**AWARD NUMBER:** W81XWH-19-1-0825

**TITLE:** Examining the Efficacy of the TEACCH School Transition to Employment and Post-Secondary Education Program

**PRINCIPAL INVESTIGATOR:** Dr. Laura Klinger

**CONTRACTING ORGANIZATION:** University of North Carolina, Chapel Hill, NC

**REPORT DATE:** October 2022

**TYPE OF REPORT:** Annual

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

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Examining the Efficacy of the TEACCH School Transition to Employment and Post-Secondary Education Program

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**6. AUTHOR(S)**
Dr. Laura Klinger and Dr. Brianne Tomaszewski

E-Mail:laura_klinger@med.unc.edu; brianne_tomaszewski@med.unc.edu

**5d. PROJECT NUMBER**

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

UNIVERSITY OF NORTH CAROLINA AT CHAPEL H
104 AIRPORT DR STE 2200
CHAPEL HILL NC 27599-5023

**8. PERFORMING ORGANIZATION REPORT NUMBER**

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**14. ABSTRACT**

The purpose of this project is to conduct a RCT trial examining the efficacy of the TEACCH School Transition to Employment and Postsecondary Education (T-STEP) Program. 60 Community college students (18-21 years of age) with autism spectrum disorder will participate in either the T-STEP Program or manualized counseling services (career, academic, self-counseling) with both proximal (executive function, social communication, and emotion regulation) and distal (employment, postsecondary education success) outcomes measured. The long-term impact of this intervention is to promote a more positive quality of life for young adults with high functioning ASD including increased postsecondary education completion, employment, self-determination, and decreased difficulties with coping and depression. Due to the COVID-19 epidemic preventing in person interactions, we have adapted the protocol to conduct online interventions. This adapted protocol has received approval from all regulatory bodies and the adapted intervention and RCT trial will begin in the second year of funding.

**15. SUBJECT TERMS**
Autism, transition-aged, community college, executive function, emotion regulation, professional social skills

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| Unclassified | Unclassified | Unclassified | Unclassified | 34 | 19b. TELEPHONE NUMBER *(include area code)* |

## TABLE OF CONTENTS

## 1. INTRODUCTION:

The purpose of this study is to test whether the targeted intervention provided by the comprehensive T-STEP (course, counseling, internship) is more effective at supporting the transition to adulthood than counseling services alone (i.e., academic, career, and self-advocacy counseling). Using an alternative treatment randomized-control trial design, transition-aged (16-21-year-old) individuals with ASD will be enrolled. Young adults will be randomly assigned to receive either the comprehensive T-STEP Program (T-STEP course, internship, counseling) or only counseling services at two community college sites. Across three academic years, 120 young adults will be enrolled, 60 in the Comprehensive T-STEP Group (T-STEP) and 60 in the Counseling Only group.

## 2. KEYWORDS:

Autism, transition-aged, community college, executive function, emotion regulation, professional social skills.

## 3. ACCOMPLISHMENTS:

**What were the major goals of the project?**

**Training Specific Major Tasks:**

- **Task 1: Learn clinical trial design and evaluation for individuals with Autism Spectrum Disorder**
    - Milestone: Submit grant proposal for Autism Research Program Clinical Translation Award (months 36-42; 100% complete)
- **Task 2: Train with experts in community-based behavioral interventions in ASD**
    - Milestone: Leading a professional seminar and community workshop on clinical interventions (months 30-36; 100% complete)
- **Task 3: Acquire skills in research team management**
    - Milestone: Supervise intervention & research staff (months 24-48; 75% complete)
- **Task 4: Build national collaborations in ASD field**
    - Milestone: Presentation of project outcome data at International Society for Autism Research Meeting (month 48; 25% complete)

**Research Specific Major Tasks:**

- **Task 1: Obtain IRB approval**
    - Milestone: IRB Approval (months 6; 100% complete)
    - Milestone: Obtain regulatory approval from Department of Defense Human Research Protection Office (month 9; 100% complete)
- **Task 2: Coordinate Study Staff**
    - Milestone: Research staff trained (month 15; 100% complete)
    - Milestone: Maintained trained and available independent evaluators (month 15; 100% complete)
- **Task 3: Randomized, Controlled Trial**
    - Milestone: 4 cohorts of participant consented, screened, and enrolled in study (months 13-40; 80% complete)
    - Milestone: T-STEP and Counseling intervention begins (months 17-41; 80% complete)
    - Milestone: Report findings from overall studies (month 48; 0% complete)
- **Task 4: Data analysis**
    - Milestone: Report results from data analysis (month 48; 20% complete)

**What was accomplished under these goals?**

**Training Specific Major Tasks:**

- **Task 1: Learn clinical trial design and evaluation for individuals with Autism Spectrum Disorder**
    - ***Milestone Achieved:*** Received Disability Research grant from ACL NIDILRR "*HEELS 2 Participation: Improving community participation for young adults with I/DD"* #90DPCP0013
    - Subtask 1: Attend UNC School of Medicine North Carolina Translational and Clinical Sciences Institute (NCTraCS) professional development seminars.
        - Activities Accomplished:
            - Attended School of Medicine, Frank Porter Graham Child Development Professional Development Series, Department of Psychiatry professional development mentoring meetings and annual Diversity, Equity, and Inclusion training, UNC TEAM ADVANCE Faculty Professional Development Series, Policy Power Lunch with Drexel University, and Carolina Consortium for Human Development Seminars and completed the Office of Diversity and Inclusion and Odum Institute's Diversity, Equity, and Inclusion in Research (DEIR) Certificate Program.

- Subtask 2: Take 1 course per year through a collaboration between NCTraCS and UNC School of Public Health in clinical trials research
    - Activities Accomplished: Completed Public Health Course in Clinical Trial Design in Fall 2021
- Subtask 3: Submit applications to attend national RCT workshops
    - Activities Not Accomplished: RCT workshops were not offered in the reporting year.
- Subtask 4: Travel to UCLA
    - Activities Not Accomplished: Travel to UCLA was not feasible due to COVID-19. However, virtual meetings with UCLA faculty Dr. Connie Kasari occurred
- Subtask 5: Participate in statistical workshops
    - Activities Accomplished: Attended NC TraCS Biostatistics Seminar Series
- Subtask 6: Submit grant proposal to start collecting pilot data.
    - Activities Accomplished:
        - Re-submission of National Institutes of Health National Institute of Aging R01 application for an early-stage clinical trial
        - Submitted an NCTraCS Stakeholder Voucher Grant
        - Submitted grants to collect pilot data to NIDILRR and HRSA for transition to adulthood

- **Task 2: Train with experts in community-based behavioral interventions in ASD**
    - ***Milestone Achieved***: Leading a professional Seminar and community workshop on clinical interventions
    - Subtask 1: Observe clinical services at the TEACCH Autism Program by attending individual and group therapy sessions.
        - Activities Accomplished:
            - Attended weekly T-STEP clinical supervision meetings for the Fall 2021 and Spring 2022 semesters.
            - Led a community workshop for mental providers. Specifically, provided a virtual continuing education course on community-based behavioral interventions for adolescents and young adults with ASD through the North Carolina AHEC program within the UNC School of Medicine.
            - Co-led T-STEP Clinician Training for new interventionists
            - Provided professional development seminar on the transition to adulthood and employer training at the 40th UNC TEACCH Autism Program Conference to professionals involved in clinical care and education of autistic individuals across the lifespan, researchers in the field of autism, and autistic individuals and their family members
            - Developed and Conducted an Employment Supports for Individuals with ASD workshop for job coaches, educators, day program staff, psychologists, and others supporting adolescents and adults at employment sites

- **Task 3: Acquire skills in research team management**
    - Subtask 1: Attend the UNC Blueprint for Engaged Supervision Training , UNC Human Resources 2-day workshop
        - Activities Not Accomplished: Course not available during reporting year.
    - Subtask 2: Take the NCTraCS/UNC Public Health Course: Team Leadership in Research Navigation
        - Activities Not Accomplished: Course not offered during reporting year.
    - Subtask 3: Co-Supervise graduate research assistant and research assistant on project related tasks.
        - Activities Accomplished:
            - Met with graduate research assistants for fidelity coding
            - Trained research assistant in randomization procedures, group assignment, and project intake flow for recruitment
            - Co-supervised post-assessment and follow-up research visits, data management, and regulatory document submission.

**Task 4: Build national collaborations in ASD field**

- Subtask 1: Meet with UCLA autism researchers during Kasari Lab visit
    - Activities Not Accomplished: Travel to UCLA postponed to due to COVID-19.
- Subtask 2: Attend UNC Autism Research Quarterly Meetings
    - Activities Accomplished:
        - Attended UNC Autism Research Meetings
- Subtask 3: Attend national conferences disseminating ASD-related research.
    - Activities Accomplished:
        - Attended and presented at Council for Exceptional Children Convention & Expo virtual conference
        - Attended and presented at the International Society for Autism Research Conference as part of a panel "Supporting the Transition to Adulthood for Autistic Youth: Results of a Community-College Based Randomized Control Efficacy Study" with national and international collaborators.
        - Applied and was accepted to the Women ADVANCE Leadership which is a workshop series to encourage and support mid-career faculty (associate professor and higher, tenured and fixed-term) seeking to enhance their skills and advance to senior leadership, research, and teaching positions.

**Research Specific Major Tasks:**

- **Task 1: Obtain IRB approval**
    - Subtask 1: Prepare Regulatory Documents and Research Protocol.
        - Activities Accomplished:
            - Submitted Administrative Review to UNC IRB
            - Submitted updated recruitment flyer to UNC IRB
            - Submitted 3 new location agreements to UNC IRB and HRPO to add additional intervention locations (i.e., community colleges).
            - Updated ClinicalTrials.gov record

- **Task 2: Coordinate Study Staff**
    - Subtask 1: Hiring and Training of Study Staff
        - Activities Accomplished:
            - Trained new research assistant to conduct recruitment and screening activities,
            - Trained one new graduate research assistant in intake interview and assessment procedures
            - Trained two new undergraduate research assistants in study protocol and pre- and post-assessment procedures.
    - Subtask 2: Coordinate supervision, fidelity checks, and training of independent evaluators.
        - Activities Accomplished:
            - Trained 2 new T-STEP Class interventionists and Counseling Interventionists
            - Conducted weekly supervision meetings with Comprehensive T-STEP class interventionists and Counseling interventionists. With two sites, we currently have 4 class interventionists and 3 counseling interventionists working across 2 community colleges
            - Met with Kara Hume to review fidelity coding procedures and fidelity coding assigned to research team members. Completed cohort 1 class fidelity coding.
- **Task 3: Randomized, Controlled Trial**
    - Subtask 1: Conduct study, report findings
        - Activities Accomplished:
        - Cohort 1: Spring 2021 semester.
            - Completed Intervention & Follow-Up Assessment: 14 follow-up participants completed the interventions and post-assessments at the end of the last reporting period and beginning of the current reporting period and participated in 4-month follow up assessments.
            - Completed Study: 14 participants completed the intervention and all study assessments.
        - Cohort 2: Fall 2021 semester.
            - Completed Intervention: 14 participants completed the intervention and post-assessments
            - Completed Follow-Up Assessments: 13 participants completed the 4-month follow up assessments.
            - Completed Study: 13 participants completed the intervention and all study assessments

- Cohort 3: Spring 2022
    - Screening: Phone screenings occurred for 35 participants
    - Baseline: 24 participants and their caregivers participated in intake assessments.
        - 3 participants were ineligible due to IQ and 1 participant decided not to participate due to distance of the program.
    - Enrolled: 20 participants were enrolled and completed pre-assessments.
        - 20 began the intervention (11 Comprehensive and 9 counseling only) began the intervention
        - 4 participants decided to no longer participate over the course of the program and resources were shared regarding TEACCH clinical services.
    - Completed Intervention: 16 participants completed the intervention and post-assessments
    - Follow-Up: Follow-up assessments will be completed at the beginning of the next reporting period.
    - Completed Study: None; Participation ongoing
- Cohort 4: Fall 2022
    - Screening: Phone screenings occurred for 75 participants
    - Baseline: 52 participants and their caregivers participated in baseline assessments
        - 6 participants were ineligible due to IQ and readiness criteria, 4 participants decided to withdraw after baseline was completed, and 1 participant withdrew due to group assignment.
    - Enrolled: 41 participants were enrolled completed pre-assessments
        - 41 began the intervention (21 comprehensive and 20 Counseling only) began the intervention

- **Task 4: Data analysis**
    - Subtask 1: Establish data management system for monitoring data collection rates and data quality.
    - <u>Activities Accomplished:</u>
        - Collected data via REDCap from 4 cohorts across pre-, post-, and follow-up assessment timepoints
            - 610 pre-assessment questionnaires (5 questionnaires/participant; 5 questionnaires/caregiver)
            - 300 post-assessment questionnaires (6 questionnaires/participant; 6 questionnaires/caregiver)
            - 297 follow-up assessment questionnaires (7 questionnaires/participant ; 4 questionnaires/caregiver)

- Presented data at INSAR analyzing rates of suicidal ideation in autistic young adults
    - From a larger sample of autistic youth and young adults including participants in the current study 33% of the sample endorsed ever having had suicidal ideation.
        - Of those, 34% reported a prior attempt, 43% reported having a plan, and 10% reported intent to act in the next month.
    - 40% of the sample met cutoff for clinical depression
    - Executive function and depression demonstrated unique effects on suicidal ideation ; participants with greater impairment in executive function and higher levels of depression were more likley to endorse suicidal ideation

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

In addition to the training program for the partnering PI described above, professional training opportunities were present for 2 clinical psychology doctoral students including weekly team meetings and one-on-one mentoring on clinical trials design, developmental of fidelity assessments, behavioral coding procedures, and supervision of undergraduate research assistants. Two clinical psychology postdoctoral fellows have been mentored on implementation of the intervention including weekly supervision meetings. Undergraduate and post-graduate research assistants have received mentoring on intervention research through opportunities to participate in the intervention as peer models, mentoring on assessment protocols, and behavioral coding. As a result, trainees were primary or co-authors on 4 presentations at the 2022 International Society for Autism Research annual conference in Austin, Texas.

**How were the results disseminated to communities of interest?**

- We presented a panel titled “Advocating for and Supporting Emerging Adults with Autism: Needs, Challenges, Clinical Considerations, and Approaches” at the Association for Behavior and Cognitive Therapies Conference in November 2021.
- We organized and presented a panel titled “Comprehensive Transition Programs for Autistic Youth: Efficacy in Targeting Immediate Outcomes and Beyond” at the International Society for Autism Research Conference in May 2022.
- We met with Southern Connecticut State University about their autism program and the potential to incorporate the T-STEP within their program.
- We consulted with the Autism Resource Center in Singapore regarding their implementation of the T-STEP within their high school transition curriculum and their Employment Services program.

**What do you plan to do during the next reporting period to accomplish the goals?**
*I*

Training Specific Tasks through next quarter:

1. Apply for the Comprehensive Program for Adaptive Interventions Training
2. Submit to national and international conference presentations

Research Specific Tasks through next quarter:

1. Complete Follow-up assessments of cohort 3
2. Complete intervention sessions with cohort 4
3. Complete Post-assessment of cohort 4
4. Begin recruitment for the Spring of 2023, final semester/cohort 5

***4.*** **IMPACT:**

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

Nothing to Report

**What was the impact on other disciplines?**

Nothing to Report

**What was the impact on technology transfer?**

Nothing to Report

**What was the impact on society beyond science and technology?**

Through our community presentations, our presentation to clinicians at conferences, and through our consultation with three community providers (Southern Connecticut State University, NC Area Health Education Centers, Autism Resource Center of Singapore) we are (1) impacting the skills and abilities of mental health providers and college instructors and counselors serving autistic individuals and (2) changing typical practices on college campuses that provide support for autistic students.

## 5. CHANGES/PROBLEMS:

**Changes in approach and reasons for change**

Nothing to Report

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

For our third cohort (Spring 2022) we were unable to recruit and retain the anticipated number of participants. Despite adding a second site we recruited fewer participants than planned. Many transition-aged youth and their families, while interested in the program, reported difficulties related to the height of the COVID-19 Omicron outbreak. In fact, several potential participants had COVID-19 and were unable to participate in assessments during the time frame of our recruitment period. Additionally, more participants withdrew from the program than has been typical with previous cohorts. This third cohort transitioned to an in-person format rather than the virtual format adopted at the height of the COVID-19 pandemic. Many participants reported the return to in-person activities at high school and/or college was overwhelming and that they could not continue to commit to the T-STEP program. Additionally, 1 participant reported that transportation was a barrier.

To resolve this difficulty with recruitment and retention we chose two new community colleges to work with for our fourth cohort (Fall 2022) to broaden our recruitment area to additional counties within North Carolina. The addition of the new community colleges allowed us to recruit 41 participants to begin the intervention, more than double any previous cohort. At the time of writing this report no participants who began the intervention have withdrawn. By utilizing two new community colleges we were able to improve recruitment and partially mitigate the lower recruitment of previous cohorts due to the COVID-19 pandemic.

**Changes that had a significant impact on expenditures**

Nothing to Report

**Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents**

**Significant changes in use or care of human subjects**

Nothing to Report

**Significant changes in use or care of vertebrate animals**

**Significant changes in use of biohazards and/or select agents**

Nothing to Report

## 6. PRODUCTS:

- **Publications, conference papers, and presentations**

**Journal publications.**

- Kraemer, B. K., **Tomaszewski, B.**, Rentschler, L., Steinbrenner, J., Hume, K., McDaniel, S., Dawalt, L., Brum, C., & Szidon, K. (2022). Assessing the quality of individualized transition plans for high school students with autism. *Career Development and Transition for Exceptional Individuals.* Advanced online publication. https://doi.org/10.1177/21651434221079743
- Savage, M., **Tomaszewski, B.**, & Hume, K. (2022). Step it Up: Increasing physical activity for adults with autism spectrum disorder and intellectual disability using supported self-management and Fitbit technology. *Focus on Autism and Other Developmental Disabilities,* Advanced online publication. https://doi.org/10.1177/10883576211073700

**Books or other non-periodical, one-time publications.**

- Tomaszewski, B., Klinger, LG., Osborne, G., & Klein, C. B. (2022). Easing the Transition to Adulthood. In D. Spain, F.M. Musich, & S.W. White (Eds.), *Psychological Therapies for Adults with Autism.* Oxford University Press.

**Other publications, conference papers and presentations**.

- Tomaszewski, B., & Chapman, S.M. (2021, October). Engaging and educating employers on the autism spectrum. Presentation at the 40th Annual TEACCH Autism Program Conference, Virtual Conference.
- White, S.W., Hillier, A., Klinger, L.G., Maddox, B., Pugliese, C., & Schall, C. (2021, November). Advocating for and Supporting Emerging Adults with Autism: Needs, Challenges, Clinical Considerations, and Approaches. Panel Presentation at the ABCT 2021 Conference, Virtual Conference.
- Cook, M., Tomaszewski, B., & Klinger, L.G. (2022, May). Predictors of Suicide Risk in Transition-Aged Youth and Young Adults on the Spectrum. Poster Presentation at INSAR Annual Conference 2022, Austin, TX.
- Marsh, T.D., Tomaszewski, B., Cook, M., & Klinger, L.G. (2022, May). Sex Differences in Rates of Coping Self-Efficacy, Depression, and Suicidal Ideation Among Autistic Adolescents and Young Adults Poster Presentation at INSAR Annual Conference 2022, Austin, TX.

- Klinger, L.G., Tomaszewski, B., Bagatell, N., Bowman, K., Lamarche, E., Cook, M., Klein, C.B, Stahl, S., & Osborne, G. (2022, May). Supporting the Transition to Adulthood for Autistic Youth: Results of a Community-College Based Randomized Control Efficacy Study. Panel Presentation at INSAR Annual Conference 2022, Austin, TX.
- Tomaszewski, B., Bowman, K., Bagatell, N., Lamarche, E., Cook, M., Klein, C.B., Stahl, S., Osborne, G., & Klinger, L.G. (2022, May). Distal Outcomes for Autistic Individuals Completing a Community College-Based Intervention. Panel Presentation at INSAR Annual Conference 2022, Austin, TX.

- **Website(s) or other Internet site(s)**

At the International Society for Autism Research Conference 2022, our T-STEP research presentation was chosen as one of 7 presentations to be highlighted through a press release and press conference on May 11, 2022. The link to the press conference is below. https://m.facebook.com/events/d41d8cd9/insar-2022-press-conference/326033152971670/

- Klinger, L.G., Tomaszewski, B., Bagatell, N., Bowman, K., Lamarche, E., Cook, M., Klein, C.B, Stahl, S., & Osborne, G. (2022, May). Supporting the Transition to Adulthood for Autistic Youth: Results of a Community-College Based Randomized Control Efficacy Study. Panel Presentation at INSAR Annual Conference 2022, Austin, TX.

- **Technologies or techniques**

Nothing to Report

- **Inventions, patent applications, and/or licenses**

Nothing to Report

- **Other Products**

Nothing to Report

## 7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

**What individuals have worked on the project?**

Name: Laura Klinger
Project Role: Principal Investigator
Researcher Identifier: 0000-0002-3399-9039
Nearest person month worked: 2.4
Contribution to Project: No change

Name: Brianne Tomaszewski
Project Role: Partnering Principal Investigator
Researcher Identifier: 0000-0003-0074-1442
Nearest person month worked: 6
Contribution to Project: No change

Name: Kara Hume
Project Role: Co-Investigator
Researcher Identifier: 0000-0002-7917-792X
Nearest person month worked: 1.8
Contribution to Project: No change.

Name: Elena Lamarche
Project Role: Research Coordinator
Researcher Identifier: 0000-0003-0600-3387
Nearest person month worked: 3.8
Contribution to Project: No change

Name: Tabetha Marsh
Project Role Research Assistant
Researcher Identifier:
Nearest person month worked: 10.20
Contribution to Project: No change

Name: Sara Stahl
Project Role Research Assistant
Researcher Identifier:
Nearest person month worked: .60
Contribution to Project: No change

Name: Michal Cook
Project Role: Graduate Research Assistant/Clinician
Researcher Identifier:
Nearest person month worked: 3
Contribution to the Project: No change

Name: Glenna Osborne
Project Role: Lead Comprehensive T-STEP Clinician
Researcher Identifier:
Nearest person month worked: 5.4
Contribution to Project: No change

Name: Kelsey Forrest
Project Role: Comprehensive T-STEP Clinicians
Research Identifier:
Nearest person month worked: 1.2
Contribution to Project: Co-taught comprehensive T-STEP intervention.

Name: Linda Varblow
Project Role: Lead Counseling Clinician
Researcher Identifier:
Nearest person month worked: 4.8
Contribution to Project: No change

Name: Halie Ellinger
Project Role: Counseling Clinician/Comprehensive T-STEP Clinician
Researcher Identifier:
Nearest person month worked: 3
Contribution to Project: No change

Name: Claire Klein
Project Role: Graduate Research Assistant
Researcher Identifier:
Nearest person month worked: 3
Contribution to Project: No change

Name: Ya Cing Syu
Project Role: Graduate Research Assistant
Researcher Identifier:
Nearest person month worked: 3
Contribution to Project: No change.

Name: Kaitlyn Shaker
Project Role: Comprehensive T-STEP Clinician
Researcher Identifier:
Nearest person month worked: 2.25
Contribution to Project: Co-taught comprehensive T-STEP intervention

Name: Melanie Feldman
Project Role: Counseling Clinician
Research Identifier:
Nearest person month worked: 1.5
Contribution to Project: Provided counseling curriculum to participants

Name: Jacklyn Googins
Project Role: Research Assistant and Counseling Clinician
Research Identifier:
Nearest person month worked: 1.0
Contribution to Project: Conducted assessments and provided counseling curriculum to participants.

Name: Bridgett Kiernan
Project Role: Research Assistant
Research Identifier:
Nearest person month worked: 1.0
Contribution to Project: Trained on and conducted assessments

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

Laura Klinger is an investigator on a grant funded in January of 2022:
20951 (Maddox & Jager-Hyman, MPI's) PCORI01/2022-01/2026 1.2 Cal Months
**A Comparison of Two Brief Suicide Prevention Interventions Tailored for Youth on the Autism Spectrum**

Brianne Tomaszewski is a PI on a grant funded in September of 2021 and September 2022:
90DNCE00006 (B. Tomaszewski, PI) ACL 09/29/2021-09/30/2026 1.2 Cal Months
**North Carolina Community Collaboration for Employment**
90DPCP0013 (D. Chan & B. Tomaszewski, PIs) NIDILRR 09/2022-08/2027 2.4 Cal Months
**HEELS 2 Participation: Improving community participation for young adults with I/DD**

Brianne Tomaszewski is an investigator on the following grants:
R34MH128439 (B. Maddox & E. Storch, PIs) NIMH 01/01/2022-12/31/2024 0.6 Cal Months
**Feasibility, Preliminary Effectiveness, and Sustainability of a Cognitive-Behavioral Therapy Program Tailored for Youth with Autism and Anxiety Treated in Real-World Community-Based Clinics**
R305A220241 (S. Odom, PI) IES 07/01/2022-06/30/2025 1.2 Cal Months
**Observer Impression Scale of Preschool Children's Peer Social Competence**
C. Felix Harvey Award (C. Corsello, PI) 03/01/2022-05/31/2023 0.6 Cal Months
**Black Families and Providers Accessing Services Together (BFAST)**

None of these newly funded grants will impact the effort amount or have any overlap with the currently funded Department of Defense grant.

**What other organizations were involved as partners?**

Organization Name: Guilford Tech Community College
Location of Organization: Greensboro, North Carolina

- Intervention and assessment staff use the partner's facilities for the various activities.
- The intervention's staff uses the partner's disability services, career counseling, and academic advising resources provided on the community college campus.

Organization Name: Johnston Community College
Location of Organization: Clayton, North Carolina

- Intervention and assessment staff use the partner's facilities for the various activities.
- The intervention's staff uses the partner's disability services, career counseling, and academic advising resources provided on the community college campus.

Organization Name: Wake Tech Community College
Location of Organization: Raleigh, North Carolina

- Intervention and assessment staff use the partner's facilities for the various activities.
- The intervention's staff uses the partner's disability services, career counseling, and academic advising resources provided on the community college campus.

Organization Name: Alamance Community College
Location of Organization: Graham, North Carolina

- Intervention and assessment staff use the partner's facilities for the various activities.
- The intervention's staff uses the partner's disability services, career counseling, and academic advising resources provided on the community college campus.

## 8. SPECIAL REPORTING REQUIREMENTS

**COLLABORATIVE AWARDS:**

**QUAD CHARTS:**

## 9. APPENDICES:

## W81XH1910825: Examining the Efficacy of the T-STEP

**PI:** Dr.'s Laura Klinger & Brianne Tomaszewski, University of North Carolina, Chapel Hill, NC

**Budget:** $1,435,538.00

**Topic Area:** TEACCH Autism Program **Mechanism:** Clinical Trial Award

**Research Area(s):** Autism, transition-aged **Award Status:** 15 September 2019 - 14 September 2023

## Study Goals:

The current study seeks to test whether the targeted intervention provided by the comprehensive T-STEP (course, counseling, internship) is more effective at supporting the transition to adulthood than counseling services alone (i.e., academic, career, and self-advocacy counseling). We hypothesize that the full T-STEP program (community college course, internship, counseling) will lead to improved short-term and long-term outcomes compared to counseling services only.

## Specific Aims:

1. Examine the efficacy of the T-STEP compared to counseling only services in improving executive function, social communication, emotion regulation, and self-determination skills.
2. Examine moderators of T-STEP efficacy to identify characteristics of individuals who benefit most from the program.
3. Examine maintenance of intervention effects and more distal outcomes (grade point average, employment) at 6-months post-intervention.
4. An auxiliary meta-analysis aim to compare outcomes of a simultaneously running RCT examining the efficacy of the comprehensive T-STEP program to a waitlist control no services/services as usual condition. This auxiliary aim will allow us to re-examine Aims 1 & 2 across three treatment groups: T-STEP (120 students), counseling only (60 students), and no services/services as usual (60 students).

## Key Accomplishments and Outcomes:

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ORIGINAL PAPER

# Self-Determination in Autistic Transition-Aged Youth without Intellectual Disability

**Brianne Tomaszewski[1] · Laura G. Klinger[1] · Cara E. Pugliese[2,3]**

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## Abstract

Self-determination refers to an individual's capacity and opportunities to act as a causal agent in their own lives to make choices, decisions, and set goals. The current study examined self- and parent-reports of the AIR Self-Determination Scale in transition-aged autistic youth (Based on stakeholder preferences, we use identity-first(autistic) or neutral language (on the autism spectrum) (Bottema-Beutel in JAMA 3:18–29, 2020)). Autistic youth completed depression and executive function measures, and parents rated their child's social-communication and executive function difficulties. Despite differences between youth and parent reports, both youth and their parents reported lower self-determination skills (capacity) than opportunities to practice self-determined behaviors. Both depression and executive function skills were related to self-determination capacity, highlighting potential intervention targets for transition-aged youth to facilitate increased self-determination and potentially improved adult outcomes.

**Keywords** Autism · Self-determination · Transition · Executive function · Adolescence · Young adult

The prevalence rate of autism has increased 150% in the first two decades of the twenty-first century, with the fastest growing subgroup including individuals without co-occurring intellectual disability (ID; Maenner et al., 2020). Within this group, compromising 2/3 of individuals on the autism spectrum, there is an expectation of positive outcomes based on relatively higher cognitive and linguistic abilities. However, longitudinal studies have not generally found more favorable outcomes in this group (Howlin, 2003). As few as 9% of autistic adults without ID reach functional independence, only 9% remain consistently employed in full-time competitive positions compared to 90%–96% of the general U.S. population, and most remain employed in entry-level jobs (Baio et al., 2018; Christensen et al., 2016; Henninger & Taylor, 2012; Roux et al., 2015; Shattuck et al., 2012; Taylor & Mailick, 2014; Taylor & Seltzer, 2011). Compared to autistic adults with ID, autistic adults without ID are three times more likely to have no daytime activities of any kind (Taylor & Selzer, 2011). The high rates of unemployment and educational and vocational disruptions (Chan et al., 2017; Taylor & DaWalt, 2017) are associated with a per-person cost of $50,319 per year for autistic adults without ID (Buescher et al., 2014).

Despite these poor outcomes, autistic youth without ID experience a steep decline in services that begins during high school and continues into the post-secondary time period. (Laxman et al., 2019). This loss of services is often characterized as ""falling over a cliff."" When asked about specific transition support needs, caregivers of autistic adults report that during high school, the curriculum focuses on academics, but not on ""soft"" skills that are critical for transition success, including independent living skills, self-determination, and preparedness for employment or

✉ Brianne Tomaszewski
Brianne_Tomaszewski@med.unc.edu

Laura G. Klinger
Laura_Klinger@med.unc.edu

Cara E. Pugliese
CPuglies@childrensnational.org

[1] TEACCH Autism Program, Department of Psychiatry, University of North Carolina at Chapel Hill, CB#7180, Chapel Hill, NC 27599-7180, USA

[2] Center for Autism Spectrum Disorders, Division of Pediatric Neuropsychology, Children's Research Institute, Children's National Hospital, Washington, USA

[3] Department of Psychiatry, Behavioral Sciences & Pediatrics, The George Washington University School of Medicine, 15245 Shady Grove Rd., Suite 350, Rockville, MD 20850, USA

post-secondary education (Anderson & Butt, 2018; Matthews et al., 2021; Snell-Rood et al., 2020). The lack of support for specific skills associated with a successful transition to adulthood has posed a significant problem for autistic youth who commonly struggle with independent living skills and self-advocacy (Gillespie-Lynch et al., 2017; Pugliese et al., 2015, 2016; Shogren & Plotner, 2012; Van Hees et al., 2015). Thus, there is a critical need to study and identify potential intervention targets for autistic youth without ID to promote successful adult outcomes.

Self-determination is one potential intervention target that has been highlighted as a significant predictor of positive outcomes in adolescence and adulthood for individuals with disabilities (Shogren & Shaw, 2017; Shogren et al., 2015) but has received less attention in autism research. Self-determination refers to a set of beliefs, knowledge, and skills (e.g. self-awareness, decision-making, goal setting) that enable someone to engage in self-directed behavior and pursue their own goals and desires in areas a person feels are important to them (Wehmeyer, 1998). Self-determination theory emphasizes the importance of providing individuals with the opportunity and support to practice self-determined behaviors in their environment (Wolman et al., 1994). Self-determination includes capacity and opportunity. Capacity refers to the knowledge, perception, and abilities that enable an individual to set desired goals, independently make choices and plans to pursue those goals, and self-awareness of goal progress. Opportunity refers to the chance to use their knowledge and abilities at home and school (Wolman et al., 1994). Much of the literature on self-determination comes from research on intellectual disabilities or learning disabilities. It suggests that higher self-determination has been linked to various positive school and adult outcomes (Wehmeyer et al., 2010). Increased self-determination is associated with higher academic achievement in high school students with disabilities (Gaumer Erickson et al., 2015; Zheng et al., 2014). Youth with disabilities and higher self-determination in high school have greater community access post-graduation, higher rates of enrollment and completion of post-secondary education, are more likely to be employed, make greater wages, have better quality social relationships, more financial supports, and advocacy, and have a higher quality of life than youth with disabilities with lower self-determination (Chao, 2018; Petcu et al., 2017; Shogren & Shaw, 2017; Shogren et al., 2015; Wehmeyer & Schwartz, 1997; Zalewska et al., 2016).

The small amount of prior research on self-determination in autistic adolescents and adults indicates that it is positively associated with quality of life (Kim, 2019; White et al., 2018). However, autistic adolescents have lower self-determination abilities than those with ID or learning disabilities (Chou et al., 2017; Kim, 2019; White et al., 2018). Studies that have combined autistic young adults with and without ID have reported that caregivers rated autistic young adults as having lower capacity than opportunities for making self-determined decisions (Cheak-Zamora et al., 2020; Tomaszewski et al., 2020). However, in contrast to the caregiver report, Tomaszewski et al., (2020) found that adolescents and young adults reported higher capacity levels. Given the central theoretical importance of the individual's perception in self-determination theory, it is critical to consider the youth's perspective. To date, no studies have examined predictors of self-reported self-determination in transition-aged youth on the autism spectrum without ID. Identification of malleable factors is essential to enhancing self-determination and downstream positive outcomes. We explore three significant predictors that may influence the ability to engage in self-determined behavior: social communication difficulties, executive function (EF) skills, and depressive symptoms.

Increased social-communication difficulties have been associated with reduced independence in autistic adults (Eaves & Ho, 2008; Howlin et al., 2004). Two studies in autistic adolescents and young adults have reported a significant association between caregiver and educator reports of social-communication difficulties and self-determination in combined samples of individuals with and without ID (Cheak-Zamora et al., 2020; Tomaszewski et al., 2020) with more social-communication difficulties associated with lower levels of self-determination. Similarly, teacher ratings of greater student self-determination abilities were correlated with greater social skills in adolescents with disabilities, more generally (Pierson et al., 2008). Thus, it is likely that greater social-communication difficulties may negatively impact self-determination in transition-aged autistic youth.

Higher order cognitive skills to manage goal-directed behavior and problem-solving have been theoretically linked to self-determination (Wehmeyer & Garner, 2003) and may be particularly relevant in autistic youth due to well-documented EF difficulties. EF abilities, including flexibility, working memory, organization, and planning, are impaired in individuals on the autism spectrum as reported by parents and teachers (Granader et al., 2014; Hill, 2004; Kenworthy et al., 2008) and as demonstrated in controlled clinical settings (Kenworthy et al., 2005, 2008; Lai et al., 2017; Landry & Al-Taie, 2016; Pennington & Ozonoff, 1996). Impaired EF has been linked to problems in areas that impact health, well-being, and independence in autistic adolescents and adults, including poor academic achievement (Pellicano et al., 2017; St. John et al., 2018) and adaptive behavior (Gardiner & Iarocci, 2018; Pugliese et al., 2015, 2016; Wallace et al., 2016). Thus, it is likely that impaired executive function may negatively impact self-determination in transition-aged autistic youth.

It is also possible that co-occurring mental health disorders, such as depression may be associated with reduced self-determination (Capriola-Hall et al., 2021). There are high rates of co-occurring depression in adolescents and adults on the autism spectrum (Cederlund et al., 2010; Hill et al., 2004; Taylor & Gotham, 2016), with a recent meta-analysis estimating a 37% lifetime prevalence rate of depression in autistic adults (Hollocks et al., 2019). Autistic adolescents and young adults also show higher depressive symptoms than those with other developmental disabilities (Gotham et al., 2015) and students without autism (Zuckerman et al., 2018). To our knowledge, the relationship between depression and self-determination has been examined in only one study in transition-aged youth (Capriola-Hall et al., 2021). A significant, negative association ($r = -0.52$) was reported between depression and self-determination. Thus, it is likely that depression may negatively impact self-determination in transition-aged autistic youth.

The purpose of the present study is to characterize self-determination for transition-aged autistic youth without ID from both the youth and parent perspective and explore mutable factors associated with its development. Specifically, we aimed to:

(1) Compare student and parent perceptions of self-determination skills (i.e. capacity) and opportunities to practice self-determination in the home and school environment.
(2) Explore the associations of age, IQ, social- communication difficulties, EF, and depression with youth- and parent-report of self-determination using structural equation modeling.

## Methods

IRB approval was obtained from [blinded for review] and from participating school districts and community colleges. Participants under 18 provided assent, and their parents provided consent to participate. Participants 18 or older were asked specific structured questions to ensure capacity for consent.

### Participants

Participants included 237 autistic transition-aged youth aged 14–21 (M = 18.36, SD = 1.64) and a subsample of their 198 parents and caregivers who completed self-determination measures. Participants were drawn from two different clinical trials studies examining the efficacy of transition to adulthood intervention programs across two different research teams. in the eastern United States. Participants were recruited from local high school transition fairs, high schools, community colleges, vocational rehabilitation services, and local clinics providing services to individuals on the autism spectrum. Inclusion criteria were: (1) being transition age between 14 and 21 years, (2) a diagnosis of autism, including an educational diagnosis (as documented by a high school IEP) or a vocational rehabilitation diagnosis (as documented by either a previous IEP or a psychological evaluation within the past three years), (3) average or higher intellectual skills and language skills as evidenced by completion or in the process of completing a standard high school diploma, and (4) current enrollment in high school or community college. Adolescents and young adults on the autism spectrum were predominately male (76%) and White (71%). All assessments were conducted before participation in an intervention. Participants completed questionnaires and direct assessments as part of a larger battery of assessments during the baseline visit to the intervention study.

The majority of measures were consistent across studies warranting a combination of baseline assessments to address questions regarding self-determination. However, there are some differences among sites, as noted below. A subset of participants (n = 106) completed the Wechsler Abbreviated Scales of Intelligence Full-Scale IQ or Brief Full-Scale IQ (WASI-II FSIQ-4 or FSIQ-2; Wechsler, 2011) to confirm an IQ score of > 80 from both sites. Participants were excluded if they received a prior diagnosis of ID.

### Measures

#### Self-Determination

The AIR Self-Determination Scale (AIR-SDS; Wolman et al., 1994) was developed to measure school-age students' self-determination across two subdomains: Capacity and Opportunity. The Capacity domain measures the student's knowledge, abilities, and perceptions that enable youth to become self-determined. The Opportunity domain measures youth's chances to apply their knowledge and abilities related to self-determination at home and school. Items are rated on a 5-point scale from "Never" to "Always," with higher scores indicating greater self-determination. The AIR-SDS Student Form and Parent Forms were used in the current study.

The AIR-SDS student form is a 24-item scale measuring Capacity (12 items), Opportunity at School (6 items), and Opportunity at Home (6 items). The Capacity (Cronbach's $\alpha = 0.89$), Opportunities at Home (Cronbach's $\alpha = 0.86$), Opportunities at school (Cronbach's $\alpha = 0.86$), and overall self-determination items, (Cronbach's $\alpha = 0.91$) demonstrated high internal consistency in the current sample. See Table 1 for item examples.

The AIR-SDS parent form has 18 items that parallel the student form, but the Capacity scale only contains six items

**Table 1** Example items for the AIR-SDS

| Capacity | | Opportunity | |
|---|---|---|---|
| Student | | | |
| Ability Think | I know what I need, what I like, and what I'm good at | At School Think | People at school listen to me when I talk about what I want, what I need, or what I'm good at |
| Ability Do | I figure out how to meet my goals. I make plans and decide what I should do | At School Do | People at school encourage me to start working on my plans right away |
| Ability Adjust | If my plan doesn't work, I try another one to meet my goals | At School Adjust | I have someone at school who can tell me if I am meeting my goals |
| Perception Think | I believe that I can set goals to get what I want | At Home Think | People at home let me know that I can set my own goals to get what I want or need |
| Perception Do | I like to begin working on my plans right away | At Home Do | At home, I have learned how to make plans to meet my goals and to feel good about them |
| Perception Adjust | I am willing to try another way if it helps me meet my goals | At Home Adjust | People at home understand when I have to change my plan to meet my goals. They offer advice and encourage me when I'm doing this |
| Parent | | | |
| Ability Think | My child sets his or her own goals to satisfy wants or needs. (S)he thinks about his or her own abilities when setting goals | At Home Think | At home, people let my child know that (s)he can set his or her own goals to get what (s)he wants or needs |
| Ability Do | My child figures out how to meet goals alone. (S) he makes plans and decides what to do independently | At Home Do | At home, my child has learned how to make plans to meet his or her own goals and to feel good about them |
| Ability Adjust | My child checks his or her own progress when completing his or her plan. (S)he asks others what they think of his or her progress | At Home Adjust | At home, people understand my child when (s) he has to change plans to meet his or own goals. They offer advice and encouragement |

assessing their child's abilities related to self-determination. The parent form Capacity (Cronbach's $\alpha = 0.85$), Opportunity at School (Cronbach's $\alpha = 0.88$), Opportunity at Home (Cronbach's $\alpha = 0.79$), and overall self-determination items (Cronbach's $\alpha = 0.87$) demonstrated high internal consistency (see Table 1 for example items) in the current sample. The Level of Self-Determination is calculated by dividing the sum by the total possible sum and multiplying by 100, with a maximum score of 100. The self-determination level was used to compare student and parent reports directly due to the different items. This measure was collected at both sites.

### Social-Communication Difficulties

Parents or caregivers completed the Social Responsiveness Scale-2nd edition School-Age or Adult Form (SRS-2; Constantino, 2012). The SRS-2 is a 65-item measure of social-communication difficulties, with higher *T*-scores indicating greater social-communication difficulties. The School-Age Form is designed for ages 4–18, and the Adult form is designed for ages 19–89 years, and there is considerable overlap between the two forms. The SRS-2 was standardized with a large representative, a sample of 1014 children and 1602 adults, and demonstrated strong internal consistency (0.94–0.96; Constantino, 2012). The total T-Score was used in the current sample (Cronbach's alpha = 0.78). The School-Age form was used at one site, and the Adult Form was used at the second site. The SRS-2 School Report and Adult both have 65 items with slight wording changes and more appropriate items for adult contexts (i.e. separates easily from caregivers in SRS-2 School Age was replaced with enjoys and is competent with small talk (casual conversation with others). The authors and the user manual recommend using the SRS-2 across the lifespan.

### Executive Function

Parent/caregiver-report of EF was measured using the Behavior Rating Inventory of Executive Function-2nd edition (BRIEF-2; Gioia et al., 2015)) or the Behavior Rating Inventory of Executive Function, Adult Form (BRIEF-A; Roth et al., 2004). The BRIEF-2 and BRIEF-A are informant report questionnaires that assess EF abilities' behavioral manifestation in school-aged children (ages 5–18; BRIEF-2) and adults (ages 18–90; BRIEF-A). The BRIEF-2 was used at one site, and the BRIEF-A was used at the second site. For both versions, items are summed to create an overall Global Executive Composite (GEC) *T*-score, with higher scores indicating more significant EF difficulties. The BRIEF-2 and BRIEF-A standardization samples included nationally representative samples of 3603 children and 1136 adults. The BRIEF-2 and BRIEF-A have demonstrated acceptable reliability and validity as an ecologically sensitive EF measure

(Gioia et al., 2015; Roth et al., 2005). The BRIEF- A (Cronbach's alpha = 0.96) and BRIEF-2 (Cronbach's alpha = 0.90) demonstrated excellent internal consistency in the current sample. A subset of adolescents with ASD (n = 47) completed the BRIEF-2 Self-Report form (Gioia et al., 2015). The Self-Report form examines EF difficulties in individuals ages 11–18. The BRIEF-2 Self-Report has demonstrated reliability and validity in clinical and non-clinical samples (Gioia et al., 2015). The GEC is on the same scale for all three BRIEF versions; thus, the GEC was used in the current analysis.

#### Depression

Autistic youth completed the CESD Scale (Radloff, 1977) or the (CESD-R; (Eaton et al., 2004), depending on site. The CESD and CESD-R are widely used measures of depression. Individuals rate the frequency of their depression symptoms from 0 *(not at all)* to 3 (*5–7 days/nearly every day*). Both CESD and CESD-R have demonstrated high internal consistency and validity (Eaton et al., 2004; Van Dam & Earleywine, 2011). CESD-R scores were converted to the same range as CESD overall scores across 20 questions for a range of possible scores between 0 and 60, with higher scores indicating more significant depressive symptoms as recommended by the authors (Eaton et al., 2004). Individuals with a total score of 16 or above are considered to have clinically significant depression scores (Eaton et al., 2004).

### Missing Data

There was missingness across the sample from the two clinical sites. Participants completed student-reported EF (N = 47) from one site and a subset of participants completed IQ measures from both sites (N = 106). There was missinginess for student-reported self-determination (N = 230), parent-reported self-determination (N = 195), social communication difficulties (N = 224), parent = reported EF (N = 219), and student-reported depression (N = 214). Data from self-determination, social communication difficulties, parent-reported EF, and self-reported depression were assumed to be missing at random (MAR) or that the missingness is due to the observed variables (Enders, 2003; Little & Rubin, 2020). Missing data were handled in data analysis using Multiple Imputation and Full Information Maximum Likelihood as described below.

### Data Analysis Plan

To characterize and compare youth and parent self-determination, repeated-measured ANOVAs were conducted using IBM SPSS Statistics, version 28 for youth and parents. Multiple imputation was used to address missing data. Data were imputed across 18 datasets to address the 18% of missing data from the parent reports of self-determination. Multiple imputation estimates a set of values for the missing data based on the observed data. Data is analyzed across the 18 datasets to derive a set of unbiased parameter estimates (White et al., 2011). Between-group differences and within-individual profiles of self-determination were examined for self-determination domains.

Analyses exploring predictors of self-determination were conducted in MPlus Version 8 using structural equation modeling (Muthén & Muthén, 1998–2017). The first step in structural equation modeling is to confirm the measurement model, or the factor structure, of the scale before adding in predictors. A confirmatory factor analysis was conducted to examine the factor structure of the AIR-Self-Determination Scale Student Report and Parent Report forms with robust weighted least squares estimators (WLSMV). WLSMV is recommended for categorical indicators (Brown, 2006). Several indices of model fit were examined to determine the adequacy of the measurement models: $\chi^2/df < 3.00$, CFI and TFI > 0.90, and RMSEA and SMRM < 0.08 (Brown, 2006). Following validation of the measurement model, a structural equation model was performed to examine the extent to which age, IQ, parent-reported autism severity, parent and student-reported EF, and student-reported depression predicted self-determination. These variables were added as covariates to the final measurement models from the confirmatory factor analyses. Associations were examined among student and parent levels of self-determination to assess the concordance of student and parent forms. Full information maximum likelihood was used to address the missing data. Full information maximum likelihood is recommended rather than listwise deletion due to the production of less bias in parameters (Enders, 2010; Graham, 2009). Full information maximum likelihood uses all available information in the dataset to produce unbiased parameter estimates and standard errors (Enders, 2010).

## Results

### Student and Parent Self-Determination Levels

The overall repeated-measures ANOVA between parent and student reported domains of Capacity, Opportunity at Home, and Opportunity at School was statistically significant, F (2, 419) = 86.51, $p < 0.001$, $\eta^2 = 0.29$, indicating that youth-rated their self-determination skills differently than their parents. Students reported significantly higher self-determination capacity, more self-determination opportunities at home, and fewer self-determination opportunities at school than parents; (See Table 2).

**Table 2** Self-determination descriptive statistics

| Self-Determination Level | Parent Level | | Student Level | | t | p-value | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| | M(SE) | Range | M(SE) | Range | | | |
| Capacity | 56.42(.96) | 23–100 | 68.43(.86) | 31–100 | 9.28 | < .001 | .16 |
| Opportunities at Home | 75.76(1.01) | 40–100 | 79.92(.93) | 27–100 | 3.00 | .003 | .02 |
| Opportunities at School | 76.81(1.19) | 33–100 | 67.66(1.89) | 20–100 | 9.15 | < .001 | .07 |

Note. Items are summarized across the 18 multiple imputed datasets for 237 participants

The overall repeated-measure ANOVA for student report of self-determination was statistically significant, F (2, 236) = 72.83, p < 0.001, $\eta^2 = 0.39$. Post-hoc paired sample t-tests indicated that students reported higher levels of opportunities to practice self-determined behavior at home than self-determination skills (capacity), t (236) = 10.81, $p < 0.001$, Cohen's d = 0.72, and self-determination opportunities at school, t(236) = 10.25, $p < 0.001$, Cohen's d = 0.68. Youth reported similar levels of capacity and opportunities at school, t(236) = 0.72, $p = 0.27$, Cohen's d = 0.04.

The overall repeated-measure ANOVA for parent report of self-determination was statistically significant, F (2, 236) = 163.24, p < 0.001, $\eta^2 = 0.73$. Parents reported that students had higher levels of opportunities to practice self-determined behavior at home, t (236) = 17.43, $p < 0.001$, Cohen's d = 1.25, and school, school, t (236) = 17.75, $p < 0.001$, Cohen's d = 1.26, than they had skills to engage in those behaviors (capacity). Parents reported similar levels of self-determination opportunities at home than at school, t (236) = − 0.90, $p = 0.18$, Cohen's d = 0.07.

## Predictors of Self-Determination

The first step of examining predictors of self-determination involved confirmatory factor analyses of the AIR-SDS Student Report and Parent Report. The hypothesized structural model of the AIR-SDS Student and Parent Reports did not fit the data well, $\chi^2$ /df = 1.99, RMSEA = 0.07 (90% CI [0.06, 0.07]), CFI = 0.90, TLI = 0.89, SRMR = 0.08. Modification indices suggested an Opportunity at Home and an Opportunity at School item loaded onto the Capacity domain for student and parent reports. On both student and parent versions of the AIR-SDS, the Opportunity at Home and School scale items "[At School]…I have learned how to make plans to meet my goals and to feel good about them" also loaded onto the capacity domain. This item was also reported as loading onto both domains in the parent version of AIR-SDS in a larger sample of high school students across cognitive abilities on the autism spectrum (Tomaszewski et al., 2020). Students and parents rated this item lower on the opportunities at home domain than the other opportunities items. The measurement model fit indices demonstrated acceptable fit, $\chi^2$/df = 1.56, RMSEA = 0.05 (90% CI [0.04, 0.06), CFI = 0.94, TLI = 0.93, SRMR = 0.07. All item factor loadings were > 0.30. See Table 3 for item statistics.

Age, IQ, social-communication difficulties, EF, and depression were regressed onto the latent constructs of student capacity, student opportunities at school, student opportunities at home, parent capacity, parent opportunities at school, and parent opportunities at home in a structural equation model. The model demonstrated acceptable fit, $\chi^2$/df = 1.48, RMSEA = 0.05 (90% CI [0.04, 0.05]), CFI = 0.94, TLI = 0.92, SRMR = 07. Lower student-reported depression (β = − 0.17, $p = 0.04$) and fewer student-reported EF problems (β = − 0.63, $p < 0.001$) were associated with greater student-reported capacity for self-determination (for student-report significant associations). The model was also repeated without student-reported EF due to only 47 participants completing this measure. There were no significant differences in relationships among measures in the model.

Higher IQ scores were associated with greater parent-reported capacity (β = 0.28, $p = 0.02$). Lower parent-reported social-communication difficulties were associated with greater parent-reported self-determination capacity (β = − 0.30, $p = 0.001$). Fewer parent-reported EF problems were significantly associated with greater parent-reported capacity (β = − 0.56, $p < 0.001$). Younger ages were significantly associated with greater parent-reported opportunities at home (β = − 0.18, $p = 0.03$).

There were no significant correlations between parent and student reports of opportunities at home. There was a small, significant association between student and parent reports of capacity (β = 0.20, $p = 0.01$) and opportunities at school (β = 0.17, $p = 0.02$). Student-reported depression was significantly associated with parent-reported social communication difficulties (β = 0.17, $p = 0.03$), parent-reported EF (β = 0.31, $p < 0.001$), and student reported-EF (β = 0.55, $p < 0.001$). Parent-reported EF was significantly associated with age (β = − 0.16, $p = 0.03$) and social communication difficulties (β = 0.43, $p < 0.001$).

## Discussion

The purpose of the current study was to compare self-determination from perspectives of transition-aged youth with autism and their parents using the AIR Self-Determination

**Table 3** Item statistics for the confirmatory factor analysis of the Air Self-Determination Scale student and parent forms

| Domain | Items | Mean (SD) | Corrected item-total correlation | Standardized factor loading |
|---|---|---|---|---|
| Student Capacity | Do1s | 3.94(.77) | .50 | .61 |
| | Do2s | 3.31(.89) | .70 | .77 |
| | Do3s | 3.28(.91) | .69 | .77 |
| | Do4s | 3.09(.99) | .68 | .80 |
| | Do5s | 3.03(1.07) | .59 | .70 |
| | Do6s | 3.29(1.01) | .59 | .66 |
| | Feel1s | 3.95(.87) | .41 | .55 |
| | Feel2s | 3.76(.90) | .60 | .69 |
| | Feel3s | 3.42(1.04) | .70 | .79 |
| | Feel4s | 3.14(1.05) | .62 | .75 |
| | Feel5s | 3.18(1.03) | .73 | .82 |
| | Feel6s | 3.60(.92) | .53 | .62 |
| | Home3s | 3.61(1.02) | .53 | .45 |
| | School3s | 3.37(1.03) | .56 | .44 |
| Student Opportunity at Home | Home1s | 4.10(.93) | .62 | .75 |
| | Home2s | 4.10(.99) | .71 | .84 |
| | Home3s | 3.61(1.02) | .52 | .44 |
| | Home4s | 4.02(1.05) | .68 | .77 |
| | Home5s | 4.12(1.05) | .63 | .76 |
| | Home6s | 4.01(1.03) | .68 | .82 |
| Student Opportunity at School | School1s | 3.42(1.04) | .57 | .70 |
| | School2s | 3.35(1.20) | .72 | .81 |
| | School3s | 3.38(1.04) | .55 | .50 |
| | School4s | 3.50(1.28) | .73 | .81 |
| | School5s | 3.36(1.32) | .66 | .77 |
| | School6s | 3.38(1.16) | .72 | .83 |
| Parent-Reported Capacity | Do1p | 3.72(.75) | .33 | .41 |
| | Do2p | 2.96(.84) | .74 | .89 |
| | Do3p | 2.65(.86) | .75 | .88 |
| | Do4p | 2.56(.90) | .65 | .78 |
| | Do5p | 2.54(.94) | .63 | .76 |
| | Do6p | 2.59(.89) | .68 | .80 |
| | Home3p | 3.35(.95) | .57 | .49 |
| | School3p | 3.28(.82) | .51 | .50 |
| Parent-Reported Opportunity at Home | Home1 | 4.02(.692) | .54 | .82 |
| | Home2 | 4.08(.750) | .54 | .80 |
| | Home3p | 3.35(.95) | .53 | .42 |
| | Home4 | 3.97(.785) | .42 | .53 |
| | Home5 | 4.00(.911) | .30 | .81 |
| | Home6 | 4.18(.807) | .40 | .92 |
| Parent-Reported Opportunity at School | School1 | 3.94(.85) | .60 | .88 |
| | School2 | 4.00(.88) | .52 | .80 |
| | School3p | 3.35(.95) | .71 | .42 |
| | School4 | 3.66(.892) | .55 | .71 |
| | School5 | 3.81(.923) | .39 | .83 |
| | School6 | 3.77(.947) | .49 | .93 |

Scale and examine associations among self-reported and parent-reported individual characteristics. First, we found evidence to suggest that ratings of self-determination capacity and opportunities to practice self-determined behaviors differ between autistic youth and their parents. Additionally, ratings on these domains were differentially distributed within each group, with skill level generally lagging opportunities for practice. Second, we demonstrated significant associations among social-communication challenges, EF, depression, and self-determination domains that differed depending on the reporter.

Autistic students reported higher self-determination capacity and higher levels of opportunity to practice self-determined behavior at home than their parents. Notably, students reported fewer opportunities to practice self-determined behavior at school than their parents. There was a small significant correlation between parent reports and self-reports of capacity. The lack of correlation finding is unsurprising, given that multi-informant reports typically only yield low-to-moderate levels of correspondence (i.e. r's ranging from 0.20 to 0.60; De Los Reyes et al., 2015). This lack of concordance between parent and self-reports in transition-aged autistic youth without co-occurring ID suggests the importance of gaining information from both youth and their parents in setting goals for the transition to independence.

While some studies suggest that we should take caution in self-reports due to these discrepancies (Mazefsky et al., 2011), self-determination involves the individual's causal agency, so it is critical to incorporate perspectives of autistic transition-aged youth. Despite differences in the mean-level report of self-determination capacity and opportunities and a lack of parent–child correlation on these domains, parents and youth both reported similar patterns across the AIR-SDS such that self-determination capacity was viewed as lower than the opportunities they had to practice self-determination skills at home; and that there were more opportunities to practice self-determination at home than at school. These findings suggest that while opportunities at home and school exist for students, they may need more support in skills surrounding explicit instruction in self-determination or activities that promote self-determination, emphasizing school-based supports. To date, one intervention incorporates explicit self-determination instruction in autistic youth without co-occurring ID ages 16–25 (White et al., 2017, 2019). The STEPS program incorporates an explicit focus on self-determination through cognitive-behavioral strategies (White et al., 2017). Results showed that students with higher self-determination levels at baseline predicted increases in college adjustment intervention gains (White et al., 2019). These findings were preliminary due to small sample sizes and did not demonstrate a change in self-determination over time; thus, more research is needed to examine self-determination interventions for transition-aged youth on the autism spectrum.

Increased levels of depression and EF difficulties were associated with student-reported capacity but not opportunity, suggesting that depression and EF may contribute to lower capacity levels. In the current sample, 35% of participants met the criterion for a clinically significant depression score. Both depression and EF have been associated with adaptive behavior or outcomes related to daily living activities in autistic adolescent youth (Kraper et al., 2017; Pugliese et al., 2015, 2016) and independence and well-being in adulthood (Wallace et al., 2016). Given that autistic youth are at risk for increased depression and EF difficulties, focusing on mental health and building strong foundational EF skills, such as teaching self-advocacy around EF challenges, may be essential for building self-determination skills. Interestingly, greater parent-reported EF difficulties were associated with decreased self-determination levels and fewer opportunities to practice self-determined behavior at home but more opportunities at school. The opposite pattern of opportunities at home and school may indicate the difference in how supports are viewed. For example, parents may rate fewer opportunities at home for students with increased EF difficulties because they have less capacity to act upon opportunities at home. Nevertheless, they may view the school as providing increased supports for their students due to their child having increased EF difficulties. Future research would be necessary to consider school context by including teacher or instructor reports of self-determination opportunities.

For autistic youth without co-occurring ID, the item surrounding making plans for goals was not clearly distinguished from the skill of self-determination or the opportunities provided to learn these skills. It may be that there need to be both learning opportunities and more explicit instruction in how to learn to make plans for goals for parents and educators. Research on goal planning in autistic transition-aged youth has suggested that clear post-school goals are essential for a successful transition to college or employment settings (Alverson et al., 2019; Wei et al., 2016). Autistic students currently in post-secondary education settings may also benefit from clear goal planning support during their experiences to promote a successful transition from post-secondary education to employment (Van Hees et al., 2015; Vincent, 2019).

This study is not without limitations. First, due to two separate samples, there were missing data on the BRIEF Self-Report and IQ measures. While data was estimated using FIML, which produces less biased parameters than case deletion, there was a larger percentage of missingness across predictor variables. Second, this study was cross-sectional, and longitudinal research is needed to explore these relationships over time to make inferences about causality

among the variables. Third, we do not have a history of previous services received. Detailing the types and amounts of services received during transition will be critical when examining future studies' service use and intervention programs. Fourth, we combined the use of the BRIEF-A and BRIEF-2, which has not been reported on previously. There is more validation work needed to justify the combination of these measures in future studies. Finally, there were no self-reported autism severity or parent-reported depression measures to examine all reporters' perspectives on these constructs.

The current study examined self-determination in autistic youth in high school and community colleges using student and parent-reports. There was a discrepancy between students and parents, with students reporting higher capacity and fewer opportunities at school. However, overall both students and parents reported that self-determination capacity lagged behind opportunities for engaging in self-determined behavior. For students, depression was strongly related to capacy suggesting that a focus on treating depression may support increased self-determination and potentially adult outcome. For caregivers, symptom severity and cognitive abilities (IQ and executive function) were most related to self-determination. Findings highlight the importance of gaining both the parent and student perspective and suggest that depression and executive function skills may be important intervention targets for transition aged youth in facilitating increased self-determination and potentially improved adult outcomes.

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## Declarations

**Conflict of interest** The authors declare that they have no conflicts of interest to disclose.

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