADA

Sara.Khan@forces.gc.ca

Capt. Samantha Thompson

Department of National Defence
CF H Svcs GP HQ/ D MH Carling Campus, Building 9
101 Colonel by Drive
Ottawa, ON K1A 0K2
CANADA

Samantha.thompson@forces.gc.ca

ABSTRACT

Training programs on resilience and mental toughness building have received mixed results in their efforts to improve performance and well-being. Recognizing the potential of these programs, the Canadian Armed Forces (CAF), like other militaries, has developed the Road to Mental Readiness (R2MR) program, an evidence-based comprehensive mental health training and education program designed to increase mental health literacy and enhance resilience and mental toughness. Despite the program's successes, recent evidence has suggested that repeated application and practice of the psychological skills not only in the training environment, but also in daily activities within the unit, could further improve their retention and effectiveness. Performance coaching is a process where one person facilitates the development and action planning of another, aiding the individual to bring about peak performance under various levels of stress. Military leaders can better prepare their personnel to manage stress by ensuring that training includes deliberate and thoughtful exposure to criterion stressors combined with individual coaching of the psychological skills required to manage these stressors. In an effort to expand the psychological skills training beyond the classroom environment, the CAF has developed a R2MR Performance and Resilience Coaching Program. The R2MR coaching content is designed to enhance military occupational health by enabling CAF leadership to integrate stress training techniques into training and daily unit activities, and to coach the psychological skills that promote resilience and mental toughness. This paper will briefly review the literature supporting resilience training, stress exposure training and performance coaching, three components of a comprehensive program. The paper will then provide an overview of the R2MR coaching objectives and key teaching points, as well as review the findings from the pilot project at the Canadian Forces Infantry School. These findings which demonstrate increases in knowledge and skill acquisition in addition to changes in performance and well-being of CAF members, and point to opportunities to build on this research and find innovative ways to expand resilience training beyond the classroom environment.

1.0 INTRODUCTION

The Canadian Armed Forces (CAF), like other militaries, recognizes that mental fitness and well-being are key contributors to operational readiness. As such, over the past ten years the CAF has developed the Road to Mental Readiness (R2MR) program; an evidence-based comprehensive mental health training and education program designed to increase mental health literacy and enhance resilience and mental toughness in order to ultimately improve short term performance and mental health outcomes. Since its inception, the R2MR program has made some gains in the training of psychological skills that promote performance and positive mental health, with improvements seen in the areas of mental health literacy, skill development and confidence [1]. Despite these successes, recent evidence has suggested that repeated application and practice of the psychological skills not only in the training environment, but also in daily activities within the unit, could improve skill retention and effectiveness.

Furthermore, a unit's performance, as well as the health and well-being of subordinates, are leadership responsibilities. Thus, while the R2MR program can provide CAF members with tools, resources and information to guard against stress, promoting positive mental health is more than a health services responsibility. Commanders have a key role to play in supporting policies and programs that globally affect the health and wellness of personnel entrusted to them. As operators and leaders, it is their responsibility to ensure the appropriate knowledge and required skills are integrated into ongoing training and passed on to those who go out into harm's way so that they may be best prepared for the difficult tasks assigned to them.

In an effort to expand the psychological skills training beyond the classroom environment, the CAF has developed a R2MR Performance and Resilience Coaching Program. The R2MR coaching content is designed to enhance military occupational health by enabling CAF leadership to integrate stress training techniques into occupational/unit training and daily routines, as well as coach psychological skills that promote resilience and mental toughness. This paper will highlight the value of linking psychological skills training to resilience training, stress exposure training and high performance coaching for leadership in order to maximize the chances that these skills will be practiced and ultimately utilized in times of stress. Next, the paper will provide a brief overview of the R2MR coaching curriculum objectives and program components. Finally, the promising findings from the initial pilot project at the Canadian Army Infantry School will be reviewed, including the limitations of the current pilot and planned future directions for the leadership performance coaching program.

2.0 RESILIENCE TRAINING, STRESS TRAINING AND PERFORMANCE COACHING

2.1 Resilience training

Over the past decade, many civilian and military organizations have developed and implemented resilience-building training programs as a means of primary prevention, aiming to equip individuals with the information and skills required to prevent the potentially negative effects of stress on performance and well-being. Evaluations of these types of programs have produced mixed results for beneficial effects, with "some interventions showing effectiveness in some contexts on certain outcomes, however, the research is not clear on exactly what mechanisms are involved" [2, p. 8]. In a recent meta-analysis, Vanhove and colleagues [3] found that the majority of employment resilience-building programs were classroom-based interventions that had a statistically significant, albeit modest, effect across health and performance criteria.

In an effort to improve retention, application and generalization of resilience skills, some training programs have looked to contextualize psychological skills training to stressful training conditions and inculcate this training into real world military training. However, these attempts have also resulted in mixed results [4]. DeWiggins, Hite and Alston [5] saw promising first-hand accounts and anecdotal evidence of improved performance when they developed and implemented a mental skills program into infantry training, however no control group or objective measures were used to confirm their findings.

In the same vein, the R2MR program has also relied heavily on classroom-based resilience training contextualized, tailored and adapted to the relevant rank, task, occupation, environment or mission. R2MR has adopted the wider CAF definition of resilience which is the capacity of a military member to recover quickly, resist, and possibly even thrive in the face of direct/indirect traumatic events and adverse situations in garrison, training and operational environments; while also focusing on improving mental toughness, as defined by Gucciardi & Hanton [6], the ability to perform at the high end of one's abilities on demand and in response to varying degrees of adversity/stress. Thus, the overall training objectives for R2MR include both improved performance under stress and long-term well-being.

R2MR program development has been informed by a set of guiding principles consistent with guidance from leading experts in military mental health training [7]-[8], and the NATO Implementation Principles for Mental Health Training [9]. The guiding principles recognized that any military mental health training must be integrated into the organizational culture, based on clear requirements and needs, and built in a developmental fashion to progressively add concepts and skills over time. For the training to be well-received and useful it must also be experiential and action-focused, using tangible skills to build flexible and adaptive coping with real-world application. R2MR training content is strengths-based, building on existing skills and abilities, while creating the positive expectancy that most people can manage most demands placed on them.

While content is tailored and customized to a given environment/occupation, there are core content components that lay at the foundation of all R2MR programming. First, all content includes an explanatory approach to the stress response and its potential impact on performance and decision making. This highlights misunderstood reactions and provides a scientific explanation for why individuals should apply strategies to better manage their response to stress. Second, all content includes the three key components of optimized performance and well-being: preparation, performance and recovery. Preparation is designed to ensure individuals understand the potential stressors they might face and practice the techniques ahead of time that will mitigate this impact and improve their performance. Performance is about using the specific skills to manage the various stressors of military operations, training and daily life. The CAF has adopted four primary psychological skills (goal setting, self-talk, visualization, and activation control) that have been proven to be effective in managing physiological responses to stress and enhancing performance. Additional skills are included for specialized occupations, such as attention control, progressive muscle relaxation, mindfulness, and compartmentalization. Finally, recovery highlights the need to restore physical and mental energy. Training is geared towards employing specific recovery strategies, coping skills and recognizing signs of under-recovery.

Since its inception ten years ago, the R2MR suite of resilience-based training has demonstrated key improvements in CAF service members' mental health literacy, confidence to manage stress, self-efficacy [1] [10], ability to recognize the need for and to seek mental health support [11], and improved positive coping [12]. However, in a recent randomized control trial for CAF recruits [13], issues were found with the adoption and use of the skills outside the 160-minute classroom session.

Given the encouraging, yet limited, success of classroom-based resilience training, the R2MR program has looked to two additional conceptual models, stress training and high performance coaching, to guide the expansion of the program with the aim of improving effectiveness.

2.2 Stress Exposure Training

In the military, and other first responder training contexts, stress training has traditionally occurred implicitly or indirectly; for example as a secondary effect of intense physical training, discipline and simulation training [14]. However, such an approach has been criticized for resulting in service members being left on their own to determine the psychological coping skills required to manage stress [15], many of whom may or may not have these stress management skills fully developed and available to them.

According to Driskell and Johnson [16, p. 193], stress training is defined as “an intervention to enhance familiarity with the criterion environment and teach the skills necessary to maintain effective task performance under stress conditions.” This differs from other forms of military training, where the focus is on gaining the required knowledge, skills and abilities to perform the given military task. Stress training allows for the systematic practice and application of psychological skills under conditions that approximate the real-world environment; and this is key for improved performance in adverse or stressful situations [17]. However, CAF leadership must be able to implement stress training in a structured, deliberate manner that includes careful consideration to the types and amount of stressors and key guidelines regarding implementation. Driskell and Johnson’s Stress Exposure Training (SET) model provides such structure and guidelines, and has been found effective in managing stress and improving performance [16], [18]-[21].

SET is a three-phase training program designed to provide information, skills training, and practice, with the goal of learning how to cope and perform while exposed to the given expected stressors in the environment. In the second and third phases, practice takes place under graduated exposure to stressors; the number and types of stressors are gradually increased in successive training scenarios [17]. It is in these latter components of the SET model that military leadership can benefit by gaining key knowledge regarding instructional content, delivery strategies, and the sequencing methods of stress training.

The R2MR program leverages the SET model in a number of ways. First, the model offers an explanatory approach to the relevance and need for deliberate training against stress, as well as to how this differs from a more indirect approach. Second, leaders learn the phased approach of stress training, the importance of teaching key psychological skills and then practicing skill application in a graduated stress environment. Finally, leaders learn how specific acute stressors can be applied in a purposeful and deliberate manner to increase challenge and adversity in the training environment, without unnecessarily contributing to training failures.

This approach could further benefit CAF personnel in training in a number of ways. First, individuals develop an awareness of the activation level at which they tend to perform best. Second, CAF members are able to appropriately manage physiological activation, and learn to stay within their optimal zone of performance for longer periods of time, as well as develop a sense of control over their preparation and performance. Finally, this approach leads to the development of service members’ self-confidence, which helps build a future-orientated perception where stress is appraised as a challenge vice a threat.

However, while there are many positive components to the SET model, namely the structure and guidelines for implementation, it also has key drawbacks. Firstly, the use of mental health professionals as the primary facilitators of this training may limit its relevance and credibility for military members [15]. Furthermore, it also limits its use to subject matter experts and therefore prevents leveraging of the knowledge and skills by leadership

on a daily basis within the unit. Secondly, SET separates stress training from other military training situations and it has been argued that a more complete approach would integrate the components of stress training into the context of all intense military training situations [15]. This approach is also supported by Fletcher and Sarkar's [22] mental fortitude training, which, drawing from resilience literature, postulates that resilience interventions should take place in an individual's existing training program and include a challenging environment where individuals are taught coping skills while facing real difficulties that they are supported through. However, this later component of support points to the third area of weakness with the current SET model. That is, while feedback and support are provided in the pre- and post-performance briefings, individuals may require additional support through the coaching of the psychological skills during the training itself. This has led the R2MR program to augment this stress training approach with high performance coaching for leadership.

2.3 High Performance Coaching for Leadership

Over the past decade, the use of coaching techniques and methodologies have become increasingly prevalent in organizations seeking to enhance performance. The R2MR program has adopted the definition of high performance coaching as "the systematic application of collaborative, individualized and solution-focused psychological practices by leaders to enhance individual, group or organizational performance" [23, p. 342]. A meta-analysis on the effects of coaching on individual level outcomes by Theeboom and colleagues [24] found significant positive effects of coaching on five individual level outcomes: performance/skills, well-being, coping, work attitudes, and goal-directed self-regulation. Furthermore, Vanhove and colleagues [3], in the aforementioned meta-analysis, found that in regards to resilience-based training programs, more direct formats such as those that focus on one-on-one coaching were found to be most effective. They hypothesized that this may be due to the fact that such formats allow for adaption to trainees' unique needs and hold trainees accountable, while also allowing for application to specific experiences and situations.

High performance coaching provides a framework to assist leaders to integrate and encourage the use of the psychological principles of stress and coping into pre-existing training settings with its roots in both positive psychology [25] and coaching psychology [26]. Both of these theoretical models share a focus on performance enhancement, leveraging individual strengths and the positive aspects of human nature [24]. High performance coaching techniques such as the use of effective questioning, active listening, setting meaningful training goals, and providing effective feedback can all be applied to the learning and practice of psychological skills training.

The R2MR coaching program has incorporated these techniques as they apply to the skills of goal setting, visualization, positive self-talk, activation control and attention control. Specific instructions are provided to leaders describing how to support subordinate application of these skills in training and operational environments. These include: the observation and assessment of subordinates' stress management abilities, identification of any performance gap between their current ability and the desired ability, assisting subordinates to set appropriate psychological training goals, providing instruction on a given skill technique, providing key reminders and cues to apply the skills in-situ, utilizing language that supports the development of the skill sets, and at times creating and inserting activities that directly apply the techniques, such as visualization scripts and mental training plans. R2MR has also incorporated mental training plans, which provide leadership with a tool to encourage subordinates to plan ahead and create individualized strategies to build psychological skills into their performance [27]-[28]. These training plans include preparation, performance and recovery plans to ensure subordinates have a predetermined structured approach on how they will cope with given stressors, including overcoming obstacles and setbacks.

As previously mentioned, the R2MR performance coaching is a leadership-driven program, in recognition of the reality that leaders are ultimately responsible for the performance and well-being of their subordinates and are best

situated to provide the required operational relevance and credibility. As was advocated by Thompson and McCreary [15] in their mental readiness training model, mental health professionals are not eliminated from the training process, but rather are utilized to teach the essential theory and skills to the leadership and then play a consultative role in supporting the integration of these concepts into military training environments, respecting the fact that the primary responsibility for designing and implementing unit training falls to the chain of command. Furthermore, leaders, once trained on these skills, can also reference and utilize them in other aspects of military life given that psychological skills are not only helpful in performance situations, but are also key life skills. For example, tactical breathing should be encouraged and coached not only to improve performance during operational tasks, but also as a key skill whenever an individual is experiencing distress. The R2MR program operates on the belief that empowering leaders to fully integrate psychological skills will ultimately contribute to broader integration of these skills into military training and exercises.

3.0 R2MR PERFORMANCE COACHING PROGRAM OVERVIEW

The R2MR performance coaching course is a two-day (720 minutes) classroom-based training designed to assist CAF leaders to coach psychological skills throughout regular training activities, as well as implement effective stress training techniques in order to improve military performance and subordinate well-being. The CAF defines leadership as directly or indirectly influencing others, by means of formal authority or personal attributes, to act in accordance with one's intent or a shared purpose [29], and as such this course content would arguably be helpful to all CAF members, the R2MR coaching program has targeted those in positions of formal authority (MCpl and above; Capt and above), with a particular emphasis on those leaders currently employed in a CAF training institution.

The core pedagogical approach to this curriculum is learning-centred with both teacher-centred activities such as didactic instruction for delivery of foundational theory along with learner-centred activities to promote reflective and collaborative learning amongst participants, including multimedia content, large and small group discussions, individual activities, and application simulations. The material is split into eight modules. For a summary of the timing and key objectives of each module refer to Table 1.

Table 1: Overview of R2MR Performance and Resilience Coaching Program including module titles, timings and key learning objectives.

Module	Timing	Key Learning Objectives
What is mental skills training	30 min	- Define resilience and mental toughness - Describe three elements to achieving optimal performance: preparation, performance and recovery - Identify three key outcomes of mental skills training: thriving in the face of adversity, failing forward, adopting a challenge mindset
High performance coaching	30 min	- Differentiate between teaching, training, mentoring and coaching - Apply key high performance coaching techniques: observation, effective questioning, active listening, goal setting, and effective feedback - Describe how high performance coaching is linked to building self-confidence and improving performance
Physiology of stress	45 min	- Define stress and pressure - Differentiate between acute and chronic stress - Differentiate between cognitive and somatic performance anxiety

		• Describe the impact of stress on performance • Identify the physiological and cognitive impact of stress
Key mental skills (Big Four+)	120 min	For each of the Big Four Plus skills (goal setting, visualization, self-talk, activation control, attention control): • Describe the benefits of the skills and how the skill works to mitigate the impact of stress and improve performance • Learn and apply the techniques of each of the key skills
Stress training and coaching mental skills	120 min	• Describe the role of adversity in improving resilience and performance • Describe role of leadership in assisting subordinates to overcome adversity • Identify key acute stressors that can be used to create stress in training and describe how each impacts on performance • Apply acute stressors to current training environment • Differentiate between training and stress training • Translate each of the three components of stress exposure training to the CAF training environment • Apply high performance coaching techniques to mental skills
Syndicate application and Simulations	180 min	• Apply the three components of stress exposure training to CAF training environment • Apply high performance coaching techniques to mental skills training in CAF training environment
Assisting subordinates who struggle and recognizing distress	75 min	• Differentiate between threat and challenge appraisals • Describe the role of leaders in promoting the development of challenge appraisals • Apply CORE questions to assist subordinates to manage setbacks • Differentiate between stress and distress in subordinates in a training environment • Apply key leadership support actions to subordinates in distress
Managing leadership stress	120 min	• Identify sources of leadership stress • Define recovery • Identify individual recovery activities • Identify individual coping strategies

After an initial introductory session that situates the coaching material within other R2MR training and establishes the course objectives, the first three modules of the program are designed to establish the relevance and importance of psychological training in promoting optimized performance. Leaders are taught aspects of resilience, mental toughness, stress management and high performance coaching theory to help them appreciate the potential benefits of integrating the coaching concepts into their training. Leadership buy-in, which is crucial to implementation, cannot occur if leaders do not fully understand the foundational concepts. Following the theoretical component, the focus of the training turns to ensuring that leaders fully understand each of the key psychological skills employed by the R2MR program: goal setting, visualization/imagery, self-talk, activation control, and attention control. Each of the skills is taught in detail and includes individual practice application. While this module is repetitive for those who have been previously exposed to R2MR training, it is recognized that an advanced understanding of each skill is required in order to facilitate coaching and skill development in others.

Module five includes the process and techniques to implement stress training and coach the key psychological skills. Leaders discuss the importance of adversity and challenge in military training and the importance of selecting the correct types of acute stressors to facilitate growth and confidence building. By training leaders on the need to link the type of stressor (i.e. time pressure, task load, novelty, etc.) to the performance and environmental demands, leaders can make informed choices on appropriate stress training. For example, while sleep deprivation is often used to augment stress levels, it is counterproductive when trying to teach subordinates new information or skills. Furthermore, in training situations, creating adversity is not about cruelty and, in fact, the role of leaders is to help subordinates anticipate obstacles and recover from setbacks, rather than yelling at them indiscriminately and further fuelling the stress response. The training includes how to implement each of the three components of stress exposure training, with a particular focus on pre- and post-performance briefings, and high performance coaching techniques as they are applied to each of the core psychological skills.

The next module follows with a detailed practical application of the stress training and coaching content. Leaders are placed into small groups and asked to deconstruct a current training activity. With the acknowledgement that many of the more challenging military courses already involve a graduated exposure to increasingly realistic training scenarios, but may lack the link to performance deficits and required coping strategies, relevant current training activities are deconstructed in syndicate work. Participants in each syndicate are asked to identify the acute stressors being targeted; prepare a pre-performance brief; discuss coaching techniques to be used and provide details on what, where and when the psychological skills could be coached; and prepare a post-performance brief demonstrating how they would provide feedback on the use of the psychological skills. This methodology ensures that those with the technical and tactical experience and expertise are designing the training activities, with the support and subject matter expertise available to them on how to ensure that personnel are trained effectively in stress management by embedding stress training techniques and psychological skills within the overall training objectives. Syndicate presentations are shared with the larger group and discussion is focused on relevance of information and challenges to implementation. Thus, at the end of the coaching course, each group will have developed a systematic protocol for integrating psychological skills into unit training activities.

The final two modules of the course focus on distress and recovery in both subordinates and leaders. Understanding that resilience and mental toughness are not solely concerned with performance, but also with overall well-being, these modules are highly relevant. Topics covered include assisting subordinates to bounce back from setbacks and recognizing and supporting those who develop more significant mental health issues. Additionally, leaders will only be able to coach and develop these psychological skills in their subordinates if they themselves are psychologically healthy, therefore, the need for leaders and instructors to employ and model these skills is further highlighted.

At the completion of the training, participants are provided with a facilitator manual that summarizes all of the theoretical aspects of the program, provides direction on implementation of the three-phased SET approach, lists acute stressors that can be leveraged in training, and reviews key coaching strategies. Leaders are also provided with trainee materials including an R2MR skill refresher brief, a template for a post-performance questionnaire, a guide to building a tactical mind set, and a mental training plan template. Leaders are encouraged to use these tools as they see fit in their training environments.

4.0 PILOT IMPLEMENTATION AT CAF INFANTRY SCHOOL

4.1 Background

In an effort to begin testing the effectiveness of the performance coaching program in improving performance and well-being, the R2MR program partnered with the Infantry School at the Canadian Army Combat Training Centre (CTC) in Gagetown, New Brunswick. Military course instructors on the Basic Military Officer Qualification - Army (BMOQ-A), a primary leadership course for Army officers, were provided the R2MR coaching curriculum in order to integrate stress training techniques and coach the psychological skills with the course candidates during the BMOQ-A. The decision was made to test effectiveness by examining the course candidates' self-reported use of the psychological skills and levels of performance anxiety during stressful aspects of the training.

4.2 Methodology

An initial search of the sport performance literature was undertaken to identify potential existing measures that could be used or slightly modified to suit this military setting. Three measures were identified: the Sport Competition Anxiety Test (SCAT), a measure of performance anxiety [30]; the Competitive State Anxiety Inventory-2 (CSAI-2), a sport-specific state anxiety scale [31]; and, the Athletic Coping Skills Inventory (ACSI), a measure of psychological skills [32]. The language in these measures was modified slightly to remove reference to sport and insert references to military training.

Data was collected from 78 BMOQ-A course candidates. These CAF members, having just completed basic training, had some initial exposure to the psychological skills through a 4 hour R2MR session during their basic training, therefore, no additional subject matter expert classroom-based training was provided, however leaders were given a R2MR refresher package to present to the students to ensure they were able to recall and apply the salient aspects of the skills. Course candidates were asked to complete the three performance-related scales prior to the start of their course (pre) and again at the end of their 55-day leadership course (post). The completed pre- and post- forms were matched for each individual using a unique identifier.

4.3 Results

The results of the SCAT showed a significant decrease in the mean anxiety score from pre to post with a small effect size (Cohen's $d=0.25$) (Table 1). When using the CSAI-2 (Table 2), a statistically significant improvement was observed for the self-confidence subscale with a medium effect size (Cohen's $d=0.40$). For the ACSI (Table 3), highly significant increases in 'goal setting & mental preparation' and the total score were observed with medium effect sizes. 'Peaking under pressure' and 'concentration' subscales also showed significant increases in post-course scores but with small effect sizes. Overall, these findings demonstrate reduced anxiety levels in course candidates and positive changes in the areas of 'self-confidence', 'goal setting & mental preparation', 'concentration' and 'peaking under pressure', which are all directly aligned with the key objectives of the training.

Table 1: Mean score and standard deviation as determined by the Sport Competition Anxiety test (SCAT) before and after the BMOQ-A course.

	Pre-course Mean (SD)	Post-course Mean (SD)	Cohen's d	p-value
Total	19.36 (4.36)	18.29 (4.07)	0.25	0.015*

*Significance at $p < 0.05$.

Table 2: Mean scores and standard deviations for each of the three subscales of the Competitive State Anxiety Inventory-2 (CSAI-2) before and after the BMOQ-A course.

	Pre-course Mean (SD)	Post-course Mean (SD)	Cohen's d	p-value
Cognitive Anxiety	19.03 (6.37)	17.87 (6.50)	0.18	0.15
Somatic Anxiety	15.10 (4.94)	13.97 (4.07)	0.25	0.090
Self-confidence	25.10 (6.17)	27.55 (6.11)	0.40	0.002*

*Significance at $p < 0.05$.

Table 3: Mean scores and standard deviations for each of the seven subscales of the Athletic Coping Skills Inventory (ACSI) before and after the BMOQ-A course.

	Pre-course Mean (SD)	Post-course Mean (SD)	Cohen's d	P-value
Coping with adversity	7.05 (2.04)	7.29 (2.01)	0.12	0.21
Coach ability	9.68 (1.90)	9.53 (2.06)	0.08	0.49
Concentration	6.83 (2.18)	7.38 (2.19)	0.25	0.007*
Confidence & Achievement motivation	7.55 (2.08)	7.91 (2.11)	0.17	0.052
Goal setting & mental prep	6.45 (2.25)	7.68 (2.35)	0.54	0.000002*
Peaking under pressure	5.58 (2.95)	6.41 (2.80)	0.29	0.0002*
Freedom from worry	6.47 (2.51)	6.72 (2.61)	0.10	0.35
Total	49.62 (11.11)	52.92 (10.97)	0.30	0.00009*

*Significance at $p < 0.05$.

4.3 Limitations and Future Directions

Several limitations exist in this initial attempt to study the effectiveness of the coaching course. First of all, the three scales used were adapted from sports psychology with slight modifications to remove the sport context, and

the reliability and validity of the modified scales were not determined in the CAF. Moreover, there was no control group in the study, which means that the improvements of scores on the performance scales could be attributed to the Infantry School training, or growth and maturation over time, instead of the performance coaching training. Next steps could include either validation of the modified SCAT, CSAI-2 and ACSI or establishing psychometric properties of a new scale using relevant questions from the SCAT, CSAI-2 and ACSI. Once a validated scale has been established, further research needs to be conducted administering the validated scale to control and intervention groups at various time points, which would help determine the efficacy of performance coaching. An additional limitation of the current study is the relatively small sample size. Once a validated scale has been developed, future applications of the material with additional CAF personnel would provide further opportunities to measure effectiveness. Finally, the current study focused on the improvement of the candidates' performance on the course and not on the coaching behaviours exhibited by the leaders employing the coaching course content. Future studies could explore and measure the coaching behaviours of the leaders to ensure the coaching content is being implemented as intended.

5.0 CONCLUSION

As discussed, since launching the Road to Mental Readiness program, the Canadian Armed Forces has seen notable improvements in CAF members' mental health literacy, confidence to manage stress, self-efficacy, ability to recognize the need for and seek mental health support, and improved positive coping. While these results are encouraging, other evidence from our program has suggested that the adoption and use of the psychological skills outside the classroom session has been limited. This finding mirrors results from other resilience-based training efforts, as discussed earlier in this paper.

However, if one examines the learning of other physical, technical, or tactical skills, these limited results should not be surprising. For example, one would not expect massive improvement in physical fitness skills if the sole intervention was one or two days in the gym reviewing physical fitness theories and key workout strategies with no follow up, encouragement or integration of physical fitness into any other military tasks. Similarly with technical skills, one would not be surprised with poor marksmanship skills, if the only intervention was a classroom session on weapons handling and instructions on how to operate the rifle. In the same vein, it is unrealistic to assume that one or two days of classroom based resiliency training would result in the generalization and integration of psychological skills into all aspects of an individual's professional and personal life.

As military organizations continue to implement resilience-based training programs, efforts must explore how to expand this training beyond the classroom environment. Furthermore, these efforts need to be undertaken in partnership with unit leadership, who retain the ultimate responsibility for the performance and well-being of their personnel.

The purpose of this paper was to review how the Road to Mental Readiness program, relying on the well-researched approaches of resilience training, stress exposure training and high performance coaching, has developed a training package to assist CAF leadership to integrate psychological skills into regular military training and other unit activities. This program has been piloted with encouraging results at the CAF Infantry School and, although this is only an initial step towards the ultimate goal of implementing an effective performance and resilience coaching into all aspects of military training, it is hoped that by sharing this information with other researchers and practitioners in the resilience field, further programs and studies can build upon this information and establish research-based approaches to taking resilience training beyond the classroom.

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Team Resilience in the IDF – Model and Intervention Scheme

Tal Polachek

IDF/Behavioral Science Department
Adad 17, Lehavim 85338
ISRAEL

tal_polachek@yahoo.com

Adi Shirazki

IDF/Leadership Development School
Herzel 1b, Zihron-Yaakov 3090201
ISRAEL

adish74@gmail.com

ABSTRACT

The characteristics of the classical war phenomena include disruptive factors affecting the capability of individuals and/or teams in combat to keep fighting. Classical disruptive factors of fighting include physical strain, fear for one's life, sleep deprivation, hunger etc. and on top of those in the last decades soldiers also face growing complexity in terms of multi-dimensional fighting surroundings and the hybrid nature of conflicts where civilians, guerilla forces and formal armies are all present in fighting zones. Military forces can improve their capabilities of dealing with such disruptive factors, by developing the resilience of the troops. Tough fighting in teams is a common strategy among combat units. Most of the programs which aim at developing resilience, as well as the research in that field, focus on the individual level. Indeed, a team comprising of highly resilient individuals may have positive effect on performance at combat situations and preservation of good mental state through and after the events, nevertheless, it seems that "the whole is more than the sum of its parts" and there are certain features of resilience that exist only at the team level. In the IDF we acknowledged the importance of 'team level resilience' as a crucial complementing factor to the individual soldier resilience. It enhances both individual function and team performance in combat situations. This article describes the model of "Unit Resilience Program" that was developed recently to conceptualize both the individual and team resilience in the IDF. The model was based on theoretical screening as well as field data analysis. It reflects a cooperation of several professional departments, in the IDF: Leadership Development School (L.D.S), the Mental Health Department (M.H.D) and the Behavioral Science Department (B.S.D).

1.0 THE RESILIENCE MODEL

The model conceptualizes resilience as a set of several competencies, in the individual and team level. When these are reasonably present, there is higher potential for the individual and team to cope during the stress of combat situation, to enhance operational continuity and to mild traumatic aftereffects. The model distinguishes between the resilience of the individual which, relies on resources of physical, emotional, perceptual- cognitive, motivational and social resources and resilience at the team level which compound from resilience facilitating leadership, task cohesion, collective efficacy, positive social and emotional climate, and shared locus of control. The model also refers to the reciprocal relationship between the individual and team elements.

The commander – the team leader, is an essential pivot in that model: As an individual in a leading role, he is expected to demonstrate high resilience when dealing with his own stress, as well as to act as role model to his soldiers. Moreover, as the commander and leader of the team he is essential as the facilitator for the team resilience developing process during the preparation stages. During operational activity the team/unit leader also holds a mediating role that has the potential to influence the volume of perceived stress factors.

In addition, the article suggests a preliminary measurement of the IDF resilience scheme's effectiveness as well as potential predicting measure of the team resilience in combat situation.

1.1 Fighting Unit Resilience Program

The FIGHTING UNIT RESILIENCE PROGRAM is aimed to support the combating unit when facing challenges, stress and even life threatening situations during fighting and to support the quality of their recovery and returning to routine function after such experiences. The program relies on accumulated academic research and field evidence from different sources (including the American CSF - Cornum, Matthews & Seligman, (2011) combined with knowledge and insights of military psychology in the IDF.

The program uniqueness expressed by 2 aspects:

Firstly, it provides conceptual frame consists of three complementary aspects, which together can create the infrastructure for enhanced resilience of the combating unit: The individual (intra- personal) resilience, the unit/team (group as a whole) resilience and the aspect of leadership role in promoting resilience.

Secondly the program aims at providing solution for resilience enhancement to the many, this is an innovative approach since other existed programs, to date, are depended on professional intensive involvement and designed for small and unique forces. The program suggested relies on rational of low intensity CBT principles and group dynamic logics. So that tactic level commanders can easily learn and apply the program's tools which enable continues assimilation.

Unit resilience is defined as **the ability of soldiers, commanders and units to adapt and to operate successfully through and after stressful and threatening events that challenge the function of the unit and completing the mission.**

This definition refers to resilience as a set of acquired competencies that can be developed through a continuous process (Connor & Davidson, 2003). Soldiers' commanders and fighting teams can acquire practical tools that can help them to respond adaptively and effectively when facing threatening and stressful experiences. These skills can also contribute to their successful and quick recuperation (Meredith, Sherbourne, Gailliot, Hansell, Ritschard, Parker & Wrenn, 2011).

Resilience at the individual (soldier /commander) level is the ratio of frequency and volume of stressful experiences relative to the person's available physical, emotional, perceptual- cognitive, motivational and social resources (Matthews, 2014). At the unit/ team (group) level there are resources which are unique to the team level and derived from the team/ group dynamics and the team's group relations with its leader: Task cohesion, collective efficacy, shared inner locus of control, and positive climate (Meredith et al, 2011, Matthews, 2014, Cornum, Matthews & Seligman, 2011).

Resilience is not a stable characteristic, it can fade when facing frequent adversity, just like a battery that is overused (Smith, Dalen, Wiggins, Tooley, Christopher & Bernard, 2008). Especially in the tense and complex reality of military service. Therefore, the better we equip soldiers and units with these competencies and teach them the skills to maintain them, the higher the chances for effective coping adapting and recuperation (Meredith et al, 2011).

In current times, due to the information revolution and the variety and quantity of technological developments, the pace of changes has done a qualitative leap. The characteristic of our era forces us humans to experience volatility handle complexity adapt quickly to frequent changes as well as to recover quickly from stressful events and crises. The military reality is no different. The army operates in surrounding rich in complexity and ambiguity (Matthews, 2014). The reality in our region is volatile and tense, the enemy's creativity forces the IDF to respond to changes all the time and seek for solutions that are innovative and flexible. Moreover, the future fighting conceptions are heading towards growing multi-tasking operational action in small and flexible structures. Quick learning and adjustments will be crucial abilities in fighting;

alongside with the ability for quick construction and deconstruction of fighting teams, small forces will fight independently scattered on the battle field. All These characteristics of the future battle field require high resilience of fighting soldiers, teams and their leaders (Matthews, 2014).

In response to the typical generic challenges of present times and (which emphasize the importance in coping with pressures and effective adapting to frequent changes), theoretical and applied research of resilience has widened. There is accumulating proof to the effectiveness of developing resilience as a protective step when preparing for stressful events and adversity. Around us many resilience programs were and are developed, to provide coping skills for variety of life areas and populations (Masten, & Reed, 2002, Luthar, 2015, Masten, 2018).

There are programs for children and/or communities in high risk environments, programs for first line workers (paramedics, firefighters etc.) and there are also resilience programs in other army forces and in business organizations (Meredith et al, 2011, Cornum, Matthews & Seligman, 2011, Wolmer, Hamiel, Pardo-Aviv, Laor, & Center, 2018). It seems that time has come for equivocal development in the IDF. Currently most efforts in preparing the troops for coping with typical stressors of fighting focus on exposure to difficult and sometimes even overwhelming fighting conditions, through variety of simulation techniques. The fundamental edition in the IDF-RESILIECE SCHEME is the preliminary preparation of individual soldiers' commanders and fighting units/ teams to such encounters by equipping them with:

- a. Inter- personal tools to regulate and manage automatic fear and stress reactions and cognitive tools to support motivation and positive thinking.
- b. Intra- personal tools designed to enhance team building and promoting communication skills and within the fighting unit
- c. Group level tools to promote quick and effective team construction reconstruction.

1.1.1 Why it is important to develop the fighting team's resilience

- It is possible to develop units and teams to become more resilient.
- A team comprising of highly resilient individuals has positive effect on performance at combat situations and preservation of good mental state through and after the events, nevertheless, it seems that "the whole is more than the sum of its parts" and there are certain features of resilience that exist only at the team level and need to be taught and trained in advance.
- In an era in which it is becoming difficult to overcome the enemy by kinetic means and classical fighting methods are changing, the resilience of the team/unit is a crucial resource before during and after fighting.
- The future vision of the warfare on land suggests that young commanders in the tactic level, will have to deal with prolonged periods of independent fighting, frequent changes that require quick adjustments including construction and deconstruction of fighting teams. These conditions are negative predictor to the soldier well-being and effective function of the team/unit. In such situations the need for better awareness and expertise of low-level commanders for individual and team resilience enhancing and maintaining techniques, is crucial.
- The IDF due to the structure of its training programs and its values of self and team development offers good platform to reach the many. Such Program if applied successfully can have influence in the national level.

1.1.1.1 The components of Fighting unit resilience

Components of individual resilience:

Only part of one's resilience can be explained as personal born traits and/or characteristics acquired in the early childhood. The literature refers to these components as Hardiness (it includes characteristics as optimistic tendencies stamina, decisiveness and resourcefulness (Bartone, Kelly, & Matthews, 2013). The literature While hardiness defined as a trait that a person has or has not, resilience is a wider phenomenon that can be developed. In the Model we suggest that individual resilience relies on 5 core competencies. Enhancing these core competencies enriches the individual resilience resources.

Physical competency: Fit and healthy body that can handle pressures and difficult environmental conditions- developing the fighter gradually to tolerate physical pressures and inconvenience make him/her more resilient to extreme conditions. Therefore, awareness to Bartone et al (2013) the body condition and maintaining good nutrition, and fitness is an important factor in resilience developing.

Emotional competency: The ability to feel calmness clarity and focus under threatening or conflictual situations is concerning one's ability to regulate one's emotional energy. The body plays an important part in regulating this energy. By operating correctly physical mechanisms, negative emotions such as fear, frustration and anger, can be controlled and thus influence the quality of function.

Perceptive-cognitive competency: cognitive patterns and beliefs influence the way a person perceives reality and direct one's reactions accordingly. The same situation can be perceived as threatening and overwhelming or controllable and solvable depending on the person's perception of it. Learning the human cognitive biases and the automatic individual cognitive patterns and understanding how to break negative and ineffective thinking patterns can change reaction to difficult and threatening reality.

Motivational competency: As Nietzsche said: "those who have a 'Why' to live, bear almost any 'How'". Personal motivations such as preserving self - esteem or dignity, caring for others, or validating need for achievement, as well as deep connection to oneself values and the values of the unit/ the army or any social group, can serve in times of hardship as a directive and supportive resource. Spiritual faith (religious or other), can also support one's coping and maintain resilience in times of need.

Social competency: Strong and meaningful social relations inside the unit and on outer circles promotes the sense of psychological security of the individual soldier and on the same time having good and strong social relations enhance the practice of social skills and social positive behaviours e.i: empathy, altruism, communication and compassion. Thus, nurturing positive social relations serve as important resources in times of pressure and conflict that contribute to the individual and the team.

Application:

The program provides cognitive and physical tools designed to strengthen emotional and physical regulation and effective thinking. The motivational and mental component is addressed by the strong and established mechanism of the army's generic values education. Sense making of the commanders in time of challenge and adversity is important in maintaining resilience, hence commanders in the tactic level should be taught and train to the relevant skills. The social component requires the attention of commanders to the soldier's social support and social relations inside and outside of the unit they should apply actions that promote values and behaviours of good and supportive relations within their teams/units.

Team resilience and how to develop and nurture it:

The resilience of the fighting team or unit is somewhat affected by the individual resilience of its members,

but their individual resilience alone cannot stand for certain qualities of the team/unit resilience. The ability to adjust and to react flexibly to challenges, and to recover from crisis, while maintaining the framework of the team and the focus on the mission, require much more than resilient team members. Team level resilience is a crucial complementing factor to the individual soldier resilience. It enhances both individual function and team function and performance at its mission. Team/unit resilience is comprised of certain unique competencies:

Task cohesion, Collective efficacy, Positive social and emotional climate, and

Task cohesion refers to shared values norms and perceptions of all team members that achieving the task goals and performing in high standards comes first. In order to achieve that the team develops mechanisms of cooperation communication, support. Thus, it can tackle unexpected problems and obstacles during action and can compensate one another performance. Teams that are high in Task cohesion form also mechanisms for progressing learning/

Collective efficacy refers to the confidence of team members in the capability of the team to carry its tasks and to achieve its goals successfully.

Shared locus of control refers to the strong shared perceptions of the team members about the team responsibility to the outcome of the team actions and their influence

Positive social and emotional climate means nurturing good communication, mutual trust and nurturing values of altruism and consideration as well as maintaining positive atmosphere and humoristic attitude when facing difficulties and obstacles.

Application:

The tools that are developed for the team level, designed mainly for the team/unit leaders- first socio and psycho education tools that provide the basic understanding about team resilience and how to develop and maintain it and then practical tools and techniques for quick team building and adjustment, that can support the tactic forces commander who need to respond to the growing pace of events during fighting.

1.1.1.2 Resilience facilitative leadership

Resilience reside in the official IDF definition for leadership as one of its components it is an important factor that its presence supports the commander coping with personal threats and challenges as any other soldier and much more due to his leading role.

Aside from the personal aspect to the army leader, in FURP the commander plays a key role in assimilating the necessary knowledge skills and values in his unit. In the model we describe his three roles in assimilating and developing resilience of the fighting team/unit.

The commander/ leader as a facilitator: Since resilience is enhanced and maintained through a continuous and complex process, the team commander has an important role in teaching (or cooperate with others to teach), his people the basic knowledge and skills of the resilience training program. The leader is also responsible for keeping the resilience training routines and supervise the individual and team progress.

The leader as a role-model: The leader in his daily routines of practicing the resilience enhancing and maintaining techniques taught in the program, act as a role model to his people, and by that encourage them to practice too. When encountering challenges and threats the leader's regulated reactions and his use of

relevant skills and tools can set an example for his team/unit and positively influence both his soldiers as coping individuals and the team climate.

The leader as a mediator: creating clear and framed picture of reality in a way that remind the individual soldier and the team/unit, their strengths and capabilities and skills. By doing that he offers hope and optimism during and after experiencing challenge or crisis, this can serve as an important factor in preserving and re-charging resilience resources.

Application:

Developing the commander as a resilience developer is done in two stages:

At the first stage the program focuses on acquisition of individual tools such as emotion regulation and positive cognitive training and it involve learning and practice. At the second stage the leader learns the framework and tools for developing team resilience. Simultaneously his role identity as a resilience developer need to be addressed.

1.1.1.3 How IDF-RESILIENCE SCHEME Is Implemented

1. Every commander who leads a fighting unit/team should keep in mind the importance of resilience resources and their contribution to the individual and team/unit in fighting.
2. In developing the individual skills for enhancing and maintaining resilience repetitive practice is needed in order to achieve enough levels of implementation meaning, the ability for automatic recall. After achieving that level, repetitive practice continues in order to maintain the competency. This principle is very much like other basic military skills and the methods of their implementation in training.
3. The tactic commander (team leader), is responsible to train and develop his soldiers in every aspect (professionally and mentally). He or she builds them as soldiers and eventually the commander, or his successor will operate them in action. Thus, when applying resilience training, the tactic commander should train alongside the soldiers so that methods language and actions can become common knowledge and even habits, norms and values of the team/unit.
4. Professional knowledge and skills can be first taught by experts, nevertheless, the efficient and effective implementation is the responsibility of commanders. They should keep the training routines and identify gaps in the implementation process where professional support might be needed.
5. In order to enhance implementation it is recommended to identify suitable and oriented commanders within the units and grant them the training and qualifications to serve as resilience officers on the field.
6. The Knowledge and skills are generic in nature. The program can fit every situation that drive a person and/ or a team out of their comfort zones and enable to use tactics that were acquired in advance in order to stabilize the reaction and function effectively. Therefore, it can and should be practiced in all military contexts. The more the skills of the program will be practiced in a varied environment the greater the chance the skills will be automatically used in actual combat situations.
7. The training of soldiers and unit by the Principles and tools can start from day one in the army and progress as part of the general training of the soldier in similar way to all others basic skills and

competencies the soldier acquire in his ongoing training. Maintenance and recharging should be applied in accordance with the soldier activity until his release from service.

8. Resilience it is not endless it can be compared to a rechargeable battery that must be recharged after use. Commanders should be aware of that, create and allow opportunities for recharging.
9. Psychologists from the Leadership Development School and (L.D.S), Behavioural Science Department (B.S.D). are responsible for developing the program and for its implementation in collaboration with the high command of the Army and the tactical ranks.

1.1.1.4 Measuring Expected Team Resiliency in Battle

A method for measuring resiliency up to the unit level has been developed using data from field research. The measurement is based on a synthesis of reliable equipment that is used to estimate resiliency (Connor & Davidson, 2003, Carron, Colman, Wheeler & Stevens, 2002). The measurement is tailored for military combat units. Using this evaluation, we can predict the resiliency of units during combat, if there is a direct link between high levels of resiliency and optimal function. As such, using this evaluation allows the commander to receive status reports periodically over the course of combat as well as precise information of the plan to develop resiliency. The evaluation presents the resiliency infrastructures: resilience facilitating leadership, task cohesion, collective efficacy, positive social and emotional climate, and shared locus of control.

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Leveraging Technologies to Complement the Road to Mental Readiness (R2MR) Training Program

Joshua A. Granek, Anthony Nazarov, Madeleine T. D’Agata, Junhan Bae, Hamid Boland, Ramy Kirollos

Defence Research and Development Canada (DRDC) – Toronto, Department of National Defence
CANADA

Kimberly Guest & LCol Suzanne Bailey

Canadian Forces Health Services Group, Canadian Armed Forces, Department of National Defence
CANADA

Josh.Granek@forces.gc.ca

ABSTRACT

The Canadian Armed Forces (CAF) considers the mental health and resiliency of its members a top priority. Leveraging technologies to create innovative approaches to mental health and resilience training may further optimize the well-being of military personnel. As one example of leveraging technologies in response to this CAF priority and in an effort to expand and modernize the Road to Mental Readiness (R2MR) mental health and resilience training program, the CAF designed and developed a mobile application (i.e., “app”) – the R2MR app. The R2MR app is designed to provide on-the-go training to help manage stress responses, improve short-term performance and long-term mental health outcomes, as well as to promote treatment-seeking behaviours. The app is based on cognitive behavioural theory (CBT) and allows for repeated practice by the user. Six modules (e.g., self-talk, goal-setting) were developed to build CBT-based training scenarios to help users achieve mental health objectives. For instance, the mental health continuum model (MHCM) module enables users to self-monitor using a visual spectrum, accompanied by descriptors designed to correspond to four health anchors (i.e., healthy, reacting, injured, and ill). Further, a seventh module was added to the R2MR app on working memory to help users improve their fluid intelligence.

As part of the validation process, the R2MR app has gone through numerous studies to ensure usability, functionality and relevance. Specifically, the R2MR app has gone through an expert analytic assessment to ensure that the design abides by established interaction design principles and usability heuristics. Further usability studies have been conducted using the Concurrent Think Aloud (CTA) protocol, wherein participants verbalize their thoughts and behaviours while using the app, imparting insight to effectively tailor the app to different user demographics. In order to validate the content of the MHCM module of R2MR, an experiment was conducted to assess if the descriptors correspond with the visual spectrum and the anchors, as well as to validate portions of MHCM self-assessment. Our results indicate that further refinement to the phrasing of the descriptors could improve self-mapping consistency. We evaluated the benefits of arousal control training in various performance environments (e.g., marksmanship), using different populations (e.g., Military Police, civilians). This was done using the heart rate biofeedback and stress scales in the app. The results suggest the settings and instructions should be configured based on users’ demographics and trade. Future directions and opportunities to further leverage technology in the space of mental health and resiliency will be discussed such as investigating training with the R2MR skills in a serious game with haptic feedback and biofeedback will evaluate engagement and performance under controlled and immersive stressors. Importantly, the R2MR app enables the use of advanced features of smartphones (e.g., gamification, biofeedback) to be leveraged as a testbed for collecting surveys, user feedback and usage analytics data. This will ultimately help increase our understanding of how to further promote mental health and resiliency of our military personnel.

1.0 INTRODUCTION

Maintaining the psychological health and resilience of military personnel is imperative for the Canadian Armed Forces (CAF), as it prepares personnel to adapt to, and overcome high-stress environments. Despite current best efforts, nearly one-fifth of CAF personnel are still impacted by mental illness [1] and a significant proportion of the CAF underutilize available mental health services [2]. Over the past few decades, the CAF has devoted many resources towards promoting the mental health and well-being of its members [1][3] and research provides some support for tailoring mental health training programs specifically to military personnel [4]. One approach to this, and a strategic priority of the CAF Surgeon General, is to leverage technology and innovate approaches as a method to promote patient engagement and access to care [5]. Recent technological advances in mobile (e.g., smartphones), wearable (e.g., heart rate monitors) and digitally-simulated immersive environments (DSIEs) (e.g., virtual reality, augmented reality, and 360-filming) provide an opportunity for the CAF to utilize DSIE technology in mental health training and clinical interventions to improve key outcomes. In order to successfully leverage technologies to improve upon mental health and well-being training programs and services, time and effort are required to properly design, develop and validate its use. This paper will review the key components used to ensure that the R2MR application meets its main objectives and enhances the in-classroom component of the R2MR training, while abiding by human-centred design principles.

1.1 Background

The current mental health and resiliency training employed by the CAF is the Road to Mental Readiness (R2MR) training program. Established in 2008, the R2MR curriculum was developed as a classroom-based training program that provides resilience training for members and their families across their career and deployment cycle, with some elements of the program based on the skills used in the US Navy Seals training program [6]. R2MR is skill-focused and requires a practical application, which has been tailored to interventions for rank, occupation, environment, and tasks.

As outlined in [7], the R2MR curriculum consists of six mental health management skills based on cognitive behavioural theory (CBT). Four are skills (goal setting, self-talk, visualization, and tactical breathing) that are intended to assist individuals in managing physiological responses to stress and enhance their performance. The two remaining skills, attentional control and psychological self-monitoring, were included in the curriculum based on feedback from CAF personnel implementing the original R2MR curriculum. Attention control is intended to direct individuals' attention to specific cues during a task while discounting irrelevant stimuli. The final component, psychological self-monitoring is based on the Mental Health Continuum Model (MHCM), which was developed in collaboration with the US Marine Corps. The MHCM is used to promote skills associated with identifying symptoms of psychological distress in oneself and others (see [7] for more details).

1.2 Development of the R2MR Mobile Application

It has been demonstrated that repetitive application and practice of skills in the training environment is essential for retention and effectiveness [8]. As such, in an effort to expand the R2MR training, the CAF designed and developed a mobile application (i.e., "app"). The R2MR app (Figure 1) is intended to provide on-the-go training to help manage stress responses, improve short-term performance and long-term mental health outcomes, as well as to promote treatment-seeking behaviours (see [7] for details). The main objectives of the R2MR app are (1) to complement the current R2MR training, (2) to turn R2MR skills into life skills and to individualize R2MR skills, and (3) to provide access to additional resources for further care.

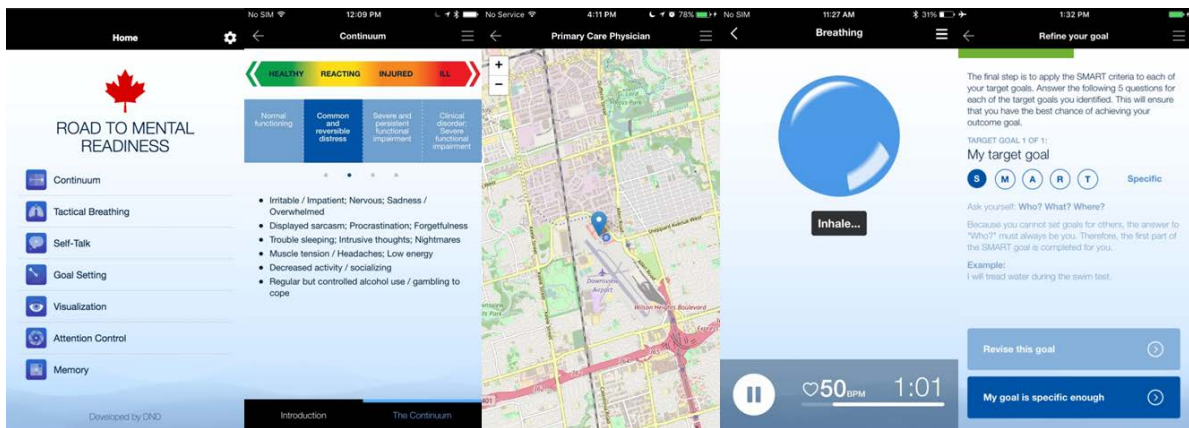


Figure 1. Example screenshots of the R2MR app.

As a complement and expansion of the curriculum, the R2MR app provides training and exercises that are included in the six classroom-based training sessions as well as an additional module on working memory [9]:

1. **Goal Setting:** Interactive tool for applying the SMART (Specific, Measurable, Achievable, Relevant, Time-bound) criteria in order to achieve desired goals. This module is integrated into calendar reminders and tracks the users' progress over time.
2. **Self-talk:** Interactive guide intended to direct the users to reframe and challenge their negative self-talk and to replace it with positive statements as well as to bookmark positive accomplishments. This module is integrated with notifications and self-monitoring.
3. **Visualization:** Guided training to help users develop customized scripts for effective mental imagery. This module is integrated with recording and playback functionality.
4. **Tactical Breathing:** Interactive breathing guide for controlled diaphragmic breathing for optimal arousal control. This module is available with near real-time heart rate biofeedback.
5. **Attention Control:** Training tool designed to enhance focused and selective attention, as well as the ability to shift attention when required. This module includes gamification and is adapted to the users' performance level.
6. **MHCM:** Self-monitoring tool to keep track of users' mood, attitude and performance, sleep, physical symptoms, social behaviour, as well as alcohol and gambling use. This module provides customized suggested resources for care.
7. **Memory:** Training tool designed to enhance working memory and fluid intelligence. This module includes gamification and is adapted to the users' performance level.

1.2.1 Leveraging the Advanced Features of the Smartphone within the R2MR App

The R2MR app offers the opportunity of individualized training and functions with and without an online connection. By harnessing the advanced features of the smartphone, the R2MR app offers users the ability to track their progress over time as well set up calendar notifications in order to reinforce rehearsal of the resilience and executive functioning skills taught in the app in order to achieve desired goals. The R2MR app also contains multimedia and graphics, such as audio recordings and playback, in order to enhance user

experience. In addition, offline access to local database storage within the smartphone allows for users to access information in the palm of their hands whenever they need it, even if no internet connection is available. Further, by connecting to location-based direct dialling, users have access to care directly within the R2MR app.

The advancement and availability of off-the-shelf wearable technologies such as heart rate monitors offer the opportunity to explore the effectiveness of wearable sensors as a complement to mobile learning. These can be leveraged in the R2MR app. Biofeedback from wearable devices (e.g., heart rate monitors) can inform the user of the physiological benefits of using the app. Commercial wearable monitors are not certified for monitoring physiological data to medical standards, but they have been shown to be adequately reliable in most use-cases relevant to the R2MR apps (i.e., while the user is relatively stationary) [10]. More specifically, one of the modules of the R2MR app, Tactical Breathing, guides the user through deep, diaphragmatic breathing. The module can connect to wearable sensors and display the user's heart rate during the breathing exercise. Heart rate biofeedback has been previously shown to be a useful complement to similar tactical breathing training during military-relevant immersive simulations (i.e., virtual reality (VR)) in CAF soldiers to attain an optimal heart rate and arousal state for improved stress management skills [8]. It has been shown that achieving an optimal heart rate during a task is a crucial component for improving performance [11] as well as for improving mental health and resiliency [12].

1.3 Current Research

The design and development of the R2MR app has been a collaborative process, combining efforts from researchers, in-house developers, contractors, and the R2MR curriculum developers. In order to find the unique balance of achieving the desired outcomes from the curriculum developers and end-users, we have gone through an iterative and agile design and development process. Further, as part of the validation process and to ensure an optimal balance between human-centred design and valid content, we have conducted a preliminary series of qualitative and quantitative studies. The studies include (1) expert analysis, (2) an evaluation of the usability, performance, and utility of the R2MR app, (3) validation of the content within the MHCM, and (4) assessment of the role of heart rate biofeedback within the Tactical Breathing module.

The work summarized below has been conducted under DRDC Toronto's Human Research Ethics Committee's approval and guidelines. Some aspects of the design, development, and evaluation have been conducted in collaboration with allies, industry, and academia.

2.0 THE R2MR MOBILE APP DESIGN PROCESS

The design process of the R2MR app has evolved from concept (simple wireframe designs) to deployment through an iterative design process. Here we highlight how we have modelled the design process off of industry standards. As part of the design process and in order to achieve ideal human-centred design and to optimize user interface and user experience (UI/UX), we also conducted a preliminary online design competition and ran a series of usability studies on both civilian and CAF members.

2.1 User-Interface/User Experience Expert Analysis

After selecting a designer from an online design competition, we designed each R2MR module to have a neutral common look and feel (see Figure 2) that could represent all Canadians, not just CAF members. As part of the design process and in order to optimize a user-friendly design (i.e., UI/UX), we solicited expert review on one of the preliminary versions of the R2MR modules along with recommendations on how to improve its UI/UX.

2.1.1 Methods

We received expert design analysis from an impartial third-party contractor assessing the UI/UX of the modules within R2MR app (see [13]) and recommendations on other available resilience apps to model off of (see [14]). The analytic assessment included a rating of the app's various features and components against established interaction design principles [15], usability heuristics [16], and mobile design guidelines [17], as informed by the consultants' previous experience and research on medical training apps.

2.1.2 Results

The outcome of the expert analysis provided feedback on the UI/UX of the R2MR app and recommendations on improving the app's design. The overall recommendations are provided in detail in [13]. In summary, the following recommendations were reported by [13] including:

1. Combine all app modules into one training suite.
2. Display all tools on the home screen for accessibility to all exercises.
3. Simplify navigation and combine functionality.
4. Create user profiles for personalization, with the intention to have a greater understanding of the target audience.
5. Anonymize the database.
6. Contextualize experience by displaying information when relevant to the task.
7. Design for accessibility with meaningful icons and legible/visible fonts, buttons and colours.

Further, recommendations were provided by [14] on other available resilience apps. The authors identified effective components of other apps that the R2MR app could benefit from. Some examples included the suggestion to provide meaningful instructions for each exercise in context (similar to Australian Veterans Affairs' *High Res* app) and to consider a "Tap to Begin" function before the commencement of a breathing exercise (similar to T2 Health's *Virtual Hope Box* app).

2.2 Usability of the R2MR Mobile App

As part of the design process and in order to achieve ideal human-centred design and to optimize UI/UX, we also ran a series of usability studies on both civilian and CAF members. Usability data were collected in a series of exploratory usability studies during the design phase of the R2MR mobile app development. Exploratory usability studies were conducted to assess users' expectations, experience, performance, and satisfaction with the app, to identify specific usability problems and to evaluate access to the functionality of the system.

2.2.1 Methods

Participants were civilians (previously reported in [18]) or CAF members and were randomly assigned to one or more of the seven mobile applications modules and completed a one-on-one, open-ended interview session. The researcher asked participants a series of exploratory questions to understand and uncover how the users want to use the mobile app [19]. Participants also explored the R2MR modules using the Concurrent Think Aloud protocol (CTA), a commonly used paradigm in usability studies to understand participants' thoughts and elicit real-time feedback as they navigate through applications [20][21]. Participants also completed a generic usability scale, the System Usability Scale [22], and answered a series

of specific questions about the functionality of each R2MR module. Lastly, user feedback (see Figure 2) and mobile usage analytics (e.g., number of clicks) were extracted to observe patterns of mobile app usage.

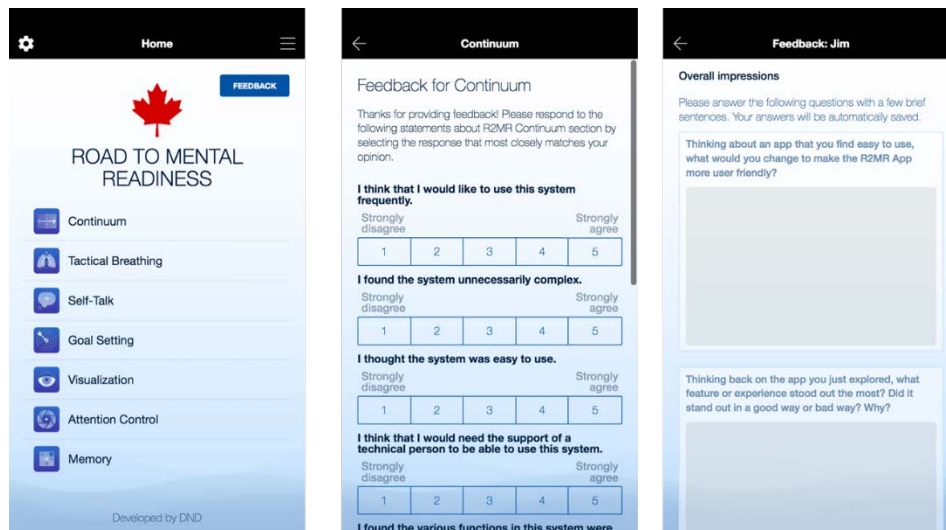


Figure 2. Screenshots of the user-feedback journey of the R2MR app.

2.2.2 Results

The qualitative results from the usability studies revealed overarching contrasting themes. CAF users (who have previously taken in-class R2MR curriculum) were more accepting of the different modules as prescribed training tools compared to civilian participants. In contrast, civilian participants enjoyed the customization of the app in order to enhance individual training. Further, the CAF members wanted to be able to view their progress in the app compared to others, whereas civilians were interested in seeing individual progress. Both populations expected to see output from the mobile app where input was given. For instance, both military and civilian participants expected to see the progression of their performance and to be able to track results for games and activities in the mobile app. Analytics of the participants' navigation (e.g., number of clicks, time spent on a function, etc.) were analyzed to assess if there were any patterns or "sticky navigation" (i.e., when user gets stuck on a function). Example data are presented in Figure 3. The datasets displayed in Figure 3 serve as an example of the type of data we can extract from consenting participants via an online server or extract locally during experimentation.

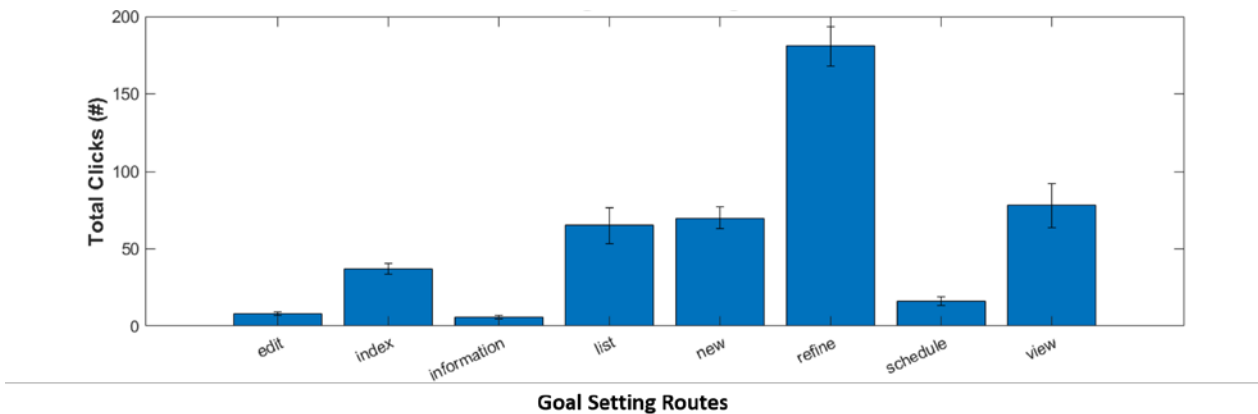


Figure 3. Example user analytics for the total number of clicks in the Goal Setting module separated by functions within the module by CAF members during usability testing. Error Bars denote standard error.

3.0 R2MR MOBILE APP DEVELOPMENT PROCESS

Similar to the design process, the mobile development process of the R2MR app has involved a combination of in-house development, contracting, and collaboration. The first requirement of the development process was the decision between “Waterfall” and “Agile” development models. The Waterfall Model provides a clear and definitive sequential plan for a project in which one stage must be fully completed before moving onto the next [23]. The Waterfall Model is ideal for projects with an established and extensive requirement analysis and a clear idea of what the final product should be [24]. In contrast, the Agile Model allows clients to provide feedback and alter features in the product at different stages of the life cycle [23]. The Agile Model requires strong and successful management to ensure that the requirements are being analyzed at different stages [24]. The Agile Model is preferred for projects that are dynamic and where the client does not have specific requirements for the final product [25]. For the development of the R2MR app, the agile development model was chosen to allow for a collaborative and iterative design and development process.

3.1 Hybrid versus Native Development

As a small team, we had to prioritize resources in the development process of the R2MR app. As the requirement for the R2MR app was to eventually make resilience training accessible to all Canadians, we needed to develop the app for both iOS and Android users. As such, we had to decide whether to develop two native apps or a web-based hybrid app. A native app is an app built for a specific platform and can be optimized for maximum performance with direct access to low-level hardware (e.g., microphone). The app can perform at faster speeds, has greater flexibility in customization, and is more responsive. The downfall is that it requires multiple codebases if the app needs to be built on multiple platforms [26]. A hybrid app, on the other hand, is a mixture between a native app and a web app (website), which has similar internal components to a website but can function like a native built app. Hybrid apps can be created with only one codebase but can be installed on multiple platforms (such as iOS, Android). The downside is that it will not be fully optimized for each platform it is built on, and will rely on external plug-ins to access low-level hardware; thus, typically, creating a poorer-performing app than a native app [26]. Since our requirements were to deploy the R2MR app on iTunes (for iOS) and Google Play (for Android) with limited resources, R2MR was developed as a hybrid app and deployed to both platforms (iOS: <https://itunes.apple.com/ca/app/r2mr/id1148743063?mt=8>; Android: https://play.google.com/store/apps/details?id=ca.drdc.rddc.r2mr&hl=en_CA).

3.1.1 Methods

Although our app was developed as a hybrid, as part of the evaluation process and in order to make direct comparisons, we also developed a native iOS app. We conducted a trial comparing the performance of one of the R2MR modules (Tactical Breathing; Figure 4), which requires graphics, multimedia and relies on an internal database, on both platforms (native iOS and hybrid). We evaluated the Tactical Breathing module on an iPhone 6 and compared the speed and processing power needed for each.

We used the “Instruments” app, a tool that comes with XCode (Apple Inc.) to collect and track the analytical data used in the trial. Within the trial, we monitored a variety of different properties including launch time, graphic requirements, memory, percentage of computer processing unit (CPU) usage and amount of “data reading” required. The trial consisted of initializing the Tactical Breathing module and completing an exercise with the default settings. The trial was deemed complete once the results section had been reached and the graph displayed results. It is worth noting that these results should only be used for comparison and not for a real projection of app use. This is because the extra analytics placed on the phone greatly diminishes its processing performance.

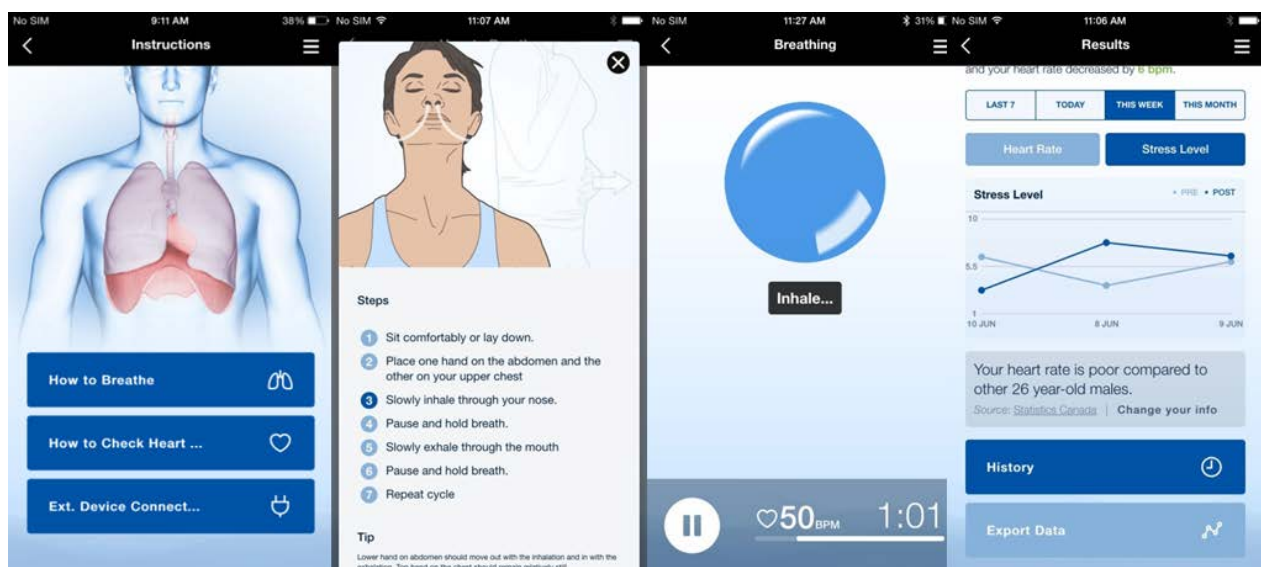


Figure 4. Screenshots of the Tactical Breathing module within the R2MR app.

3.1.2 Results

The hybrid versus native trial resulted in a number of performance differences between the two Tactical Breathing apps. Overall, the hybrid app took approximately three times longer to launch than the native app. Although simple transitions (e.g., changing page) were faster on the hybrid app, more complicated transitions and graphical operations (e.g., drawing and rendering objects) and data saving operations produced a greater lag. For details on performance metrics of an example trial, see Table 1.

Table 1. Performance metrics of the native vs. hybrid Tactical Breathing app.

Variable	Description	Native iOS Performance	Hybrid iOS Performance
Launch time (Seconds)	The time it takes for the app to load to the main screen when it is first opened.	4.88	15.93
Frames per second (FPS)	Average FPS of the first 20-sec interval of the trial.	25.08	11.78
Central Processing Unit (CPU) (Percentage)	Average amount of CPU usage that the app uses to start the tactical breathing exercise.	32.6	36.1
Heap Allocations (Mebibytes)	All temporary memory management (i.e., Virtual Memory) allocated as persistent bytes by the operating system.	8.13	17.09
Memory Used (Gibibytes)	Total memory used for the entire trial.	2.94	3.16
Data read (Gibibytes)	Total data acquired from the app for storage and processing within the Random Access Memory (RAM)	19.6	22.22

In summary, the native app performed faster than the hybrid app, especially for its initial launch. Since the hybrid app was required to read more data, it resulted in additional memory requirements and performance lags.

3.2 Content Validation

A critical component of the validation process of an educational mobile app is to ensure that the content is delivered with optimal fidelity to the instructional design of the curriculum and provides the appropriate information for the intended learning outcomes. One of the main components of the R2MR app is the MHCM. The MHCM is a self-monitoring tool that also provides access to care via the maps and dialling apps. In order to evaluate its content, an experiment was conducted to assess if the phrasing of the MHCM descriptors corresponds to validated measures assessing similar constructs and to the anchors (i.e., *healthy*, *reacting*, *injured*, *ill*) in the continuum (see [27]). This was done for each of the six functional domains (i.e., (i) Mood, (ii) Attitude & Performance, (iii) Sleep, (iv) Physical Symptoms, (v) Social Behaviour, (vi) Alcohol & Gambling) featured in the MHCM.

3.2.1 Methods

Participants ($N = 392$) were Regular Force CAF members and were randomly assigned to self-map onto the MHCM with the descriptors and anchors together (as is presented in the app) or separately in an online study. Participants also completed validated measures that assessed the same or similar constructs to those presented in the MHCM (e.g., alcohol use, depression/anxiety) (see [27] for complete details).

3.2.2 Results

Two main findings emerged in [27]. First, the results indicated support for the MHCM in its current form such that there was some alignment with how participants self-mapped onto the MHCM descriptors and their scores on the corresponding validated measures [27]. However, there was variation across the functional domains, suggesting some improvements can be made to the descriptors to improve upon users' ability to

distinguish between symptom severity [27]. For instance, in some cases, participants self-mapped as *healthy* onto the MHCM Mood domain but screened positive for symptoms of psychological distress (i.e., depression and/or anxiety; see Figure 5 for example).

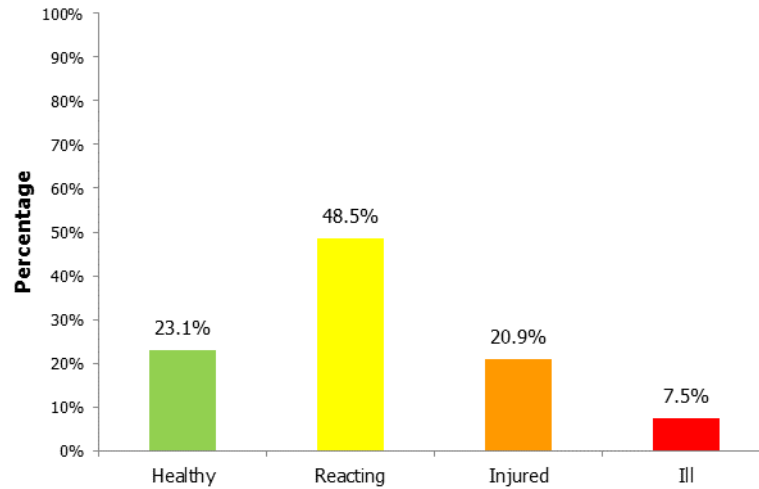


Figure 5. MHCM Mood anchor self-mapping among participants who screened positive for psychological distress (n = 138).

Second, although the rates varied across functional domains, at least 15% of participants were inconsistent in self-mapping onto the corresponding descriptor and anchor (see Table 2). In other words, in some cases participants self-mapped as healthy, reacting, injured, or ill on the continuum, but selected a descriptor that in the MHCM is matched to a different anchor than what was selected (see [27] for complete results).

Table 2: Percentage of participants with consistent descriptor and visual spectrum self-mapping.

Functional Domain	Unweighted <i>n</i>	Weighted %/ <i>n</i> ^a (95% Confidence Interval)
Mood	257	68.1/27882 (61.2 to 74.2)*
Attitude & Performance	258	77.2/31914 (70.8 to 82.5)*
Sleep	259	54.7/22654 (47.7 to 61.4)
Physical Symptoms	257	62.4/25634 (55.6 to 68.7)*
Social Behaviour	257	68.0/27878 (61.2 to 74.1)*
Alcohol & Gambling	254	83.1/33725 (77.6 to 87.4)*

^a Weighted cell counts were rounded to the nearest whole number.

**p* value for $\chi^2 < .001$

3.3 Biofeedback and Arousal Control Evaluation

Another crucial component of the development process involved integrating the R2MR app with the advanced features (i.e., low-level hardware) of the smartphone. As discussed previously, one such example was the connections to wearable sensors via Bluetooth available within the Tactical Breathing module. Specifically, we have incorporated connection to wearable heart rate monitors to evaluate the impact of near real-time (“real-time”) heart rate biofeedback on arousal control (see Figure 6). Available both pre/post and real-time, the heart rate biofeedback option during the breathing training/exercise offers users the ability to

be objectively aware of their current physiological state. This is important as many individuals are poor at accurately perceiving their physiological state such as heart rate [28].

3.3.1 Methods

In a previously described study [7], we evaluated the effectiveness of different types of real-time biofeedback presented in a proprietary app provided by Hexoskin (Carré Technologies Inc.) while following an audio-recorded Tactical Breathing exercise. We tested Search and Rescue Technicians (SAR Techs) ($n = 10$) undergoing R2MR training to see if biofeedback could enhance the learning of tactical breathing. Specifically, participants listened to an audio recording of a script for tactical breathing and practiced three times per day for four days. Each session consisted of tactical breathing with and without real-time visual feedback of their physiological metrics (i.e., breathing and heart rates). The two types of visual feedback were (1) numbers representing breathing and heart rates, and (2) a visual animation depicting lungs with a graph trace of their heart rate. In addition, resting breathing and heart rates were also recorded prior to each experimental condition (i.e., baseline condition).

In a follow-up study on the Canadian Forces Military Police Academy (CFMPA) (see [29] for details), participants ($n = 28$) were instructed to train on their own time with the Tactical Breathing module within the R2MR app twice a day, five times a week for 12 weeks. Participants were divided into three groups: (1) control group: participants performed tactical breathing as instructed in the R2MR curriculum, (2) app only group: participants performed tactical breathing aided by the Tactical Breathing visual prompts, and (3) app plus biofeedback group: participants performed tactical breathing aided by the Tactical Breathing visual prompts and biofeedback from wearable sensors (Mio Alpha; Physical Enterprises Inc.).

3.3.2 Control Results

As previously reported in [7], participants successfully followed the breathing prompts and lowered their breathing rate compared to baseline ($F(2,127) = 59.7$, $p < 0.05$, see Figure 6). No differences in heart rate were observed ($F(3,171) = 2.2$, $p > 0.05$; see Figure 6B), however, between experimental conditions and baseline conditions, representing a floor effect at performing tactical breathing at rest without an external stressor.

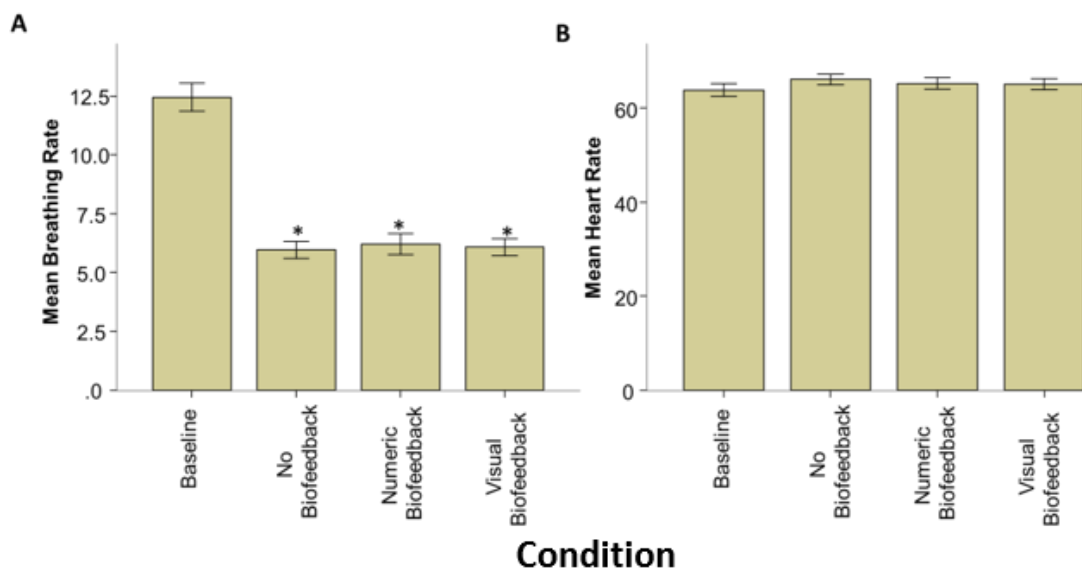


Figure 6. Mean Breathing Rate (A), Heart Rate (B) for the Baseline and Experimental Conditions During Tactical Breathing (from [7]); *Denotes $p < 0.05$ (Bonferroni).

In a follow-up study on CFMPA personnel, no overall differences were observed across control or

experimental groups. These differences could be due in part to poor compliance to the suggested training in the app plus biofeedback group (13% compliance) compared with compliance rates of the app only group (43%; $p = 0.054$) and control group (45%; $p < 0.05$). The participants reported difficulties finding time outside of the busy curriculum to perform the requested training. Pooled across participants and trials, there appears to be a dip in heart rate after one breathing cycle (i.e., 16 seconds) (see Figure 7).

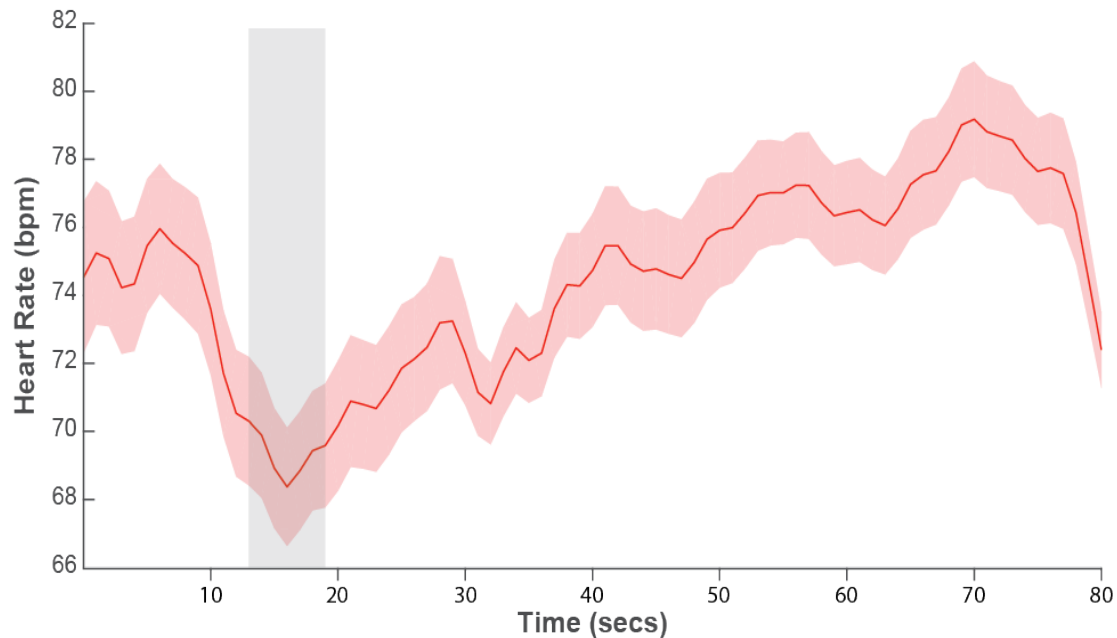


Figure 7. Heart Rate (beats per minute) biofeedback data (mean plus standard error of the mean; low-pass filtered at 0.5Hz) during Tactical Breathing session from app plus biofeedback group. Grey rectangle overlaps with one breathing cycle (i.e., 16 seconds) (from [29]).

In order to influence future compliance rates, the optimal number of breathing cycles required for optimal performance is being investigated in an ongoing collaboration with the University of Waterloo to decipher if one breathing cycle may be enough to impact arousal control and ultimately the performance of a given, high-pressure task (e.g., novice marksmanship).

4.0 DISCUSSION

In summary, the results presented in this paper reinforce the requirement for comprehensive evaluation during all stages of app development in order to create an effective mobile training app. Expert analyses of the preliminary R2MR modules reveal the requirement to combine the app into one training suite with a user login requirement for personalization and for tracking analytics. Usability findings indicate that participants may benefit from a more overt “so-what” factor for each module and for the app as a whole. The results indicate that participants were also left longing for more output from the app as some of the modules require a significant amount of user input. The usability results also suggest population differences. The CAF users were more accepting than the civilians of the app as a prescribed training tool delivered as an adjunct to the R2MR training curriculum. Further, the usability results indicate that training (e.g., instructions, examples, feedback) should be tailored to specific user types (e.g., trade, rank).

Our results from the validation of the MHCM indicate that modifications to the wording of some of the descriptors in the model could improve upon self-assessment consistency within the MHCM. In addition, in order to improve compliance rates in self-paced mobile learning, preliminary evidence from CFMPA

participants suggests that in order to increase compliance to using training apps, integration within an ongoing classroom curriculum could be beneficial. As such, it is recommended to have top-down support in order to integrate mobile apps as part of the curriculum. Further, the biofeedback results indicate that arousal control training (e.g., using the Tactical Breathing module) should be performed under stressful, task-relevant situations in order to avoid floor/ceiling effects as per the SAR Techs and CFMPA members at rest. Further analyses are required to establish the relationship between arousal control (e.g., heart rate variability) and performance during stressful training or theatre of operations.

4.1 Ongoing and Future Research on R2MR App

Building upon the capabilities, findings and collaborations (allies, industry, and academia) resulting from work on the R2MR app and curriculum, we are currently looking to address the gaps in technological interventions for resilience training and therapy. As such, we will evaluate the effectiveness of current technologies on resilience training and therapy including physiological monitoring with wearable physiological sensors, immersive environments (e.g., virtual reality, and haptic vests), as well as remote access to healthcare professionals, while anonymously tracking usage analytics data and user feedback in order to tailor training and therapy to the given user.

4.1.1 Configuration for Collaboration

Mental health and well-being are also considered high priorities by paramilitary departments (e.g., first responders) and other military allies. As such, we have developed the R2MR app with localized language, graphics and media files for quick and easy configuration to other languages, cultures and trades. With a user-friendly Graphical User Interface (GUI), the R2MR app, coded in JavaScript (JS) in an Ember JS framework, can be configured relatively easily to accommodate translations and configured examples for different populations for training and in theatre.

As such, we have begun collaborative work with universities and allies from the New Zealand Defence Force (NZDF), Dutch Ministry of Defence (MoD) and Danish MoD, all with configured versions of the R2MR app (in various stages of development). In collaboration with the University of Waterloo, we are currently examining the effectiveness of app-based tactical breathing and “naturalistic” (i.e., available if required) biofeedback in novice civilian marksmanship. Expanding on the work with novice civilians and in collaboration with the NZDF, we are investigating the control of breathing and biofeedback on elite marksmanship during meaningful high-pressure (e.g., shooting competition) marksmanship environments. Further ongoing usability and experimental studies on configured versions of the R2MR app are currently in different stages of evaluation in collaboration with the NZDF, Danish MoD and Dutch MoD.

4.2 Ongoing and Future Research Building Upon R2MR App

4.2.1 R2MR Serious Game Development

The CAF is currently considering the expansion of the R2MR app into a serious game in order to allow training in simulated stressful CAF-relevant environments. Based on the gaming literature, it is clear that clinical games can be successful in teaching a desired skill or behaviour, but fail in engaging players over time as they lack a fun factor. This is because they are designed to teach a desired skill or behaviour, not to entertain the gamer. Moreover, clinical games are generally developed under significant time and cost constraints. Commercial video games are designed to entertain and engage the player and are successful in doing so as reports from 2018 indicate that 67% of Americans report playing video games [30]. However, clinical videogames aimed at addressing mental health issues such as anxiety fail to appeal to young men [31]. This supports the notion that young men are less likely to seek mental health help compared to young

women [32]. Thus, leveraging commercial games' motivational characteristics to teach resilience is a plausible method to train resilience while engaging gamers.

Serious games have been shown to have promise for increasing the efficiency of training complex cognitive skills and improving performance; for instance, in one study training with serious games was shown to increase usage by threefold as compared with traditional CBT [33]. However, the game elements must be carefully adapted to the specific training environment [33]. One factor that has come up in our usability studies on the R2MR app is that CAF members wish to compete against other members and want to beat their "score". Thus, developing a game with an online leader-board might leverage CAF members' natural competitiveness and thus intrinsically motivate them to practice the skills.

As such, in collaboration with the University of Toronto, we have developed a military-themed preliminary prototype of a serious game. The prototype is a first-person shooting game that requires the successful completion of the resilience skills (e.g., attention control, goal setting) taught in R2MR. The game is interactive and the user's heart rate is monitored and displayed to enforce optimal arousal control during the gameplay. As a complement to the R2MR app, the prototype will serve as a functional mock-up for further development and evaluation. Future reports will expand on this initiative.

4.2.2 Digitally-Enhanced and Immersive Resilience Training Evaluation

Currently, we do not have empirical evidence that the R2MR curriculum and/or app fully meets the needs of the intended end-users (i.e., CAF personnel trainees). Furthermore, we do not have insight into what other functionality may be desired, along with its relative importance. Identifying these gaps systematically and comprehensively will allow us to understand whether future development of the mobile app is warranted and, if so, how we might prioritize and identify critical development objectives.

In order to gather information regarding the R2MR app and future potential technologically-enhanced resilience training methods, we are preparing an online survey on CAF members to identify gaps in mental health and resilience training from the perspective of our personnel and to assess their perception of whether the digital enhancement of training may reduce these gaps. The intended use of the research will be to provide user-centred guidance on how we can reduce these gaps by enhancing current and future training delivery methods using digital and immersive technologies. Further we are looking to assess the perceived usefulness/relevance of novel technologies to: (1) augment several CAF training domains (e.g., mental health, resilience training/training under stress, moral-ethical training, public-speaking), (2) augment/improve/facilitate mental health treatment-seeking, and (3) improve the ability to monitor and assess physical and mental well-being.

The results from the CAF technology training survey for mental health and resilience will guide our future evaluation of such technologies. First, in collaboration with industry partners, we intend to evaluate the potential benefits of a customized immersive "sensory reality" testbed which incorporates immersion from VR, temperature, wind, olfactory and biofeedback for resiliency training for CAF members. Further, in order to complement the R2MR serious game, we intend to examine the benefits and skill transfer of training with a serious game during stressful simulated environments incorporating haptic feedback (i.e., muscle stimulation; [34]) for enhanced immersion and consequence for actions (i.e., pain). We plan to examine the potential benefits of remote access to a health coach through an online wellness platform to encourage behaviour change and reduce barriers and encourage early access to care for CAF members. Additionally, in order to further evaluate training under stress, we are preparing to evaluate if an immersive VR public speaking environment with data-driven analytical performance feedback can be beneficial for arousal control training and the fidelity of training delivery. Specifically, we intend to evaluate the benefits of augmenting existing program processes (e.g., R2MR training delivery) with appropriate digital tools (e.g., virtual environment, automatic capture of lecturers' eye contact, prosody). These data would have the potential to

strengthen the fidelity of interventions, assist in a program's capacity to scale its training, and allow for consistent and discrete fidelity and engagement monitoring.

Aligning with previous recommendations to increase the salience and immersion of psychological training (e.g., immersive moral-ethical decision-making scenarios [35], embedding DSIEs in CAF psychological training (e.g., R2MR) may facilitate knowledge acquisition, reinforce learning, and increase the long-term retention of skills through higher cognitive and emotional engagement during training. Depending on the training domain, optimal immersion and presence may be best achieved through multi-sensory DSIEs (e.g., audio-visual simulation and tactile feedback). Potential DSIE-enabled training solutions may include serious gaming (e.g., reinforcing learning through engaging digital games) and virtual reality scenarios. Augmenting the DSIE-enabled psychological training with state-of-the-art physiological monitoring (e.g., electroencephalography, heart rate variability) and biomarker profiling (e.g., stress hormones) may further optimize training through biofeedback and can elucidate factors that relate to optimal performance [34]. Specific to the potential beneficial role of DSIEs in clinical interventions, recent innovative research has alluded to the utility of virtual clinicians to improve mental health treatment outcomes [36]; therefore, this presents an opportunity for the CAF to explore the contexts and circumstances (e.g., remote locations, increasing privacy) in which virtual clinicians may provide added benefits to CAF personnel and their allies.

5.0 CONCLUSIONS

The CAF are consistently working to improve mental health and well-being, and to achieve optimal performance. Technologies may appear to be the solution but may depend on the user and the context and should be integrated as a complement to ongoing training. Thus, ongoing and collaborative research and development is crucial to provide the CAF and its allies with recommendations on mental health prevention and treatment by investigating effective ways of disseminating resiliency training and therapy using technological interventions. Further, preliminary findings highlight the importance of providing validation and content assessment of technological interventions for mental health and resilience training during task-relevant and immersive scenarios (i.e., under stress). This report reinforces the importance of ensuring that all interactions with technologies abide by human-centred design principles to adequately meet the needs of the intended users in order to optimize training compliance and, as a consequence, short-term performance improvements and long-term well-being.

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A Reward-Based Approach to Improve Workplace Well-Being Awareness and Behaviours

**Hamid Boland, MEng, Madeleine D'Agata, PhD,
Joshua Granek, PhD and Anthony Nazarov, PhD**
Defence Research and Development Canada (DRDC) – Toronto
CANADA

Anthony Jaz
Transport Canada (TC)
CANADA

hamid.boland@forces.gc.ca

ABSTRACT

Workplace well-being refers to employees' overall experience and functioning from a psychological (e.g., subjective experience), physical (e.g., health), and social perspective (e.g., workplace relationships) [1]. Despite the important role that workplace well-being plays in the effectiveness of military organizations and the retention of its members, there has been a lack of workplace well-being interventions that have demonstrated sustained beneficial effects. The emergence of new digital tools and technologies provides an opportunity to consider innovative approaches in designing and delivering interventions that optimize workplace well-being. The primary objective of this pilot project is to determine the cost-effectiveness and feasibility of a workplace well-being program that combines traditional workplace well-being interventions with reward-based incentivization, delivered on a mobile platform. Specifically, this research project will assess the feasibility of using points-based incentives to drive behaviour change, predominantly with the intent to engage public servants, military, and leadership in familiarizing themselves on the importance of fostering healthy workplace habits while providing opportunities and encouragement for participants to make healthy workplace behaviours. The four objectives of the project are: a) to collect baseline data on perceived quality of interpersonal workplace relationships within a civilian setting and military; b) identify weaknesses and opportunities to improve workplace well-being; c) pilot a reward-based mobile application incentivizing employees and managers to make positive workplace behaviours; and, d) evaluate changes in perceived quality of interpersonal relationships in the workplace. The results of this project will impart insight into the development of innovative approaches that can be leveraged by current government practices to promote and enhance workplace well-being in public servants and military personnel.

1.0 INTRODUCTION

1.1 Background

Workplace well-being refers to employees' overall experience and functioning from a psychological (e.g., subjective experience), physical (e.g., health), and social perspective (e.g., workplace relationships) [1]. Employee workplace wellness is identified as an important factor for both individual employees and organizational effectiveness and productivity [2]. As such, there has been interest from organizations to develop and implement programs, policies, and interventions that aim to foster employee well-being [2]. Accordingly, Canadian federal government departments and the Canadian Standards Association are dedicated to maintaining and improving employee workplace wellness [3].

The Government of Canada (GoC), with a workforce of approximately 262,000 employees, is Canada's largest employer. The health and wellness of the Public Service is vital to the success of the GoC, and, as

noted by the Clerk of the Privy Council in a recent message to all public servants, “support for wellness needs to come from all levels. To date, more than 90 deputy ministers and heads of agencies have signed the pledge to support mental health, and employees now have access to tools, support, and training through the newly-launched Centre of Expertise on Mental Health in the Workplace” [4]. Moreover, he reiterated that “the mental health and well-being of our workforce remains a top priority for the Public Service of Canada and for me personally” [4].

Currently, the Public Service Employee Survey (PSES) is the primary survey being used to assess workplace well-being in the GoC, which provides limited cross-sectional data and does not allow for ongoing, longitudinal, real-time data collection. The Department of National Defence (DND) conducts research that will allow for a better understanding of the workplace well-being of its employees [e.g., 2]. Moreover, as outlined in Canada’s 2017 Defence Policy, work focused on developing initiatives and promoting physical and mental health in military personnel is a top priority [5]. However, the lack of comprehensive knowledge of employee well-being may prevent organizations from implementing timely and tailored interventions to optimize the well-being of their employees. Finally, traditional behavioural nudges (i.e., interventions that motivate employees to make the intended behaviours, such as healthy lifestyle choices) are typically challenging to execute, standardize, and monitor when implemented within workplace settings. The emergence of new digital tools and technologies (e.g., smartphones, mobile applications) provides an opportunity to consider innovative approaches in designing and delivering interventions that optimize workplace well-being.

A complementary approach to the PSES is to harness new technology and to consider innovative approaches to help improve workplace well-being. Research suggests that there may be benefits to using technology-enabled approaches, such as mobile apps to increase awareness of depression symptomatology, reduce stress, and reduce excessive sitting in the workplace [6]. The primary objective of the current project is to determine the cost-effectiveness and feasibility of a workplace well-being program that combines traditional workplace well-being interventions with reward-based incentivization, delivered on a mobile platform. Specifically, this project will assess the feasibility of using points-based incentives to drive behaviour change, predominantly with the intent to engage public servants, military members, and leadership in familiarizing themselves with the importance of fostering healthy workplace habits, while providing opportunities and encouragement for participants to adopt healthy workplace behaviours. The methodological approach of the project will consist of: a) collecting baseline data on the perceived quality of interpersonal workplace relationships within a military and civilian setting; b) identifying weaknesses and opportunities to improve workplace well-being; c) piloting a reward-based mobile application incentivizing employees and managers to make positive workplace behaviours; and, d) evaluating changes in perceived quality of interpersonal relationships in the workplace. Secondarily, the current research may shed light on whether there may be effective methodologies that could be employed to positively influence the workplace well-being of GoC employees. Moreover, this work may provide support for encouraging positive workplace relationship behaviours. The Harvard University Study of Adult Development that was launched in 1938 and continued for 80 years was designed to examine factors associated with healthy aging [7]. One of the strongest predictors of perceived health and happiness is strong interpersonal relationships [8]; thus, this is an area of workplace well-being that our current work focuses on.

1.2 Government of Canada Entrepreneurs (GCE)

The Deputy Ministers Task Force on Public Sector Innovation (DM TF-PSI) examines broader trends and emerging technologies with the objective of advancing concrete initiatives in two key work streams: core systems transformation and experimenting with disruptive technologies. To support the DM TF-PSI and their organization-specific objectives, a team of GoC Entrepreneurs (GCEs) was convened to explore emerging technology-based initiatives to measure, understand, and enhance workplace well-being in the federal public service, and complement data from the PSES. Discussions within the DM TF-PSI raised the issue of investigating potential alternatives to the PSES, an annual online survey that includes limited

questions related to assessing employee workplace well-being. In particular, discussions that arose were focused on whether assessing workplace wellness more often than once a year would be beneficial, such that it may provide more current and thus more relevant information on which to base workplace wellness interventions in the future.

1.3 Rationale

By leveraging the advanced features of smartphones and the talents of a Toronto-based firm, Carrot Rewards, we are evaluating the effect of nudges aimed at promoting relationship-building in the workplace on perceived change in the quality of interpersonal relationships in the workplace. Carrot Rewards is a mobile application that leverages behavioural nudges to promote healthier choices. Carrot Rewards provides its users with consumer loyalty points as an incentive for completing surveys or hitting one's daily step target. The firm has worked with Ontario, British Columbia, and Newfoundland governments to increase physical activity amongst their residents. Carrot Rewards has also worked with Natural Resources Canada for energy efficiency research and Health Canada for indoor air quality and opioid research. This social marketing organization has developed a unique social reward platform that uses mobile technology to support large-scale behaviour changes to improve Canadians' well-being.

As part of this pilot, the Carrot Rewards mobile app will reward public servants and military members with an accumulation of redeemable points (e.g. Scene Points, Aeroplan, RBC rewards, Petro Points, etc.) when they respond to short quizzes within the app designed to assess various topics related to workplace well-being such as interpersonal communication and work stress. They will also be rewarded each time they achieve their daily step goal.

This app has been downloaded and is being used regularly by over 700,000 Canadians. In addition, its development has been made possible by a contribution of \$5 million by the GoC, through the Public Health Agency of Canada's grants and contribution program. The results of this project will impart insight into the feasibility, comprehensiveness, impact, and success of using a digitally-delivered reward-based workplace well-being intervention for driving behaviour change within a military and civilian organization.

1.4 Purpose of Study

The current research is a pilot study that will be used to help inform future experimentation in this domain. The objective of this project is to deliver customized interventions related to workplace well-being on the Carrot Rewards mobile app to meet the following needs:

1. To roll out the customized app for public servants and military personnel in various GoC departments;
2. To build awareness and understanding of workplace well-being among public servants and encourage behavioural change to foster healthier relationships in the workplace;
3. To collect and analyze workplace well-being data and report on the findings; and,
4. To inform and better target policy and program measures related to workplace well-being.

2.0 Methodology

The current work is being conducted under DRDC Toronto's Human Research Ethics Committee's approval and guidelines.

2.1 Focus Group

Before distributing invitations across the departments, a small focus group ($n = 7$) was conducted at Defence Research and Development Canada – Toronto Research Centre. The purpose of the focus group was to (i)

obtain feedback on the nudges; and, (ii) assess their experience using the Carrot Rewards app in general. Participants downloaded the app before the focus group session. Participants engaged with the app for a thirty-minute period and completed a simple use-case scenario session within the app (e.g., complete the sign-up process, set up a walking challenge with a friend, etc.). Participants' usability based on their first interactions with the mobile app was then captured with the System Usability Scale (SUS) [9], a generic usability scale with validated psychometric properties [10]. Given the small sample size, SUS scores are not reported here, however, it is worth noting that certain issues with on-boarding were identified and were communicated to Carrot Rewards.

Upon completion of the SUS, participants were presented with 12 nudges and were asked: (1) their initial thoughts; (2) what they (dis)liked about the nudge; (3) if they would perform the recommended behaviour; (4) any barriers to engaging in the behaviour; and (5) any suggestions for improving the wording of the nudge. For each nudge, participants then indicated on a 10-point Likert scale (1 = *strongly disagree*; 10 = *strongly agree*) the extent to which they agreed with the following statement: "I would like to receive the nudge." Mean scores ranged between 3.00 ($SD = 1.93$) and 8.63 ($SD = 1.19$). These scores, along with the open-ended feedback that participants provided, were used to select the final nudges that were included in the study.

2.2 Participants

Up to 1500 GoC employees across various workplaces (e.g., DND, Transport Canada (TC), Canada School of Public Service (CSPS), Health Canada, and Statistics Canada) will be invited to participate in this study.

2.3 Design

Data collection is currently in progress. Participants are invited to participate via email, which includes a link to the website (only accessible to public servants) containing relevant information pertaining to the study (http://www.gcpeia.gc.ca/wiki/GC_Entrepreneur/RewardsPilot) as well as links to the information sheet and to the voluntary consent form. There are multiple versions of the recruitment email; this was done in order to assess if certain versions were more effective at recruiting participants compared to others.

The following in-app elements are included in the program:

- One baseline survey to assess current perceived quality of interpersonal relationships in the workplace
- Rewards for daily step goal achievement
- Rewards for Step Together Challenges encouraging competition among participants
- Four short surveys related to improving mental wellness, resilience, and connections in the workplace
- Five blog posts on the following topic areas: (1) The importance of forging real relationships at work; (2) Exploring the "languages" of appreciation and recognition; (3) Having difficult conversations: Boost your skills to reduce stress; (4) Trust in the workplace; (5) Office relationships: Connection and closeness to work colleagues
- A follow-up survey to measure change in the perceived quality of interpersonal relationships in the workplace throughout the program
- A final survey to assessment of user experience using Carrot Rewards app

Once participants have downloaded the app and entered the code, they are presented with the first of six offers (i.e., surveys) that will be presented over a three-month period. Offers in the Carrot Rewards app are referred to as short, app-based learning exercises and surveys that have redeemable points associated with

completing them. We have created a series of nudges that will be presented to participants throughout the study, presented on the homepage (see Figure 1). The nudges are focused primarily on promoting positive workplace relationships (e.g., “Commit to getting to know one co-worker you don’t know very well this week”). Two types of codes are being used during recruitment such that some participants will either receive a code that will provide them with nudges being presented within the app, whereas others will receive a code that is associated with no nudges being presented to them within the app.¹



Figure 1: ‘How was your weekend?’ nudge presented on the homepage.

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The first offer assesses workplace relationships and the same measure will also be administered during the sixth offer (see Figure 2). The remaining offers consist of questions that assess workplace well-being for interpersonal communication, recognition and reward, work stress, work-life balance, and trust. Additionally, as mentioned above, nudges will be presented only to approximately half of the participants within the app at different intervals to promote positive workplace well-being and wellness behaviours. In partnership with Carrot Rewards, the investigators are also including subtle nudges for all of the participants to help promote behaviours such as tracking steps or challenging a work colleague to achieve their daily step goals together. Additionally, data on behavioural outcomes within the app such as the number of users who continue to use the app over time, number of app referrals to other new users, daily steps, number of challenges initiated by participant to complete daily steps with another user, and so on, will be collected. All participants are also presented with five blog posts with topics related to workplace relationship at the end of offer two to six. The traffic analytics from each blog posts been tracked, and two of the blog posts will give participants redeemable points for reading them.

¹ Due to restrictions associated with recruiting participants, it was not possible to randomly assign participants to receive a code that presents nudges within the app or a code that does not include nudges.

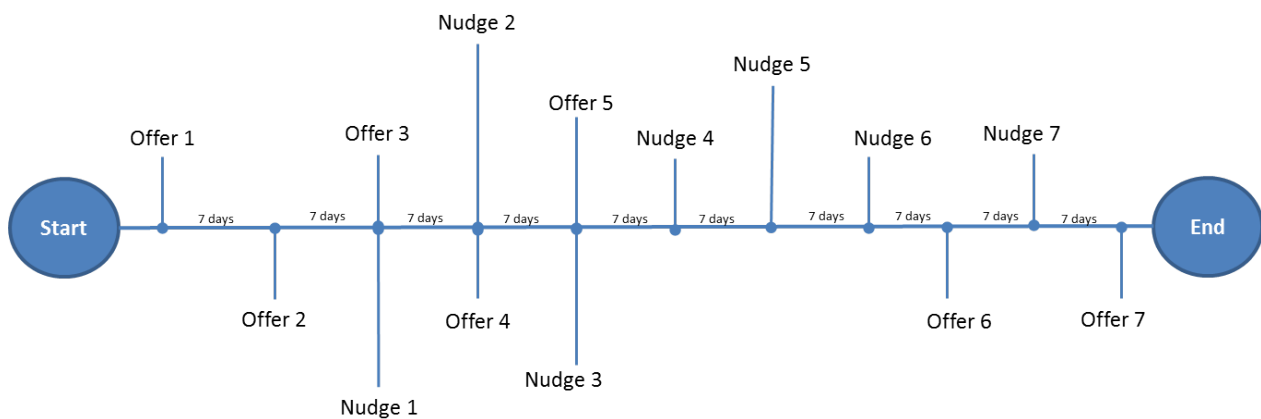


Figure 2: Timeline of the Offers and Nudges.

2.4 Measures

As mentioned prior, participants will receive a total of seven offers throughout a three-month period. Some of the measures are taken from established measures and are described below. Additionally, some items from the PSES are included in the offers so that comparisons can be made to the prior PSES results as well as to assess relevant concerns that have been highlighted in past PSES. Finally, Carrot Rewards created educational items that are typically presented at the beginning of each offer (e.g., “Managers play a large role in building and promoting a trusting team environment” (*true or false*)).

2.4.1 Demographics Characteristics

We are collecting demographic information on age, gender, and, whether the individual is military or a public servant. This information will be used in our analyses to better understand our sample (i.e., which individuals elected to participate in the study).

2.4.2 Offers 1 & 6: Workplace Relationships

Workplace relationships is the only measure that is repeated and will be assessed at the beginning of the study and at the end, using the Needs for Relatedness subscale of the Work-Related Basic Need Satisfaction Scale [11]. The subscale has seven items to assess the extent to which participants feel connected to others and a sense of group membership within the workplace context [11].

2.4.3 Offer 2: Interpersonal Communications

Four items from the Co-workers subscale of the Job Satisfaction Survey [12] are used to assess interpersonal relationships at work and the extent to which participants believe they are affected by those relationships.

2.4.4 Offer 3: Recognition & Reward

Recognition and reward is being measured using the Contingent Reward subscale of the Job Satisfaction Survey [12]. The subscale has four items used to assess the extent to which participants perceive recognition and the availability of rewards within their workplace [12]. Additionally, one question from the PSES is included in the offer: “I receive useful feedback from my immediate supervisor on my job performance”.

2.4.5 Offer 4: Work Stress

To assess work stress, four items from the PSES are included: “My immediate supervisor creates an environment where I feel free to discuss with him or her matters that affect my well-being at work”; “I have support at work to balance my work and personal life”; “In my work unit, people behave in a respectful manner”; and, “I am satisfied with how interpersonal issues are resolved in my work unit.”

2.4.6 Offer 5: Trust

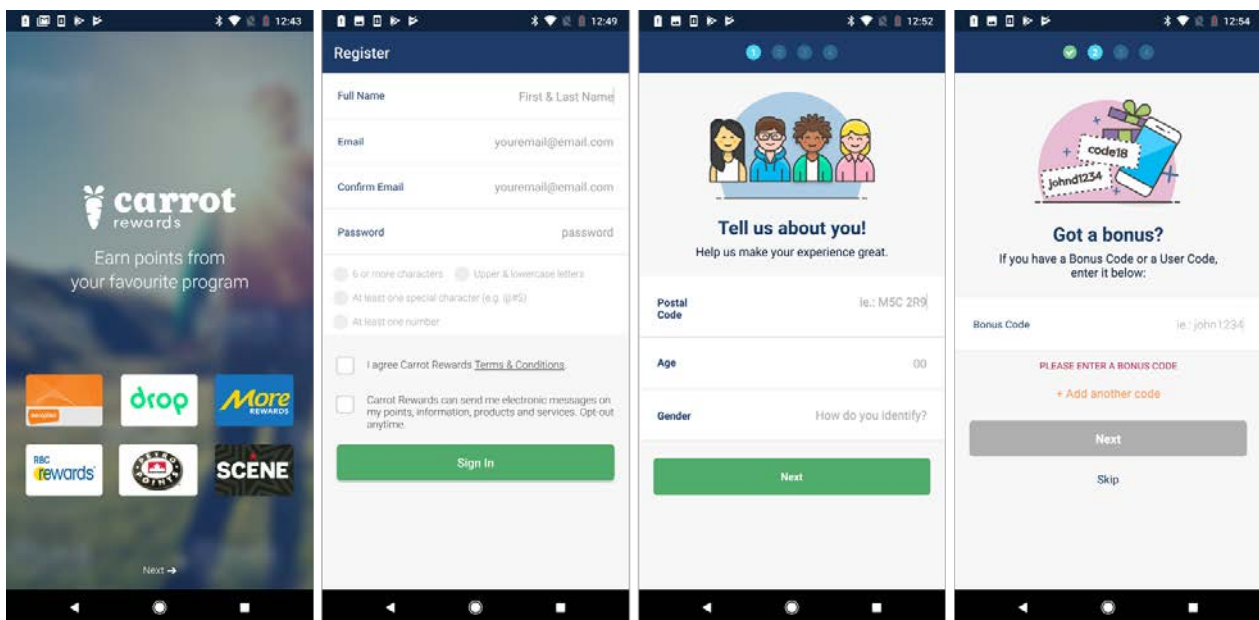
Trust will be measured using the following PSES questions: “Overall, my department or agency treats me with respect”; “In my work unit, every individual is accepted as an equal member of the team”; “Overall, to what extent do issues with your co-workers cause you stress at work”; and, “Overall, I feel valued at work”.

2.4.7 Offer 7: User Experience

To assess overall user experience of the Carrot Rewards app and the perceived effectiveness of the pilot study a series of close-ended questions will be presented in the final offer.

2.4.8 User journey through the Carrot app

Figure 3 presents the user journey flow through the Carrot Rewards mobile app, starting with initial onboarding, and continuing through the process of completing the initial offer.



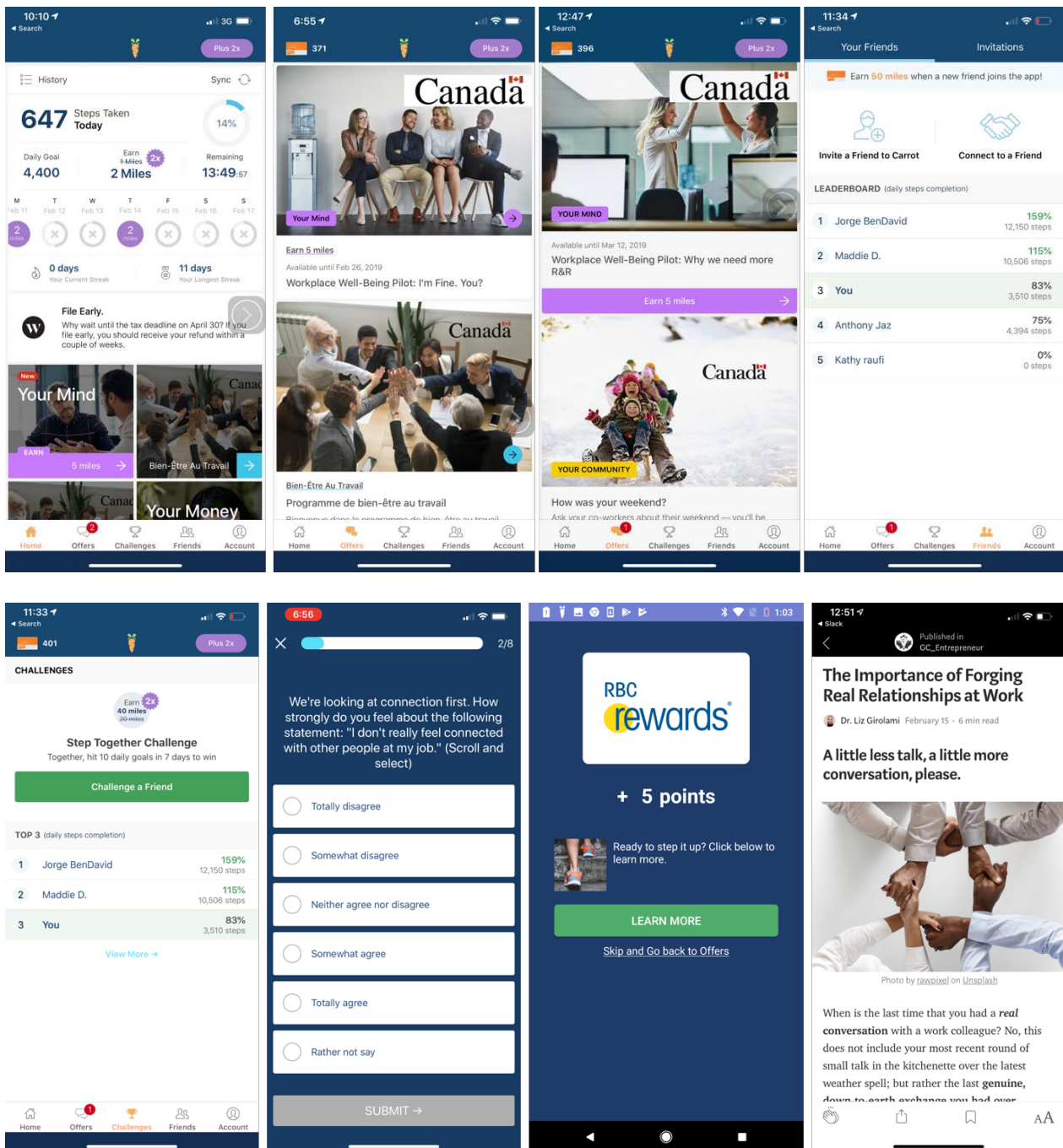


Figure 3: User journey through Carrot app.
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3.0 PRELIMINARY RESULTS

As mentioned prior, data collection is currently underway; however, here we present preliminary results from the Work-Related Basic Need Satisfaction Scale [11] Offer 1 of the study. Participants ($n = 292$) who have completed Offer 1, generally report positive workplace relationships (see Figure 4 and 5).

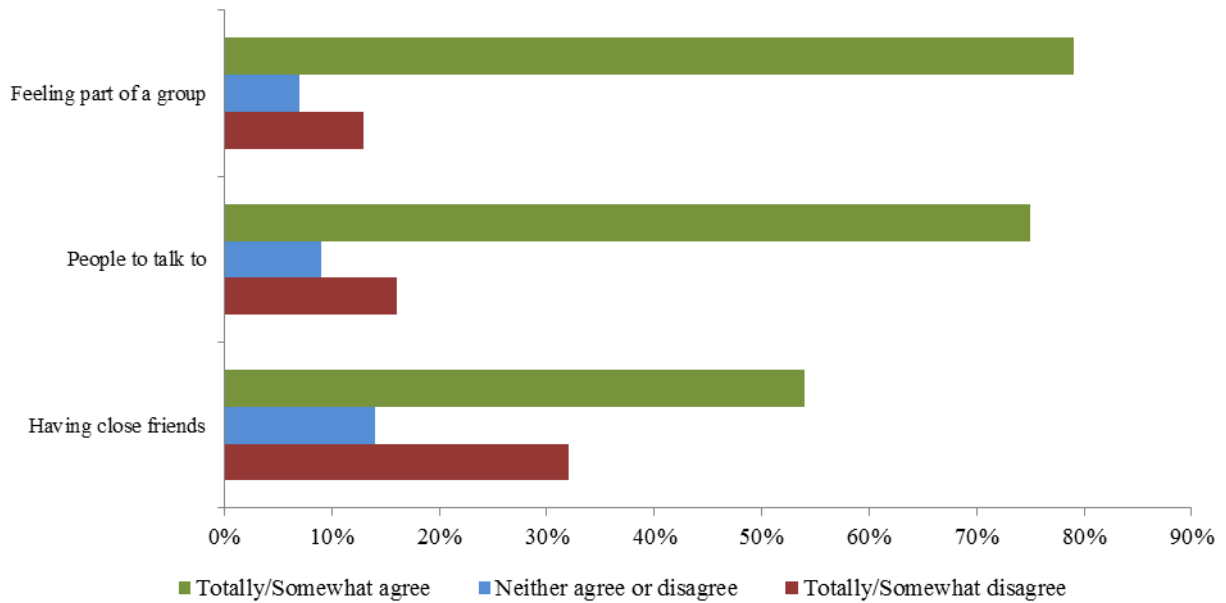


Figure 4: Percentage of participants' responses to positively worded items assessing workplace relationships.

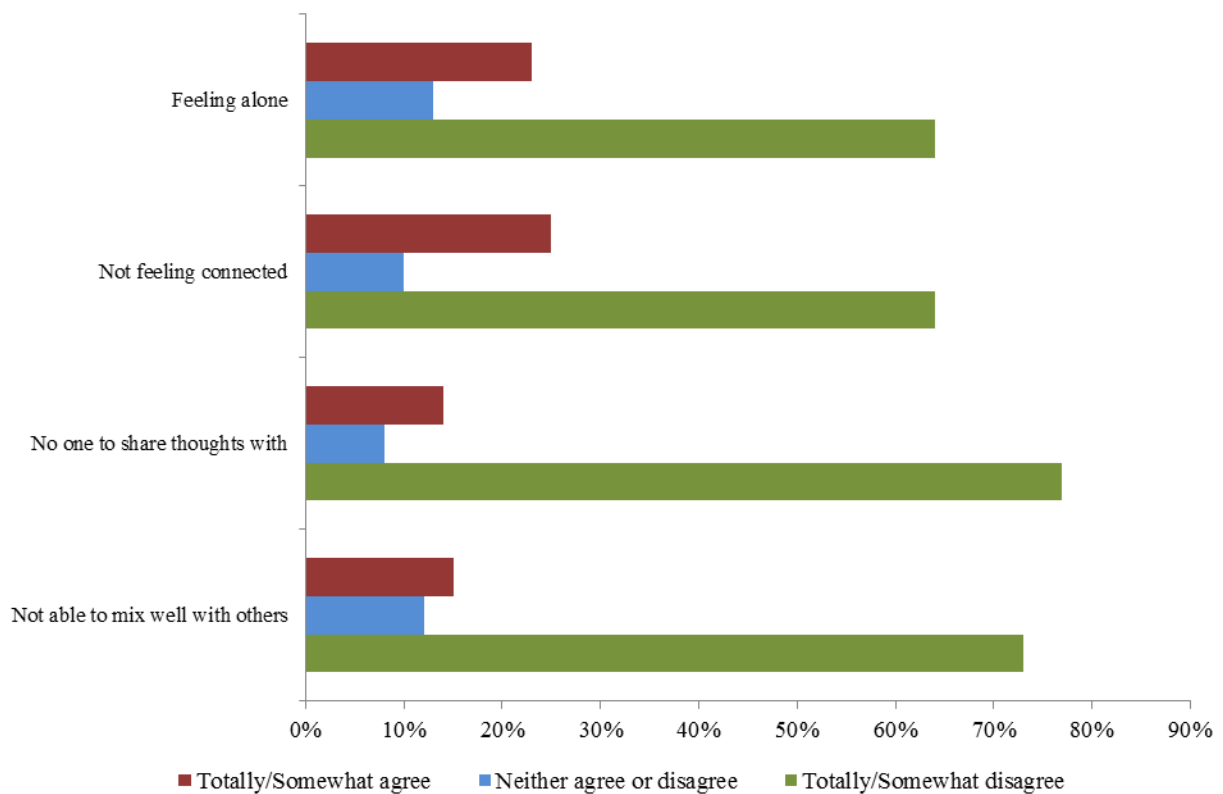


Figure 5: Percentage of participants' responses to negatively worded items assessing workplace relationships.

4.0 DISCUSSION

Despite the important role that workplace well-being plays in the effectiveness of military organizations and the retention of its members, more work is needed to develop interventions with sustained beneficial effects. The emergence of new digital tools and technologies provides an opportunity to consider innovative approaches in designing and delivering interventions that optimize workplace well-being. This pilot experiment is attempting to determine the cost-effectiveness and feasibility of a workplace well-being program that combines traditional workplace well-being interventions with reward-based incentivization, delivered on a mobile platform. The project will assess the feasibility of using points-based incentives (i.e., the Carrot Rewards app) to drive behaviour change, predominantly with the intent to engage public servants, military, and leadership in familiarizing themselves on the importance of fostering healthy workplace habits while providing opportunities and encouragement for participants to perform healthy workplace behaviours. The GCE team working on the Workplace Well-being project may help in the development of a model that the GoC can utilize to break down barriers and to help form agile and nimble teams to work on cross-cutting projects of this nature.

5.0 NEXT STEPS

Upon completion of data collection, we will focus our efforts on documenting some of the perceived and real barriers that were faced in launching a study of this nature. To conduct research within the GoC, there are various procedures and processes that must be followed. Although certain processes are necessary and clear to follow (i.e., obtaining approval from a human research ethics board), others, at times, seemed less central to conducting research and innovation. We will also examine user data from the app (e.g., on-boarding, participation rates, etc.) in order to provide recommendations for scaling future initiatives or programs similar to the current research. Finally, Statistics Canada will receive anonymized data from Carrot Rewards to host a data hackathon, a new method of solving data analysis challenges that began in 2018. Participating in this event will allow for data analyses to be conducted by a team of analysts from the GoC for a period of three days. These results will provide an overview of the findings of this pilot.

6.0 CONCLUSION

The work of the GCEs along with the results of this project will impart insight into the feasibility of using a digitally-delivered reward-based workplace well-being intervention program to drive behaviour change within military and government organizations. More specifically, the current work, as an innovate solution, can be leveraged by current GoC approaches to address issues in the current problem space (e.g., the PSES; large-scale research, etc.) to promote workplace well-being. Moreover, our work may promote the use of behavioural economics (i.e., nudges) as a subtle and effective technique for enhancing workplace well-being in federal government employees and military personnel.

7.0 ACKNOWLEDGEMENTS

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of Change, and the Carrot Rewards team for their ongoing support and contribution to this project.

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Using Evidence of Effective Incentives to Enhance Physical Health and Fitness of the Canadian Armed Forces.

Dr. Tara Reilly, Phil Newton, Daryl Allard & Patrick Gagnon

Human Performance Research and Development
Canadian Forces Morale and Welfare Services
4210 Labelle St
Ottawa, ON K1A 0K2
1-613-943-4806

CANADA

Tara.reilly@forces.gc.ca

ABSTRACT

Objective/Topic:

- *To develop and implement an individual Fitness profile for each military member to incentivize occupational and health-related physical fitness above and beyond the minimum required for employment*
- *To provide leaders with a continuous metric of their members' physical and health related fitness in order to best design and deliver their health promotion and physical fitness services and programs.*

Since 2013, the Canadian Armed Forces (CAF) have had a field expedient physical employment standard (PES), with four components, which accurately predict job performance on completing the common military tasks required for employment. However, as this is a legally defensible PES, it has a minimum performance standard and assesses employability, a dichotomous variable, not a true indicator of other aspects of fitness. Asking CAF members to achieve only a minimum standard is counter to incentivizing improved performance. Therefore, in 2015 the CAF introduced a tiered incentive program with links to health-related and occupational related fitness, named the "Fitness Profile (FP)".

The 4 elements of the PES, when performed to maximum and converted to a point scale are compared to 8 categories of age and gender norms for the CAF to determine Occupational Performance. In addition, PES scores provide an accurate measure of one's Cardiorespiratory fitness (CRF) or $\dot{V}O_{2max}$. There is a wealth of research linking low CRF to increased mortality and morbidity and this relationship is independent of age, ethnicity, smoking status, alcohol intake, and health conditions. Therefore, to assess one's "Health related fitness" $\dot{V}O_{2max}$ is linked to one's age and gender related risk of morbidity and mortality. In addition, research has identified relationships between the PES, $\dot{V}O_{2max}$ and risk of a musculoskeletal injury.

Fitness Profile results are reported to the chain of command to provide metrics on their members over time. By using these data, commanders are better able to target the appropriate health and fitness programming for their base/wing and identify if there are specific barriers to programs or resources.

Future analysis of these metrics may enable us to determine if there are changes in performance during major events in a member's journey, such as post-partum, post deployment, following rehabilitation of an injury, or even a lifestyle change, which may merit an accommodation or more creativity in designing physical training programs for the individual.

1.0 ADDRESSING THE NEED TO INCENTIVISE HEALTH-RELATED FITNESS

In 2010 The Canadian Armed Forces (CAF) Chief of Defence Staff (CDS) expressed the need to enhance the health and fitness of his members, as evidenced by the results of the 2008/2009 Health and Lifestyle Information Survey which showed that less than half the CAF can be considered physically active (Born et al 2010). A revised Physical Employment Standard (PES), which applies to all CAF members, was implemented in 2013, and with this, the start of collecting PES results on a digital platform for tracking and reporting purposes (FORMeFIT). Given CDS' concern over obesity in the CAF as well as the operational focus of the FORCE Evaluation, the Human Performance Research and Development Cell within the Directorate of Fitness, was directed to examine potential avenues for enhancing and incentivising, while tracking and acting on a broader range of physical fitness components in CAF personnel.

The only basis for taking career action on personnel fitness would remain the Common Military Task Fitness Evaluation, as predicted by the FORCE Evaluation, the annual PES. However, the need for a more general physical fitness profile provides as a basis for counselling individuals and directing them toward appropriate resources (e.g., Health Promotion (HP) programs, DFIT.ca or PSP-led fitness classes) as well as guiding the chain of command in addressing fitness levels in the CAF.

The FORCE evaluation is an evaluation of the CAF members' Operational Fitness Capability, assessed at the minimum level required to complete operational tasks with physical demands. However, it does not capture all of the components of Physical Fitness. The general components of physical fitness are (a) cardiorespiratory endurance, (b) muscular endurance, (c) muscular strength, (d) body composition, and (e) flexibility (Caspersen et al, 1985). The annual PES, FORCE (Figure 1), and the minimum standard of operational fitness capture (b) muscle endurance and (c) muscle strength as well as (e) flexibility. FORCE at the minimum standard was neglecting provide an assessment of a members (a) cardiorespiratory endurance (or CRF-Cardiorespiratory fitness), or (d) body composition, as these were not identified as the limiting components of physical fitness to perform at a minimal operations standard. The Fitness Profile (FP) was developed to incentivise both Operational Fitness (performance on the PES), and Physical fitness.

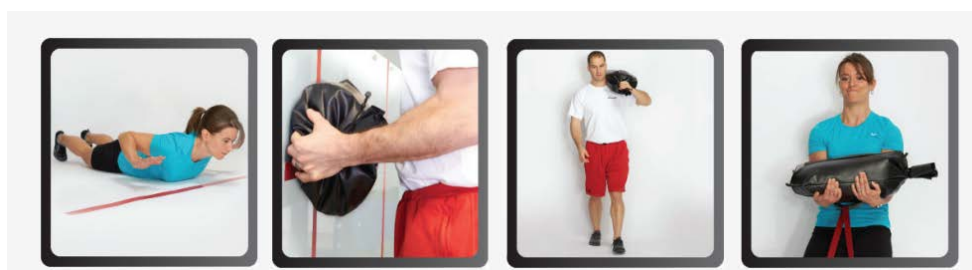


Figure 1: The FORCE Evaluation performed as 20m rushes (20mR), Sandbag Lift (SBL), Intermittent Loaded Shuttle (ILS), and SandBag Drag (SBD).

2.0 THE FITNESS PROFILE: HEALTH RELATED FITNESS

Cardiorespiratory Fitness (CRF) and Body Composition are components of Health related fitness. The mean oxygen cost of performing FORCE at the minimum operational standard was determined through direct measurement to be reasonably low, 26.3 ml O₂/kg21/min (Reilly, 2014), well below accepted thresholds for optimal health (Kodoma et al, 2009). Between 2014-2016 the $\dot{V}O_{2max}$ max FORCE relationship was investigated to see if results on FORCE could accurately predict $\dot{V}O_{2max}$ (Laframboise et al, 2018). Over this period a sample of 248 healthy adults (73 females) aged 17-59 years performed FORCE at maximum effort

and a GXT (a maximal graded exercise treadmill test). As there was no current measure of body composition, height (Ht), weight (Wt), percent body fat, waist circumference (WC), and lean body mass (LBM) were also captured. A linear regression analysis including anthropometrics and demographics (sex and age) identified various models with high predictive ability (R^2 range 0.72-0.76; SEE range 3.82-4.12 mL/kg/min). These values are similar to other indirect maximal tests used to predict $\dot{V}O_{2max}$ such as the Cooper tests, a 1.5 mile run and the 12 min run, and the Leger 20m shuttle run. These are commonly used and reliable field tests that yield high prediction accuracy in adults; [1.5 mile run: $r = 0.79-0.90$ (Grant 1999, George 1993, McNaughton 1998), 12 min run: $r = 0.84-0.92$ (Jorgensen 2009, Grant 1995, McNaughton 1998, Penry 2011), and 20m shuttle run $r = 0.79-0.90$ (Leger 1982 1988 1989, Ramsbottom 1988, Grant 1995, Penry 2011, McNaughton 1998)]. The regression equations generated to link FORCE with $\dot{V}O_{2max}$ yielded errors (%SEM) ranging from 8.4 to 9.1%, which fall within the 10% error range accepted for predictive tests (McCardle, 1991). The largest predictive range was ± 2.2 mL/kg/min, which occurs for the low performing females between 25 and 30 years of age. Ultimately, the predictive model selected requires only the ILS FORCE time, WC and gender to predict $\dot{V}O_{2max}$.

2.1 Cardiorespiratory Fitness and All-Cause Mortality

A relatively detailed and wide-ranging review of literature supports the position that CRF and body composition are both independent and significant predictors of mortality and morbidity. A total of 49 studies (including original papers and meta-analyses) were accepted into a literature review performed by Human Performance. The majority of the data reported was based on large-scale longitudinal epidemiological studies which tested various components of fitness and then followed individuals for as many as 35 years. As well, an existing meta-analysis of studies relating CRF to mortality and morbidity served as a starting point to locate additional studies (Kodama, et al., 2009). This review included 33 studies. There were 6910 cases of all-cause mortality in 102 908 participants and 4484 deaths attributed to Coronary heart disease (CHD) and Cardiovascular disease (CVD) in 84 323 participants. Kodama et al (2009) concluded that better CRF was associated with lower risk of all-cause mortality, CHD and CVD. A 1-MET increase in a person's $\dot{V}O_{2max}$ was approximately associated with a 13% and a 15% risk reduction in all -cause mortality and CHD/CVD, respectively. The relative risk ratio for low fitness versus high fitness was of 1.4 -1.7 for all-cause mortality.

Other militaries linking CRF and health include the US National Guard who employ a 2-mile run and categorize personnel based on a 10-year CHD risk. This was implemented as a result of identifying that their National Guard members were experiencing CVD symptoms despite being screened as low or moderate risk on the Framingham profile (469 cardiac referrals of deployed soldiers with a mean age of 39 years) (Talbot et al., 2009).

The US Air Force developed a scoring system on their fitness test creating a health profile which was determined based on CVD risk, and risk of injury, assessed through a 1.5 mile run, push-ups, sit-ups and abdominal circumference (Baumgartner et al., 2018) This model was also employed to guide the Fitness Profile for the CAF. Similar emergency services such as The Royal National Lifeboat Institution in the United Kingdom (Reilly and Tipton, 2005), and Firefighters in the USA and Canada (Poplin et al., 2014) have an aerobic fitness standard with the intention of improving health, while not always directly linked to the metabolic demands of the job, but more the categorisation of “fit” and “unfit”.

At the time of this research project, only self-reported Physical Activity (PA) was collected for the CAF. Through this literature review self-reported PA was found to be inconsistent and inconclusive as an indicator of all-cause mortality (Folgelholm, 2010). When physical activity, physical fitness and possible confounding variables are included in a multivariate model, fitness remains strongly associated with mortality and the association between self-reported activity and health is no longer significant (Blair et al 2001, 2001; Sobolski et al. 1987). Therefore, the use of these zones of low to high risk based on Kodoma's meta-analysis of CRF

were established and implemented in the FP, similar to the USAF (Figure 2, Table 1). As $\dot{V}O_{2\max}$ was easily and accurately predicted by the FORCE Evaluation when WC was included, these additional measures would serve to establish a more complete FP of CAF personnel, expanding beyond simply the occupational fitness required to pass the minimum standard. Though no career action could or should be taken on these broader measures of physical fitness, the information would serve to counsel the individual as well as to provide metrics to the chain of command to guide and prioritise program delivery.

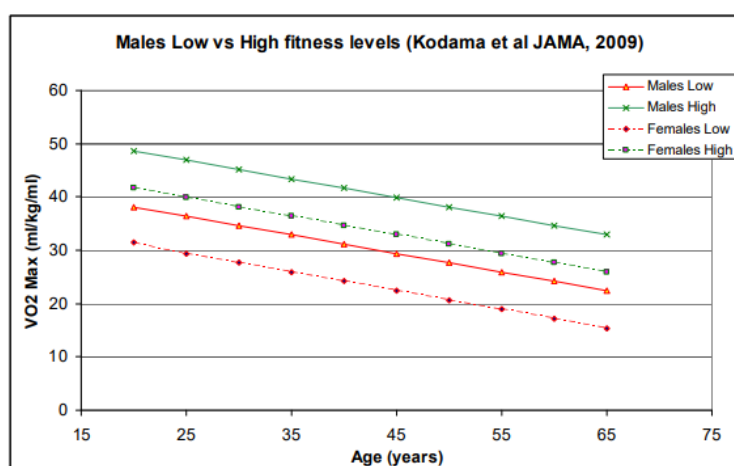


Figure 2. Cut-offs for low and high CRF based on Kodoma et al, 2009.

Table 1. High and low risk cut-offs based on Kodoma et al (2009) (Reilly, 2014).

Age	VO ₂ max (mL/kg/min)			
	Male		Female	
	Risk Cut-off			
	High	Low	High	Low
15-20	38.1	48.6	31.5	41.7
20-25	36.4	46.9	29.4	39.9
25-30	34.6	45.1	27.6	38.1
30-35	32.9	43.4	25.9	36.4
35-40	31.1	41.6	24.1	34.6
40-45	29.4	39.9	22.4	32.9
45-50	27.6	38.1	20.6	31.1
50-55	25.9	36.4	18.9	29.4
55-60	24.1	34.6	17.1	27.6

2.2 Body Composition

The addition of WC to the PES was hypothesised to be a potential obstacle due to its perceived link with aesthetics, and the personal nature of taking the measure. However, the value of introducing a body composition measure to incentivize health related fitness was first established and communicated to the defence team. Similar research had been conducted within military organisations using body composition to identify health risks. The US National Guard had identified a significant relationship between abdominal circumference (AC) and CVD risk (19 years longitudinal study). A significant positive relationship was observed between AC and 10 year Coronary heart disease risk (men), when controlling for age, and AC established as a predictive variable for a 10 year CHD risk score (Ricciardi et al., 2009). Adiposity and

physical fitness are both important predictors of diabetes, and are independent of several other risk factors (age, smoking, alcohol and parental history) (Katzmarzyk, 2007; Lee et al., 2005; Lee et al., 2009). To identify unfit males at risk for CHD (as assessed by the Framingham Heart Study), WC or AC was determined as the best anthropometric when compared to % Body fat, BMI and Waist to hip ratio (WHR).

In addition, varying medical governing bodies had begun publishing results reinforcing the need to collect WC or AC at the doctor's office (NHLB, 2013; World Health Org., 2011). In fact, the 2006 Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children indicated AC or WC help to determine a patient's risk profile for CVD and overall health risk, providing a reference point for monitoring AC over time to prevent obesity related diseases. They recommend the creation of a national surveillance system that incorporates at minimum the measurements of height, weight and AC (Lau et al., 2007). To establish risk zones for the CAF cut offs of < 102 cm for men and < 88 cm for women were established, based on findings by the World Health Organization (WHO).

However, to determine if there would be resistance from the CAF on the introduction of a WC measure, a pilot trial of the Fitness Profile, including 624 military participants from 4 military bases/wings was conducted (27% female). Participants performed the annual PES (FORCE) to their volitional maximum, had their WC measured by the fitness instructor or researcher, as well as completed a survey following testing to solicit their opinion on both the Fitness Profile, and the WC measure. Very few recruited participants refused the abdominal circumference measurement and based on their answers on the post evaluation survey, most believed that WC and a debrief on their Fitness Profile score provided a benefit to the evaluation. For example, 4.6% disagreed or did not understand the need to take WC and 5.7% were not comfortable having it taken (Table 2). It was repeatedly made clear to participants that the WC measurement in the FP is in no way linked to any employment condition or policy.

Table 2. Results from the 2017 survey on the introduction to the FP and WC measurement.

	Agree strongly (%)	Agree moderately (%)	Agree a little (%)	Neither agree nor disagree (%)	Disagree a little (%)	Disagree moderately (%)	Disagree strongly (%)	Do not know or not applicable (%)
Understood reason for taking AC measure	51.0	25.7	11.3	3.5	3.2	0.7	0.7	0.5
Comfortable with having AC measure taken in this way	58.1	21.1	7.3	4.1	2.5	1.7	1.5	0.2
Understood fitness profile result	75.5	13.7	4.6	0.8	0.3	0.2	0.5	0.3
Believed fitness profile result was accurate	48.6	31.1	6.9	1.7	3.4	1.9	1.9	0.5
Plan to make changes to lifestyle based on result	34.6	29.2	14.9	8.4	1.4	2.9	3.9	1.0

2.3.1 The relationship between AC and CRF

In the final model, to predict health-related fitness (morbidity and mortality) WC only accounts for only 25% and $\dot{V}O_{2max}$ the other 75%. This ratio was implemented as, for given levels of abdominal subcutaneous fat, visceral fat or WC, research indicates that men with higher levels of CRF had substantially lower metabolic risk compared with men of low CRF (Lee et al., 2005). Stevens et al. (2002 & 2004) report that both CRF and obesity are independent predictors of mortality and that high fitness substantially ameliorated the risk of obesity but did not eliminate it. The highest risk of mortality was observed in those who are both obese and unfit (Lee et al., 2010). In addition, to this scientific reasoning to place the emphasis on CRF, it was the decision of the organisation to put more importance on incentivising CAF members to increase their fitness, than improve their body composition, potentially through diet alone.

3.0 THE FITNESS PROFILE: OPERATIONAL FITNESS AND HEALTH RELATED FITNESS



Figure 3. The Fitness Profile employed in the CAF incentivisation strategy today. The Vertical (Y) axis refers to points earned on the FORCE Evaluation and “Occupational Fitness” whereas the Horizontal axis (X) refers to points earned on the $\dot{V}O_{2max}$ prediction (75%) + WC (25%) translated to health related fitness.

Figure 3 is the chart for which a CAF member reviews with a fitness specialist after completing their annual PES. Their result is plotted based on their score on FORCE, considering their WC, given their age and gender category. Within each group, age and gender-specific scores are calculated for each of the four FORCE Evaluation components, wherein each test element is scored on a scale of 100 points, for a total of 400 points on the overall test. Before the 2016 launch, the trial year of 2015 provided Fitness Profile data of over 35,000 FORCE Evaluations performed in the CAF. These data formed the original frequency distributions by gender and 5-year age group. It is important to note at this stage although the incentive program structure was approved by Armed Forces Council (AFC) in February 2015, the logistics of assigning and administering rewards were still being addressed by the Chief of Military Personnel within the CAF, and the rewards themselves were not determined.

After two more years of collecting FORCE data for the Fitness Profile (2016/2017), adjustments were required to ensure the incentive thresholds of the Occupational performance, and norm references categories, reflect the CAF. Electronic data from 109 000 test entries were used to update the normative scoring tables associated with each 5 year age-gender category and determine the upper 50% eligible for the incentive. This revision resulted in more representative categories of the top 34% in Bronze, ~14% in Silver, ~2% in gold, and 0.1% in Platinum. An adverse Impact analysis indicated that females had a 94.6% chance compared to males at attaining each of these categories. Where females were less likely to achieve incentive was in categories of older females where data sets were not complete due to females avoiding testing in large numbers. Also, as females age, one element of the FORCE test seems to decline more than the others creating an imbalance in the scoring.

The tables and figure below (Table 3 and Figure 4) provide an on the spot report of data from 2018. These are the type of analysis the FORMeFIT system allows for, a queryable data based, where incentive results can be instantaneously produced and reviewed based on demographics.

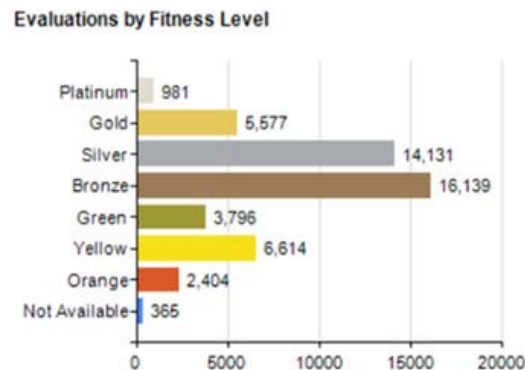


Figure 4. Evaluations by fitness level for 2018, demonstrating the relative numbers in each category.

Table 3. Evaluations by Incentive and Gender

Evaluations by Fitness Level and Gender

Gender	Platinum	Gold	Silver	Bronze	Green	Yellow	Orange	Not Available	Total Evaluations	Average Level
Male	880	5,035	12,427	13,928	2,942	5,632	2,215	184	43,243	Bronze
Female	101	542	1,704	2,211	854	982	189	181	6,764	Bronze

Starting in April 2017, participants who score above average on their Fitness Profile were eligible for the Incentive Program.

Bronze: you have a result better than or equal to 50% of the CAF population group.

Silver: you have a result better than or equal to 84% of the CAF population.

Gold: you have a result better than or equal to 98% of the CAF population.

Platinum: you have a result better than or equal to 99.9% of the CAF population.

Currently, as of 2019, the rewards are monetary, and those in the Silver or above will receive a t-shirt, those in Gold receive a hooded sweatshirt, and those in Platinum receive a hooded sweatshirt and a pin.

4.0 ADDRESSING THE NEED TO HAVE A DYNAMIC AND ELECTRONIC REPORTING PLATFORM

The ability to deliver the Fitness Profile hinged on one major evolution regarding how we evaluate CAF personnel on their annual PES. These evaluations needed to be captured electronically so that a CAF members FP could be reviewed with them instantly after the test (Figure 5), thereby providing an individual with information to empower change, and direct them to the appropriate resources. In addition, the electronic fitness platform (FORMeFIT) would allow for quarterly reporting on fitness and health-related fitness metrics to their Chain of Command (CoC).

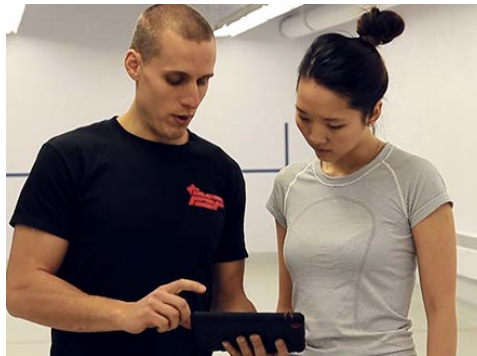


Figure 5. Fitness staff for PSP reviewing a CAF members Fitness Profile (FP) directly after she completes her FORCE evaluation.

An impetus for the need to collect and report these metrics on the CAF was identified by the Assistant Deputy Minister (Review Services) (ADM(RS)) audit in 2014 of the 2008 CAF Health and Physical Fitness Strategy. This review highlighted the requirement for a more robust performance measure and reporting mechanism relating to health and fitness in the CAF. Therefore, the evolution to the FORMeFIT System addressed that requirement by providing efficient means of tracking and reporting of evaluation results.

A risk analysis was performed considering the privacy/legal concerns of collecting personal data on CAF members and reporting these data within their CoC. Three working groups were established including members from Clinical Council (Surgeon General), the office of the Judge Advocate General (JAG), DND/CF Legal Advisors (DND/CF LA), Director Health Services Delivery (DHSD), and Director Access to Information Privacy (DAIP). The three areas addressed in these consultations were (1) respecting data privacy (2) providing the correct framework for commanding officers (COs) to interpret the FP data they receive on their subordinates, and (3) ensuring that the results complement and do not contraindicate those from Health Services.

4.1 Collecting and storing personal information

The collection and storage of any personal data by the federal government is a tightly regulated process. A Privacy Impact Assessment was conducted in collaboration with the Director of Access to Information Privacy (DAIP) in order to ensure that all regulations were adhered to. A Personal Information Bank (PIB) was subsequently developed in 2016 to house the results of the FORCE Evaluation proper, as well as the waist circumference data, in accordance with all regulations. Legal counsel from DND/CF LA saw no à priori issues with the collection of this data, as tracking general physical fitness could easily be justified in terms of overall operational effectiveness of the CAF, and up until this time COs could access individual PES data.

4.2 Guidance to Leaders on the use of their members results

Currently aggregate data are provided at the L3/L4 [Brigade commander/formation (such as fleet Atlantic) and their sub-units (L4: ship specific)]. DND may allow access to subordinates overall incentive level (did the member reach bronze and up) but the CoC will not have access to force times, scores, WC, this data remains personal confidential and cannot be solicited from the subordinate. Guidance to COs explained explicitly that as long as the individual passes the FORCE Evaluation, no punitive action should be taken based on their FP results. The FP is to be used for counselling and goal setting and not to justify sanctions or career actions. In addition, selection of personnel for deployment, operations, training, exercises or any other

purpose should only be based on whether they pass the FORCE Evaluation and not on any other aspect of the FP. The link between health-related fitness or incentive status and the requirements of operations has not been established.

Though the minimal standard on the FORCE Evaluation has been shown to be attainable with training for all ages, and genders, not everyone has the genetic or physiological potential to attain the upper levels of the incentive program. For this reason, it was explained to the COs that is important not to place unrealistic expectations on members of units.

4.2.1 Information Provided to COs

The “colour” attributed to an individual’s performance provides the CO with information about his/her unit/members on where improvements can be made in both Operational and Health-related Fitness, helping to direct the CO to the appropriate programs and services through PSP and Health Promotion. Average times for each of the 4 FORCE components are available to a CO at the unit level. If there are weakness in areas such as the aerobic or strength components specifically, these may be a reflection of current physical training (PT) practices and can indicate how to improve and direct future PT in order to improve performance, and produce a more balanced fitness profile. A visual algorithm flow chart was developed to help COs make educated and effective decisions for their subordinates based on FP results (Figure 6).

4.2.2 Not Provided to COs

Individual score as a time or “raw score” is always translated to its relative/percentile score for the Fitness Profile. To compare raw score between individuals does not provide additional information and has the potential to be misinterpreted. It is not possible to extract WC or CRF information from any “color” alone. Therefore, individuals’ CRF and WC will remain protected as they are not “operational” measures and the prediction equation/algorithm will not be shared with COs. WC is assessed to be neither an identifier nor a quasi-identifier given the limited range and the ability to visually detect WC. This data will still not be shared with COs as it presents a high risk for misinterpretation with little overall benefit.

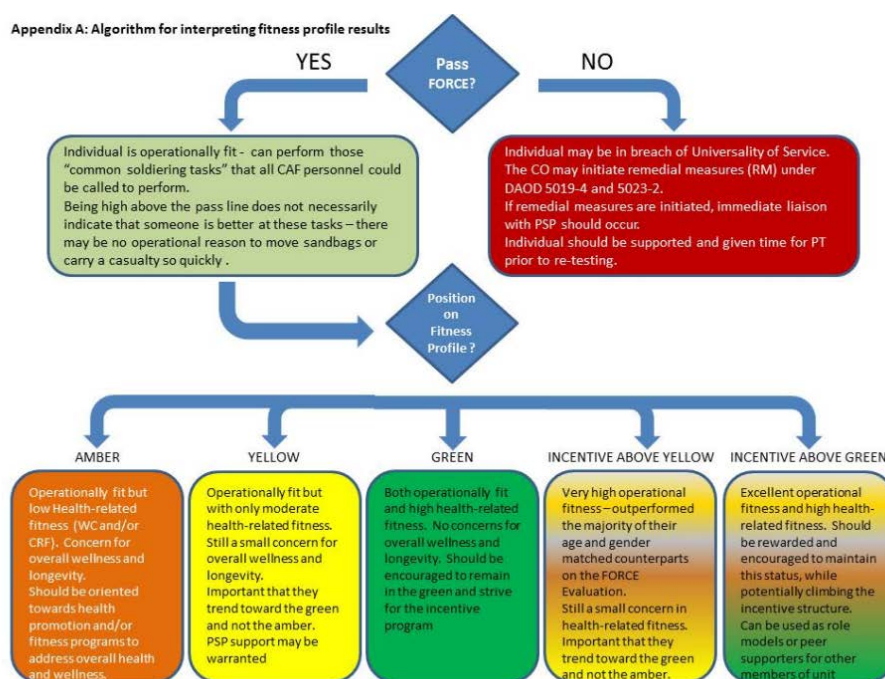


Figure 6. Diagram to demonstrate how the CO can interpret the “colour” on the FP.

4.3 Enhancing the Periodic Health Assessment (PHA)

Through consultations with the committee representing the Surgeon General, it was agreed that cardio-respiratory fitness would enhance the overall risk assessment within the PHA. As indicated, many reports have recommended that CRF assessment should be included in the clinical setting based on the importance of CRF to morbidity and mortality prevention (Cheng et al., 2003; Gulati et al., 2005; Kodama et al., 2009; Myers et al., 2004). The Framingham risk score (currently used as part of the PHA) is a gender specific predictive algorithm that was developed using categorical variables to allow physicians to predict multivariate Coronary heart disease (CHD) risk in patients without overt CHD (Wilson et al., 1998) for up to a 10 year span. The outcome of a fitness profile was not meant to replace or “compete” with the Framingham health risk score – these estimates are assessing distinct constructs. As previously discussed, the protective effect of CRF on mortality is independent of many of the measures considered in the Framingham risk score, such as age, ethnicity, adiposity, smoking status, alcohol consumption as well as health conditions (Blair et al., 2001). It has been recommended to include CRF into the Framingham score as a major risk factor (Kodama et al., 2009), as CRF is also a useful health indicator for both symptomatic and asymptomatic patients in clinical practice (Gibbons et al., 2002; Gulati, et al., 2005; Myers et al., 2002).

Many studies suggest that the assessment of an overweight patient’s fitness status is just as important as the measurement of glucose level, cholesterol, blood pressure, smoking and family history (Fogelholm, 2010). While one measure does not replace the other, fitness assessments can complement the health evaluation of an individual especially where one may be categorized as obese but have the shielding effect of a high level of CRF (Blair et al., 2001; Blair et al., 1995; Blair et al., 1996). Blair et al. (1995) observed a decrease in mortality risk in the population (n=10 000 males) who maintained or improved physical fitness present in both healthy and unhealthy men. Results are consistent across age groups, independent of other confounding risk factors. Clinicians should act on this info (CRF) to promote regular physical activity in order to reduce premature deaths from CVD and all causes (Lee et al., 2010).

4.4 How is feedback/evidence being used to measure effectiveness

As indicated, the FORMeFIT system provides timely metrics at L0, L1, L2, and L3, resulting in CoC accountability along the way. Below in Figure 7, an example report where aggregate data is presented to allow for comparisons between Commands.

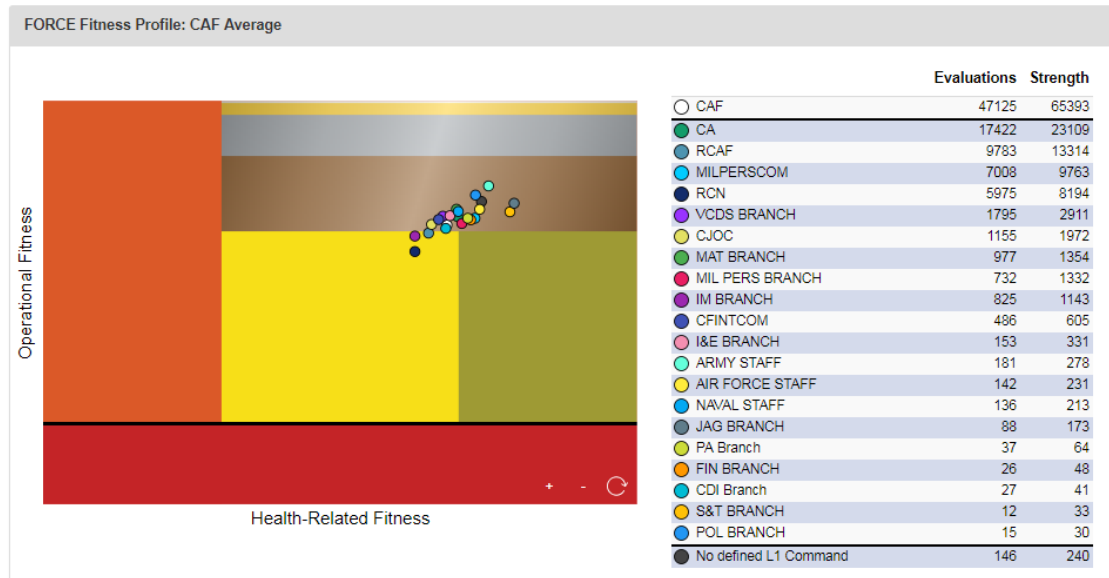


Figure 7. Fitness Profile for L0 (CAF) and L1 (Commands) for Fiscal year 17/18,

The future aim is to provide reporting of all CAF on FORMeFIT, and to include the primary reserve. Currently efforts are directed at learning more about CAF members who are not included in the reporting. These groups are primarily those on temporary medical categories, Mat/Pat leave, still completing paper evaluations, and no-shows or test avoiders. Once the number of test avoiders and their location(s) are identified, more can be done to ensure maximum participation in what is a requirement of employment for all CAF members (DAOD 5023-2).

This year (2019) our organization launched a new Health and Fitness Strategy (BALANCE) and the success of various health promotion and fitness interventions will be evaluated with the metrics received through the FORMeFIT system and the FP. The previous Health and Physical Fitness Strategy (2008) did place a certain responsibility on COs for the fitness of their personnel, but did not provide metrics or a performance measurement tool with which to identify the success or failure of various interventions and resources.

The ability of the monetary reward to incentivise members to improve their FP score will be reviewed on an annual basis, and will evolve as needed. Currently this reward was chosen based upon the results of approximately 15,000 questionnaires and seven focus groups which sought to uncover what CAF personnel would find motivating and attainable in a fitness rewards program (Spivock, 2015).

5.0 FUTURE DIRECTION

5.1 Musculoskeletal Injuries (MSKI)

Cardiorespiratory fitness and WC have been linked to risk of a MSKI in industrial and military populations (Hauret et al, 2018, Jones et al, 2017, Lisman et al, 2017, Lisman et al 2013, Witchalls et al 2017, Zambraski et al, 2012). Poplin et al. (2014) compared levels of aerobic fitness in injured employees with those of non-injured employees. Participants in the lowest fitness level category with a $\dot{V}O_{2max}$ between 43 and 48 ml/kg/min were 1.38 times (95% CI: 1.06 -1.78) more likely to incur injury than those with a $\dot{V}O_{2max}$ above 48 ml/kg/min. Hazard ratios were found to be greater for sprains and strains. They suggest that improving relative aerobic capacity by 1 metabolic equivalent of task (approximately 3.5 ml O₂/kg/min in $\dot{V}O_{2max}$) reduces the risk of any injury by 14%.

Since the implementation of the FORCE Evaluation in 2013, demographics, health-related characteristics, and MSKI sustained during Basic Military Qualification (BMQ) in recruits were investigated. A retrospective analysis of injuries in recruits introduced in the training rehabilitation program during 2016/2017 identified there was a significant relationship between poor performance on FORCE and an increased injury risk, regardless of age and gender. For a population of 7192 over this period, the overall injury rate observed was 4.3% (307 recruits: 183 males, 124 females) (Chassé et al, 2019, under review). Results demonstrated that injured recruits were older, performed worse on FORCE, had a larger WC and lower predicted $\dot{V}O_{2max}$ than non-injured recruits ($P < 0.01$). Three of the four components of FORCE were significant predictors of injuries: 20mR, ILS and SBD with an odds ratio (CI) of 2.69 (1.89-3.83), 2.74 (1.91-3.95), 2.26 (1.52-3.37) (all $p < 0.01$) respectively. Predicted $\dot{V}O_{2max}$ was also a predictor (OR: 2.19 (1.30-3.70) of overuse injury only. It was determined that the CAF PES FORCE is a useful tool to evaluate the risk for injuries during BMQ for the CAF.

Currently the FP does not include a prediction of MSKI, however this recent work exposes the potential to use the Fitness Profile in predicting MSKI and adding a further dimension of Health Related Fitness.

5.2 Feedback on the usefulness of the Fitness Profile and FORMeFit reporting

In January 2019, the Directorate of Fitness polled 37 Fitness and Sports Managers of Bases and Wings across the nation for their feedback regarding the effectiveness of the FORMeFit Reporting system (Chenard, 2019).

Specific questions were posed such as:

1. How often have FSMs utilized FORMeFit Reporting with their Chain of Command (CoC);
2. The feedback of FORMeFit Reporting from the field;
3. The advantages/disadvantages of FORMeFit Reporting;
4. The effectiveness of FORMeFit Reporting on local programs; and
5. The administrative efficiency of FORMeFit Reporting.

The results from the FORMeFit Quarterly Reports Survey confirm that the field is in fact utilizing the FP results as 96% of Fitness and Sports Managers have accessed and briefed the CoC at their respective location at least once; 25% of which have met and briefed the CoC 3 times or more. The survey identified a strong, consistent interest in further subcategorizing the levels of the CAF.

6.0 SUMMARY

In summary, determining where a CAF member is plotted on the Fitness Profile proves useful to the CAF in several ways:

- CAF personnel have a better understanding of their own fitness level, and will be empowered to take

actions to address issues where they may exist. They are now provided with a metric on their aerobic fitness and their body compositions, components of fitness that were missing in their PES result.

- FORCE Evaluators have a better basis from which to direct CAF personnel to resources to assist in increasing their fitness (e.g., Health Promotion, fitness classes, DFIT.ca, etc.).
- Results are automatically transmitted to the Human Resource Management System (DND/GUARDIAN) which removes the need for paper filing, providing PSP fitness staff the ability to put more focus into programming.
- The CoC are provided a reporting forum for the Operational and Health related fitness of their subordinates, as well as direction how best to use the information
- The 2019 Health and Fitness Strategy BALANCE can be evaluated for longitudinal effectiveness with a sensitive metric.
- In addition, Medical officers can ask a CAF member at their periodic health assessment if they can access the members FP (providing additional information on which to develop a health risk profile)
- The relationship between MSKI and the FP identifies another dimension of risk prediction and therefore has the potential to further enhance the Health related physical fitness component of the Fitness Profile.

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Fatal monotony: Increased daytime sleepiness in the deployed setting

Speaker:

Dr. Reinhard Stark, Lieutenant Colonel (MC)

Bundeswehr Hospital Hamburg, Department of Neurology, Lesserstr, 180, D - 220149 Hamburg,
Telephone: +49 (0) 40 6947 16110
GERMANY
reinhardstark@bundeswehr.org

Coauthors

PD Dr. Roland Girgensohn

Affiliation: Bundeswehr Medical Academy, Munich, Germany
Address: Bundeswehr Medical Academy, Section E, Military Medicine Research and Development,
Ingolstädter Str. 240, 80939 Munich
GERMANY
RolandGirgensohn@bundeswehr.org

PD Dr. Stefan Sammito, Lieutenant Colonel (MC)

Affiliation: Air Force Center of Aerospace Medicine, Cologne, Germany
Address: Air Force Center of Aerospace Medicine, Branch I 3, Flughafenstraße 1, 51147 Köln
GERMANY
Telephone: +49 (0) 2203 908 3541
StefanSammito@bundeswehr.org

Prof. Dr. med. Antje Büttner-Teleagă

Affiliations: Woosuk University, Jeonbuk, South Korea; Witten/Herdecke University, Witten, Germany
Address: Institute for Cognitive Science, Woosuk University, 565-701 Samrye-up, Wanju-gun, Jeonbuk,
South Korea
GERMANY
Telephone: +49 (0) 176 23249826
E-mail: antja18b@yahoo.com

ABSTRACT

Introduction

Intolerance of monotony, i.e. the tendency to make errors or even fall asleep during monotonous activities, can be life threatening in certain occupational settings. This applies, for example, to drivers, pilots and guards. Combined with the usual types of deployment-related stress, deployments to crisis areas with a high potential of conflict lead to increased daytime sleepiness. Non-physiological shift work schedules with sometimes irregular rest periods, temporary accommodations that are associated with further factors adversely affecting sleep (heat, noise, insects, etc.), and personal worries trigger monotony intolerance and can become a problem for the German Armed Forces. The primary objective of this study was to identify mobile tests for diagnosing monotony intolerance with sufficient sensitivity and specificity and for screening military personnel in a deployed setting.

Material and Methods

The study used an experimental design and included a literature search. The vigilance of 30 subjects (night duty nursing staff of the Bundeswehr Hospital in Hamburg) was assessed before and after a night shift.

Therefor several tests were used: the vigilance test described by Quatember and Maly (VIGIL®), the WAFV, which is a component of the SLEEP® test battery described by Schuhfried (for visual vigilance), the pupillographic sleepiness test (pupillography), the Schuhfried's SLEEP® test (for measuring tonic and phasic central nervous system activation) and the Stanford Sleepiness Scale (SSS) (for assessing sleepiness).

Results

VIGIL® and WAFV – unlike pupillography, the measurement of tonic and phasic alertness, and the SSS – were found to be suitable tests for detecting monotony intolerance with very high levels of sensitivity and specificity. Psychometric tests showed that, after night shift work, 60% of the subjects did not have the level of vigilance required to drive a car, for example. There was a considerable difference between subjective sleepiness and objective test results. Two thirds of the subjects had a higher level of sleepiness than they realized.

Conclusions

VIGIL® and WAFV are two inexpensive computer-based test systems that are easy to operate by even inexperienced users and showed the highest levels of specificity and sensitivity for measuring monotony intolerance. The tests do not require complex hardware and software components (only a portable computer) or special user training. They are suitable for measurements during deployments abroad.

Keywords:

Monotony intolerance, daytime sleepiness, central nervous system activation, sustained attention, sleep deprivation.

1. INTRODUCTION

Daytime sleepiness can have life-threatening consequences. Numerous studies have proven that in Germany, drowsy drivers are involved in more fatal accidents than drunk drivers. As many as 25 % of all fatal accidents on Bavarian motorways are the result of fatigue (Langwieder et al. 1994). Other studies and surveys carried out on road accident casualties also show that fatigue behind the wheel is the most common – and avoidable – cause of accidents (Åkerstedt T 2000, ten Thoren & Gundel 2003, Yamasaki et al. 2016). In Germany, the cost of accidents resulting from fatigue amount to approximately ten billion euros (Hajak & Zulley 2008). A number of disasters have been connected to workplace errors as a result of daytime sleepiness. Examples include the Chernobyl and Three Mile Island reactor accidents of 1986 and 1979, respectively, and the Bhopal gas disaster in 1984. The Exxon Valdez oil spill (1989) and the capsizing of the MS Herald of Free Enterprise ferry after leaving the port of Zeebrugge (1987) were also attributed to fatigue-related human error based on the timing of the accidents (each one happened in the early morning hours) and the circumstances surrounding them (Hajak & Zulley 2008). A Swedish study by the stress researcher Åkerstedt of the University of Stockholm showed that 7 % of employees unintentionally fall asleep at work at least once a month and that as many as 23 % do so during their leisure time (Åkerstedt et al. 2002).

The German Sleep Society (*Deutsche Gesellschaft für Schlafforschung und Schlafmedizin*) recommends a combination of several complementary diagnostic tests for assessing daytime sleepiness. Since the recommended tests only cover certain aspects of daytime sleepiness, it has not been possible to establish a single test method that could be used as a standard for validating other methods (Weeß 2018).

In choosing the tests, one focus was on ensuring that they covered various components of attention (tonic central nervous system activation, phasic central nervous system activation, vigilance / sustained attention) and on complementing computer-based psychometry with an independent test (pupillography).

The aim of this study was to identify a test method that is easy to administer even for inexperienced users and that detects sleepiness with high levels of sensitivity and specificity.

2. METHODS

The vigilance of night-duty nursing staff of the Bundeswehr Hospital in Hamburg was tested immediately before and after a night shift. Each test lasted 90 minutes. The night shift began at 9 pm, and the evening tests were carried out between 7.30 pm and 9 pm. The night shift ended at 6.30 am, with the test thus lasting until 8 am. Based on the nature of their work, it was postulated that they would not get any sleep during the night of the test. Subjects were asked to confirm this before testing in the morning.

We used the following objective and subjective tests in this study:

- two objective tests to examine vigilance / sustained attention:
 - a) S1 vigilance test with circular path according to Quatember and Maly (VIGIL®)
 - b) measurement of visual vigilance with WAFV test, S2 test battery from the Schuhfried SLEEP® test battery
- two objective tests to determine daytime sleepiness:
 - a) pupillographic sleepiness test
 - b) measurement of tonic and phasic central nervous system activation with the Schuhfried SLEEP® subtest
- the Stanford Sleepiness Scale (SSS), a scale for subjective assessment of the current level of sleepiness.

The test procedure was standardised, with the test sequence and intervals between the individual tests predefined.

Before the tests started, each subject had to fill out the SSS. The first test was the pupillography test. After an interval of 5 minutes, the vigilance test (VIGIL®) was then performed. And lastly, after another 5-minute interval, the WAFV test (SLEEP® test battery) was carried out to assess phasic and tonic central nervous system activation and to measure visual vigilance.

Five days after the test, the subjects were contacted again and asked up to which point on the SSS they would consider themselves to be fit to drive. The purpose of asking this question at a later point was to obtain an objective self-assessment. It was necessary to avoid situations where subjects might consider themselves sleepy after the morning measurement but did not wish to have this recorded because of their intention to drive afterwards.

Nurses of the Federal Armed Forces Hospital Hamburg, who were between 20 and 40 years old, came as probands in question. In a preliminary interview they were asked about possible health restrictions. Only healthy subjects were accepted. Gender was not specified. The study design was approved by the Ethics Commission of the Medical Association (Ethikkommission der Ärztekammer) in Hamburg (PV 4909) and it was part of a military medical research project (SoFo19K2-S-32 1515).

To test statistical significance, non-parametric tests were used because the data collected was not expected to be distributed normally. All tests were evaluated using two-sided significance tests. A test shows impaired vigilance if at least one of the measurements collected falls within the pathological range. A subject is objectively sleepy if at least two different tests (other than SSS) show a reduced level of vigilance. The definition was based on the German Guidelines on Assessment of Fitness to Drive

Gräcmann & Albrecht 2017). These guidelines define sleepiness as objectifiable if a method used to test central nervous system activation or vigilance reveals at least one abnormal result or if two attention functions show abnormal results. All evaluations were carried out with IBM SPSS Statistics 19.

In total, 16 male and 14 female subjects were tested. There were not enough subjects for a statistically

significant gender-specific analysis and results were not differentiated based on specific test nights (e.g. the first night of a night-duty period).

2. RESULTS

2.1 Overview of impaired vigilance before and after a night shift

The greatest change over the course of the night shift towards greater sleepiness was evident on the SSS, in the number of correct reactions and the reaction time in the VIGIL test, and in the number of missed reactions and the reaction time in the WAFV test. The number of missed stimuli with tonic activation, which was reduced after the night shift, went the other way (overview of all tests, Table 1).

Table 1: Results of the individual sleepiness tests before and after night shift. Mean values (MV), standard deviations (SD) and overview of the central tendencies in the Wilcoxon Test. SSS = Stanford Sleepiness Scale, PUI = pupillary unrest index, VIGIL = vigilance test, WAFV = visual vigilance test

Test	Parameter	Before night shift		After night shift		Difference		Wilcoxon Test	
		MV	SD	MV	SD	MV	SD	Z	p
SSS		1.77	0.69	3.43	1.04	-1.67	0.92	4.731	< 0.001
PUI		5.94	3.07	6.79	4.11	-0.85	3.39	1.213	0.225
VIGIL	Correct reactions	53.13	28.42	23.27	25.38	29.87	32.42	3.841	< 0.001
	False reactions	44.93	23.41	34.27	29.52	10.67	35.18	1.772	0.076
	Reaction time	63.40	30.43	43.30	31.22	20.10	28.64	3.412	0.001
WAFV	Missed stimuli	59.87	29.05	35.13	30.88	24.73	39.60	2.982	0.003
	False reactions	34.77	24.25	22.13	26.68	12.63	33.09	2.135	0.033
	Reaction time	69.87	26.57	57.77	29.52	12.10	26.43	2.528	0.011
Tonic activation	Reaction time	68.17	21.21	63.10	21.67	5.07	18.27	1.264	0.206
	Motor time	69.13	20.89	68.47	23.80	0.67	16.22	0.036	0.971
	Missed stimuli	52.20	14.65	55.17	10.04	-2.97	12.31	1.089	0.276
Phasic activation	Reaction time	70.03	21.51	64.80	25.11	5.23	24.33	0.887	0.375
	Motor time	72.37	18.94	70.20	21.74	2.17	11.45	0.958	0.338
	Missed stimuli	53.00	0.00	48.00	15.26	5.00	15.26	1.633	0.102
	Reaction time difference	52.43	24.15	52.23	28.15	0.20	38.14	0.022	0.983
	Motor time difference	55.87	25.13	53.87	26.05	2.00	25.50	0.680	0.496

2.2 Share of subjects with impaired vigilance

Vigilance was objectively impaired in 60 % of subjects after the night shift. This is best reflected in the VIGIL and WAFV tests. In contrast, tonic activation after the night shift shows fewer sleepy subjects.

The vigilance of 20 % of the subjects was already impaired before their night shift began.

Table 2: Objectively sleepy subjects (for definition, see above) before and after night shift, and sensitivity in the individual tests. PUI = pupillary unrest index, VIGIL = vigilance test, WAFV = visual vigilance test, tonic / phasic = tonic / phasic central nervous system activation.

	n	Objectively sleepy	PUI	VIGIL	WAFV	Tonic	Phasic
Before night shift	30	6 (20.0 %)	3 (10.0 %)	8 (26.7 %)	9 (30.0 %)	3 (10.0 %)	3 (10.0 %)
After night shift	30	18 (60.0 %)	6 (30.0 %)	19 (63.3 %)	20 (66.7 %)	2 (6.7 %)	8 (26.7 %)

2.1 Sensitivity and specificity of the individual tests

The following evaluations do not distinguish between whether a subject was examined before or after a night shift. The data is seen as a collective of 60 data sets with varying degrees of impaired vigilance. In total, there were six objectively sleepy subjects before night shift and 18 sleepy subjects after night shift (cf. Table 2).

Sensitivity refers to the share of all objectively sleepy subjects (here $n = 24$) who were also identified as such in the respective test.

Specificity is the share of all subjects who were objectively not sleepy (here $n = 36$) and who are classified in the respective test as not sleepy.

Table 3: Sensitivity and specificity of the individual tests in terms of assessing sleepiness. PUI = pupillary unrest index, VIGIL = vigilance test, WAFV = visual vigilance test, tonic / phasic = tonic / phasic central nervous system activation.

	PUI	VIGIL	WAFV	Tonic	Phasic
Sensitivity	37.5 %	95.8 %	100.0%	12.5 %	41.7 %
Specificity	100.0 %	88.9 %	86.1 %	94.4 %	97.2 %

The VIGIL and WAFV tests show good sensitivity and acceptable specificity. PUI and tonic and phasic activation show poor sensitivity and reasonable specificity. VIGIL and WAFV are therefore recommended methods for identifying impaired vigilance.

2.2 How reliable is self-assessment?

Table 4 compares the self-assessment of sleepy subjects with that of subjects who are not sleepy. There is no significance as regards subjective fatigue in this context

Table 4: Comparison of the self-assessments of subjects who are objectively sleepy and those who are objectively not sleepy. This table shows the mean values (MV), standard deviation (SD), sample size (n) and the results of the Mann-Whitney *U* test (Z value = test statistic, p value = probability measure, SSS = Stanford Sleepiness Scale.

	SSS			Mann-Whitney <i>U</i> Test	
	MV	SD	n	Z	p
Objectively not sleepy	2.56	1.229	36	0.524	0.600
Objectively sleepy	2.67	1.204	24		

A comparison with the self-assessment values from Table 1 before/after a night shift shows that the subjects generally assess themselves as sleepier after night shifts but that this assessment does not correspond to the actual degree of sleepiness.

This SSS points score specified by the subjects in the follow-up survey was compared with their self-assessments of their sleepiness on the SSS after the night shift. It follows that subjects would consider themselves unfit to drive if their indicated level of sleepiness after the night shift was higher than their subjective limit in terms of fitness to drive. Otherwise, subjects considered themselves fit to drive after the night shift. Based on this assumption, two thirds of the subjects with impaired vigilance still consider themselves to be fit to drive, while only half of the subjects who are not sleepy do so (Table 5).

Table 5: A comparison of the percentage and absolute numbers of subjects who were objectively not sleepy or sleepy after a night shift with those of subjects who were subjectively fit to drive or not fit to drive.

After night shift	Objectively not sleepy	Objectively sleepy
Subjectively fit to drive	6 of 12 (50 %)	12 of 18 (67 %)
Subjectively not fit to drive	6 of 12 (50 %)	6 of 18 (33 %)

3. CONCLUSIONS

In the study, common neuropsychological measuring methods for the presentation of sleepiness, proposed by the German Society for Sleep Research and Sleep Medicine, and a scale for the subjective assessment of the current drowsiness were compared. One focus was the juxtaposition of different attention components (tonic central nervous activation, phasic central nervous activation, vigilance / sustained attention). It was to be clarified which measurement method proves a vigilance-related attention deficit with the highest sensitivity and specificity.

As psychometric testing revealed, 60 % of the subjects (18 out of 30) showed no longer a high enough level of vigilance to drive a car after working at night (in this case the night shift in a hospital). Two thirds (12 out of 18) of those with abnormal psychometric results still considered themselves fit to drive, however.

Impaired vigilance can be identified at an early stage by screening the attention components vigilance / sustained attention (Quatember and Maly Vigilance Test S1 with circular path and the WAFV test from the Schuhfried SLEEP® test battery). In compare to this self-assessment scales (here: Stanford Sleepiness Scale) are unsuitable for detecting loss of vigilance. Subjects cannot accurately assess their own sleepiness.

As psychometric testing revealed, 60 % of the subjects (18 out of 30) no longer showed a high enough level of vigilance to drive a car, for example, after working at night (in this case the night shift in a hospital).

Two thirds (12 out of 18) of those with abnormal psychometric results still considered themselves fit to

drive, however.

The test methods that were used to determine tonic central nervous system activation (here: pupillography and Schuhfried® SLEEP test battery subtest) exhibit low specificity but very high specificity for moderate sleep deprivation. These vigilance tests are characterized by a short test duration (pupillography 11 minutes, Schuhfried subtest battery 4 minutes). It is conceivable that the vigilance impairments caused by moderate sleep deprivation can be compensated through willpower during these short measurements. In addition, the subjects began the test series with the pupillography and thus still had the largest reserves at this time. If deficits were found in the testing of tonic-central nervous activation, their specificity was markedly high (pupillography 100%, WAFV 94.4%)

The result of a study by Grellner et al. (2005) presents itself in accordance with this hypothesis. This showed that after the night shift the PUI of night-care nurses had only a relatively moderate (but significant) increase, which, when considered as an absolute value, was increased only in the grey area. Only after additional demanding one-hour continuous load (Vienna test system), there was a further significant increase with a pathological absolute value.

Another cause for the low sensitivity of pupillography with only a slight increase in PUI may be due to the rather moderate sleep deprivation. Already Manousakis (Manousakis et al., 2017) describes a relevant increase in PUI only after a sleep deprivation of 20 hours.

The phasic-central nervous activation was expected to have a low sensitivity: On the one hand, nursing staff is characterized by being able to react quickly and adequately to critical stimuli (eg in emergency situations) and to be able to intuitively implement this even with limited vigilance. On the other hand, this 4-minute drowsiness test is so short that vigilance impairments can be most readily compensated through willpower in accordance with the testing of tonic-central nervous activation.

There are several preliminary studies comparing drowsiness diagnostics. The Multiple Sleep Latency Test, or the Maintenance of Wakefulness Test, are frequently used as references. A comparison of current psychometric drowsiness diagnostics is not yet demonstrable. Therefore, the results of the test psychometric subgroups phasic and central nervous activation or visual vigilance cannot be set in the context of previous studies.

As initially hypothesised, subjective self-assessment of sleepiness correlates very unclearly with objective test results. People with impaired vigilance find it more difficult to assess their own performance (Philip et al., 2001; Weeß et al., 2001). Already Danker-Hopfe et al. (2001) found that subjective self-assessment on the SSS does not correlate with objective measurements of tonic central nervous system activation (pupillography test and Multiple Sleep Latency Test). Vigilance deficits are detected early by a screening of the attention components vigilance / sustained attention (Quatember and Maly Vigilance Test S1 with circular path and the WAFV test from the Schuhfried SLEEP® test battery). Test methods for the demonstration of the attention component of tonic central nervous activation (here: pupillography and subtest test battery SLEEP from Schuhfried®) and the phasic central nervous activation (here: Schuhfried® SLEEP test battery subtest) show a low specificity in moderate sleep deprivation.

The temporal adaptation of the vigilance measurements to the shift model of the night shift motivated the subjects to participate actively in the tests. This was demonstrated, among other things, by the fact that the participants appeared punctually on the dates of the measurements and that they regularly had their results explained. Innovative is the bundling and thus comparability of several renowned drowsiness tests.

Certainly, the number of subjects is rather small. Nevertheless, the earnings trend seems very clear.

As a follow-up a further special military medical research project has been approved: Here the Quatember-

Maly vigilance test, which was found to be the gold standard, will be compared with a three-minute test for identifying sleepiness. The latter test is performed on a portable handheld computer and is therefore also suitable for mobile measurements in a deployed setting. It was developed by the Department of Aviation and Space Psychology of the Cologne-based German Aerospace Center.

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Sleep Leadership: A Randomized Trial¹

**Dr. Amy B. Adler, Dr. Paul D. Bliese, MAJ Matthew LoPresti,
Dr. Jennifer McDonald, and Ms. Julie Merrill**

Walter Reed Army Institute of Research
503 Robert Grant Ave.
Silver Spring, MD 20910
USA

amy.b.adler.civ@mail.mil

ABSTRACT

While military leadership is an important determinant of unit health, behavioral health leadership, or targeted leader behaviours that address specific health-related outcomes, provide a focal point for junior leader training. Building on this concept, several behavioral health leadership domains have been identified, including health-promoting leadership, rear detachment leadership, and sleep leadership. In each case, specific leadership behaviours have been associated with healthier outcomes even after controlling for ratings of general leadership. In the present study, we examine sleep leadership, or the degree to which leaders encourage and enable sleep health in unit members. Building on correlational findings documenting the association between sleep leadership and sleep health, training materials were developed and tested in a randomized controlled trial. Specifically, 61 platoon leadership teams were randomized to either a sleep leadership training or wait-list control condition. Baseline and 1-month follow-up surveys were administered to assess changes in sleep habits, attitudes, and knowledge; post-training surveys assessed training acceptability. Taking the nested nature of the data into account, analyses will compare the training conditions on these outcomes. Dissemination of sleep leadership training materials and the implications of research for leader and unit health will be addressed.

1.0 THE ROLE OF LEADERS

1.1 Behavioural health leadership

Many studies have documented the impact of leadership on helping individuals adjust to difficult occupational circumstances. In the military context, the use of general leadership skills has been found to mitigate the impact of deployment challenges that Service members face. For example, general leadership has been linked to better mental health outcomes during both peacekeeping (e.g., Bliese & Halverson, 1996) and combat deployments (Castro & McGurk, 2007; Jones et al., 2012). Indeed, both the Soldier Adaptation Model (Bliese & Castro, 2003) and Occupational Health Model for the Military (Adler & Castro, 2013) indicate that general leadership skills can partially moderate the mental health consequences of occupational stressors.

However, few studies have identified specific leadership behaviours that promote employee health and adjustment, a particularly critical task for leaders in high-risk occupations. Given the difficulty in training leaders in relatively vague general leadership tasks, we borrowed from the leadership literature which had begun

¹ Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The referenced research study was conducted in compliance with AR 70-25.

to examine specific leadership behaviors. Unlike general leadership, domain-specific leadership skills are characteristic of leaders in specific domains, and are focused on specific situations. Initially, researchers found that safety leadership could shape employee health and wellbeing (e.g., Barling, Loughlin, & Kelloway, 2002; for a meta-analysis, see Clarke, 2013). For example, Barling and his colleagues found that that safety-specific leadership was predictive of safety climates and safety-related outcomes like reducing injuries (see also Kelloway, Mullen, & Francis, 2006; Newman, Griffin, & Mason, 2008).

Building from these and other findings (Golaszewski et al., 2008; Gurt, Schwennen & Elke, 2011; Rhoades & Eisenberger, 2002), Hammer, Kossek, Anger, Bodner, and Zimmerman (2011) demonstrated the benefit associated with training supervisors in family supportive behaviors. These studies demonstrate the utility of targeting behavioral health leadership. Indeed, Adler, Saboe, Anderson, Sipos, and Thomas (2014) coined the term “behavioral health leadership” and demonstrated the link between leader behaviours associated with combat operational stress control doctrine and mental health symptoms in soldiers deployed to Afghanistan, even after controlling for general leadership. Follow-up studies have examined the role of health-promoting leadership behaviours in the adjustment of deployed medical staff (Adler et al., 2017) and in the adjustment of troops deploying in response to the Ebola outbreak of 2014 (Adler et al., 2016). More recently studies have shown the benefits of rear detachment leadership (Jennings, Adler, & Thomas, 2017) and resilience training leadership (Sims & Adler, 2017). In the present study, we focus on sleep leadership.

1.2 Sleep Leadership

Given the potential impact of health-specific leadership and the importance of sleep both in garrison and across the deployment cycle, the Walter Reed Army Institute of Research (WRAIR) has developed the construct of sleep leadership, or leader behaviours that proactively promote sleep awareness and healthy sleep behaviours among subordinates. This concept has been assessed with deployed personnel in non-combat operations (Mental Health Advisory Team [MHAT]-Africa and MHAT-Korea) and in combat operations (MHAT 8 and MHAT 9). In each of these cross-sectional studies, ratings of sleep leadership have accounted for mental health, sleep and unit climate responses over and above benefits conferred by ratings of general leadership skills (while controlling for rank and combat experiences).

In surveys with military personnel on peacekeeping and combat deployments (Gunia et al., 2015), we predicted that “sleep leadership” would be negatively associated with sleep problems (physical), depressive symptoms (psychological), and negative climate (organizational), and that sleep would mediate the relationship between sleep leadership and psychological and organizational variables. Results from these two surveys indicated that sleep leadership was directly associated with improved sleep and climate, and indirectly associated with improved climate and reduced depression even after controlling for general leadership.

1.3 The Importance of Sleep

We selected sleep leadership as a focus of study because of the association of sleep and work performance (e.g., Lockley et al., 2007; LoPresti et al., 2016), emotion regulation (Palmer & Alfano, 2017), and cognitive functioning (e.g., Nilsson et al., 2005). Indeed, sleep is a critical resource for service members and has been associated with the development of posttraumatic stress disorder symptoms (e.g., Wright, Britt, Bliese, & Adler, 2011). Despite the importance of sleep, numerous studies have documented that individuals in general (e.g., Hirshkowitz et al., 2015; National Institute for Occupational Safety and Health, 2004) and U.S. soldiers, in particular, get below the recommended guidelines. Evidence documenting this gap in optimal sleep comes from a variety of studies, including WRAIR’s Mental Health Advisory Teams (MHATs) with units in combat and

non-combat operations (e.g., Sipos, Wood, Riviere, & Adler, 2014).

1.4 Study Goals

Given the importance of sleep in soldier health and functioning, and the potential role of leaders in addressing sleep through the concept of sleep leadership, the present study evaluated a new training developed in “Sleep Leadership” developed by the Walter Reed Army Institute of Research. The goal of the present study was to assess leader perceptions of this training and determine if there were any changes in attitudes from before to after the training. We hypothesized that after receiving training, leaders would report more positive attitudes toward sleep and their role in influencing the sleep patterns of their units. We also hypothesized that those in the sleep leadership training condition would report engaging in more sleep leadership behaviours at follow-up than leaders who had not yet received the training.

2.0 METHOD

In this group randomized trial of platoon leadership teams, participants were randomized to a sleep leadership training condition or a waitlist control condition. Individuals were briefed on the study and asked to provide informed consent. They were then asked to complete a baseline survey (T1). Approximately two weeks later, half of the leadership teams were provided training. Four to six weeks later, all leaders completed a follow-up survey (T2). Those in the waitlist control condition were then provided the training. In both conditions, leadership participants completed a survey after receiving sleep leadership training (post-training survey). The research was approved by an Institutional Review Board at the Walter Reed Army Institute of Research.

2.1 Participants

Consent was provided by 100% of the 76 leaders. In terms of rank, 36 officers (47.4%) and 40 non-commissioned officers (NCOs; 52.6%) completed the T1 survey. All leaders were male; 81.8% had been deployed to combat at least once. More than half had been in their current platoon leadership team for at least 3 months. In terms of meeting criteria for sleep problems at T1, 10.5% of leaders scored above cut-off. In all, there were 61 leadership teams.

2.2 Measures

Leaders were asked about their attitudes toward the training with 8 items scored on a 5-point scale (1 = strongly disagree to 5 = strongly agree). Participants were also asked the write-in comments regarding the training in terms of what should be sustained and what should be improved. Sleep attitudes were assessed with 7 items scored on a 5-point scale (1 = strongly disagree to 5 = strongly agree).

Sleep leadership was measured by 12 items adapted from the Gunia et al. (2015) measure. Each item was rated on a 5-point scale (1 = never to 5 = very often). On the leadership surveys, items were assessed in terms of self. Cronbach’s alpha was .90.

Sleep problems were measured with the 7-item Insomnia Severity Index (ISI; Bastien et al., 2001) in terms of the past two weeks. The scale included “Difficulty falling asleep,” “Difficulty staying asleep,” and “Problem waking up too early” rated on a 5-point scale (1 = none to 5 = very severe), an item on satisfaction “how SATISFIED/DISSATISFIED are you with your current sleep pattern?” rated on a 5-point scale (1 = very satisfied to 5 = very dissatisfied), an item on “how NOTICEABLE to others do you think your sleep pattern is in

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terms of impairing the quality of your life” rated on a 5-point scale (1 = not at all noticeable to 5 = very much noticeable), an item “how WORRIED/DISTRESSED are you about your current sleep pattern” rated on a 5-point scale (1 = not at all worried to 5 = very much worried), and “to what extent do you consider your sleep pattern to INTERFERE with your daily functioning (for example: daytime fatigue, ability to function at work/daily chores, concentration, memory, mood, etc.)” rated on a 5-point scale (1 = not at all to 5 = very much). A cut-off score was calculated based on moderate or severe symptom severity.

2.3 Training

The Sleep Leadership training was a one-hour module that used PowerPoint slides, videos, handouts, and discussion to highlight the importance of sleep and the role of a leader in influencing unit member’s sleep habits. The training information was organized around the acronym “SLEEP” with each letter standing for a key leader behaviour. S stood for “Set Conditions” and addressed the need to ensure the physical environment was conducive to sleeping. L stood for “Lead by Example” and addressed the need for leaders to demonstrate their commitment to good sleep habits. The first E stood for “Educate” and addressed the need to talk to soldiers about the impact of caffeine and alcohol use on sleep and the treatment for sleep problems. The second E stood for “Encourage” and addressed the need for individual responsibility in managing sleep and to be aware of the impact of sleep deprivation on unit members. The P stood for “Plan and Prioritize” and addressed the need for leaders to establish schedules that optimized the sleeping opportunities and allowed for sleep banking and recovery. Figure 1 provides an example of one of the training slides.

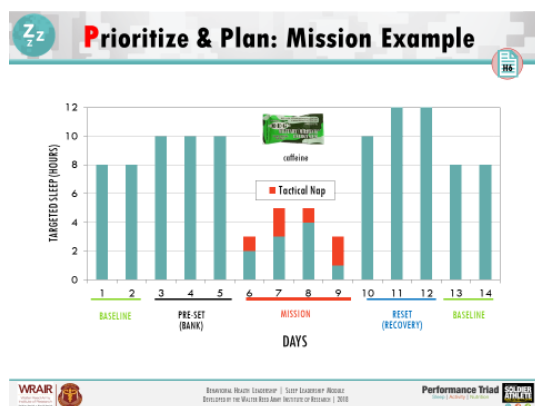


Figure 1: Sample Training Slides.

3.0 RESULTS

3.1 Leader Perceptions of Training

The leadership teams provided feedback regarding the training. Figure 2 provides frequencies related to endorsement of training evaluation questions. Almost all of the soldiers reported that the training provided important information and was interesting and relevant. They believed this training was helpful for their development as a leader. Interestingly, only about half reported that the training fit well with command priorities, suggesting that the training could be further adapted to address a broader cultural shift in attitudes toward sleep.

Also, less than half of the leaders reported that the training brought them closer as a leadership team, suggesting that the training could be adjusted to reinforce the officer-NCO team approach in addressing sleep as a unit priority.



Figure 2: Training Evaluation.

Table 1 provides a sample of representative hand-written comments that provide further insight into how this training was received. These comments underscore the positive training evaluation evident in Figure 2. Many of the hand-written comments addressed strengths of the training such as covering relevant material, highlighting an important topic, and providing evidence-based information. Comments regarding what could be improved about the training focused on ensuring that leaders at higher levels should receive the same training and questioned how to have an impact if a soldier was not open to guidance regarding the importance of sleep.

Table 1: Write-In Comments from Leaders.

Comments: Sustain	Comments: Improve
Statistics, relevant facts; - concise, to the point	More leader (Company & BN) involvement
Caffeine information	Include 1SGs, CPTs, CSMs, & Battalion Commanders - THEY NEED TO HEAR THIS!!
Incorporated field and garrison info	I think this should be mandatory for all command teams
I like the fact the Army is making sleep deprivation an issue in need of studying	Junior Soldiers don't care about sleep/performance - Tailor more for decision makers/leaders
The recommendations and explanations. they gave good reasons to why you should try these methods to increase sleep	The recommended sleep patterns are not attainable
Fact based - Army is stubborn & is difficult to change - Helped with up & coming leaders	Use this as a baseline & increase information complexity to reduce redundancy in future classes

3.2 Leader Attitudes toward Sleep

As can be seen in Figure 3, two sleep items significantly changed from pre- to post training. These two items, “Soldiers can train themselves to go without sleep” and “Sleep deprivation is part of being a soldier,” increased from before to after sleep leadership training.

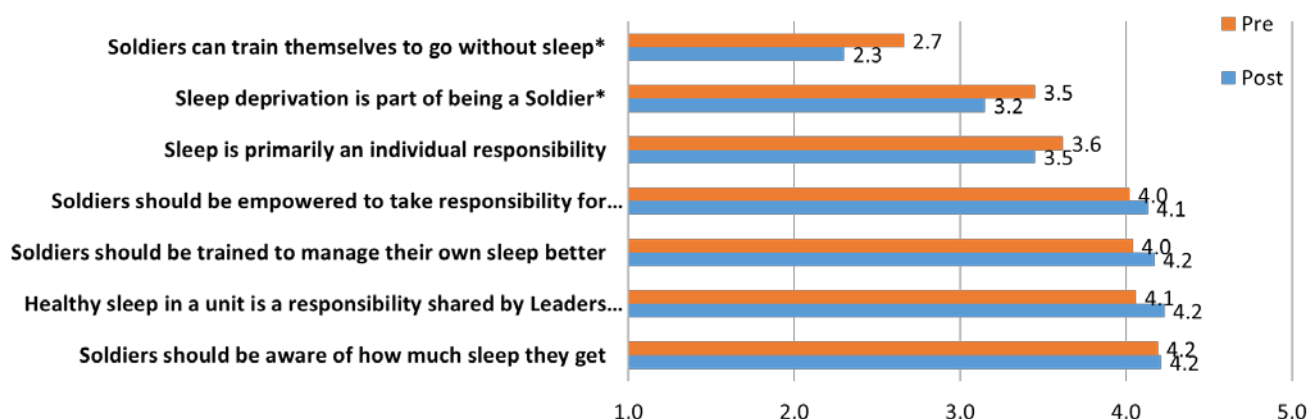


Figure 3: Sleep Attitude Changes from Pre- to Post Training.

* $p < .05$.

We also compared leader ratings of their own sleep leadership behaviours at T2 by condition. For example, 50% of the leaders in the sleep leadership condition reported that they “encouraged their soldiers to get adequate sleep” often or very often in comparison to 40% of leaders in the wait-list control condition, although the difference between the two groups was not significant, $\chi^2 (1, N = 64) = .64, p = .21$, one-tailed. In contrast, 44% of leaders in the sleep leadership condition reported “I plan our unit schedule so that my Soldiers have time to get adequate sleep” often or very often compared with only 17% of leaders in the wait-list control condition, $\chi^2 (1, N = 64) = 5.59, p < .01$, one-tailed. In terms of caffeine, 32% of leaders in the sleep leadership condition reported “I discourage my Soldiers from using caffeine or nicotine in the hours prior to sleep” often or very often compared with 13% of leaders in the wait-list control condition, $\chi^2 (1, N = 64) = 3.21, p < .05$, one-tailed.

4.0 DISCUSSION

The results of the present study underscore the importance of presenting leaders with relevant and accurate information about sleep. In this group randomized trial, leaders receiving a one hour sleep training module provided strong, positive feedback about the training and recommended that this training should be provided at various levels of leadership. These findings suggest that leaders are open and interested in hearing about sleep and what they can do to better manage their unit’s sleep habits.

Results also demonstrate that a one-hour training could result in a changed perspective regarding sleep leadership and an increase in self-reported sleep leadership behaviours at follow-up. By empowering leaders with the rationale for focusing on sleep, identifying the role of leaders in their unit’s sleep habits, and providing

specific methods for improving unit sleep habits, the training piloted here appears to have been successful in terms of shifting leader behaviors.

There are several strengths of the current study, including the use of group randomization and longitudinal design. Nevertheless, study limitations include reliance on self-report and a modest sample size.

Despite these limitations, the fact that one hour of training could result in changes measured more than a month later is encouraging. It appears that the concept of sleep leadership can provide the basis for training leaders with targeted materials. The next step is to determine how sleep leadership training influences unit member sleep patterns and whether this concept of behavioural health training can influence other targeted outcomes as well. Indeed, this study supports the development of a behavioural health framework from which to consider how leaders influence team member health and performance.

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