

THESIS

THE RELATIONSHIP BETWEEN ASSISTIVE TECHNOLOGY UTILIZATION
AND ACADEMIC OUTCOMES FOR POST-SECONDARY STUDENTS WITH A
MENTAL HEALTH CONDITION

Submitted by

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ABSTRACT

THE RELATIONSHIP BETWEEN ASSISTIVE TECHNOLOGY UTILIZATION AND ACADEMIC OUTCOMES FOR POST-SECONDARY STUDENTS WITH A MENTAL HEALTH CONDITION

The prevalence of mental health conditions (MHC) in post-secondary students is increasing steadily, affecting as many as 30% of the college student population (Eisenberg et al., 2013). Mental health conditions can affect student's cognitive, social, and emotional functioning including challenges with attention, memory, problem-solving, attendance, and in-class participation, impacting their ability to be successful academically (Brown et al., 2019; Gitlow et al., 2017; Markoulakis & Kirsh, 2013). Previous studies have demonstrated this negative influence, finding presence of a mental health condition in post-secondary students to be related to lower grades (Hysenbegasi et al., 2005; Markoulakis & Kirsh, 2013). Post-secondary institutions need to identify methods to better support these students to promote positive academic and psychosocial outcomes. As part of title II of the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act, assistive technology (AT) and AT support services are legislatively mandated accommodations currently offered to many post-secondary students with disabilities, including students with a disability resulting from a mental health condition. AT was demonstrated to support the cognitive functions impacted by a MHC, such as through note-taking aids, scheduling and reminder technology, and thought organization technologies, to improve students' academic performance and satisfaction (Gitlow, 2021; Malcolm & Roll, 2017a). Limited evidence exists to demonstrate if any relationship exists

between students with a mental health condition, utilization of AT services, and academic and psychosocial outcomes. The purpose of this study was to 1) identify predictors of AT service utilization, 2) identify predictors of GPA, and 3) identify predictors of self-advocacy and self- confidence for students with and without a MHC. Results of this study indicate that predictors of higher-grade point average (GPA) included AT service utilization, female gender, increased age, and non-first-generation status. Presence of a MHC was not predictive of AT service utilization, GPA, or ratings of self-advocacy and self-confidence compared to students with disabilities that did not have a mental health condition. Because these findings differ from current literature on the general population of post-secondary students with a MHC, further research is needed to identify if differences in academic and psychosocial outcomes exist for students with disabilities with a MHC compared to students not seeking disability services with a MHC.

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Introduction

The prevalence of post-secondary students with a mental health condition (MHC) has increased significantly in recent years (Oswalt et al., 2020). Mental health conditions are comprised of various disorders involving mental, behavioral, or emotional impairments. They can range from mild to serious mental illness in which the condition impacts participation in one or more life activities (National Institute of Mental Health, 2019). An international study from the World Health Organization found that one-fifth of college students had a diagnosable mental health disorder (Auerbach et al., 2016). In the United States, studies have estimated the amount of post-secondary students with a mental health condition to be as high as 30% (Eisenberg et al., 2013). Students with mental health conditions often face increased challenges reaching their full academic potential due to the cognitive and social impacts of their mental health condition, accompanied with a lack of structural and adaptive supports within the learning environment (McEwan & Downie, 2019).

For post-secondary students, the cognitive implications that often accompany mental health conditions have a negative impact on academic success (Oswalt et al., 2020). Areas of cognition affected by MHCs include attention, memory, concentration, concept-formation, problem-solving, and decision-making (Brown et al., 2019; Gitlow et al., 2017). Furthermore, students experiencing disabilities associated with MHC can have increased difficulties participating in class and with course attendance (Markoulakis & Kirsh, 2013). Some college students have described the obstacles they face as difficulties with focusing and concentrating, confusion, impaired memory and comprehension, feeling overwhelmed, and not being able to complete their degrees in the “typical” timeline (Gitlow et al., 2017; Kain et al., 2019; Padron, 2006). Additional emotional implications of MHCs include decreased self-esteem, internalized stigma, feeling worthless and hopeless (Kain et al., 2019; Padron, 2006). These cognitive and emotional implications can lead to difficulties in accessing and engaging with learning materials

and activities and may also affect a student's self-confidence and ability to self-advocate. Studies have demonstrated the impact of these cognitive and emotional symptoms to negatively affect the student's abilities in specific academic tasks such as completing homework, test-taking, and studying as well as challenges with broader social interactions leading to decreased attendance, in-class communication, and group work participation (Kain et al., 2019; Markoulakis & Kirsh, 2013; Padron, 2006). Such barriers may underlie many negative academic consequences.

As a result of cognitive and emotional challenges, students with a mental health condition may have difficulties with completing or comprehending academic work as well as attending and participating in class. These difficulties lead many students to fall behind in coursework and either require extra time to earn a degree or drop out prior to completion (Collins & Mowbray, 2005; Hysenbegasi et al., 2005). Additionally, studies have demonstrated inadequacies in the post-secondary environment to support students with a MHC. Educational policies based in the medical model focus primarily on the student's MHC as the problem to implement supports, rather than approaching from a social model of disability to identify barriers in the environment and activity that are inhibiting the student's success (Tinklin et al., 2005). For example, work by Markoulakis & Kirsh and Tinklin et al. identified lack of service coordination, lack of support for specific academic skills (i.e., note-taking), inflexible timelines of due-dates, and lack of understanding from faculty and staff as common barriers facing college students with MHCs (Markoulakis & Kirsh, 2013; Tinklin et al., 2005). Due to these structural and environmental barriers college students with MHCs do not have the resources they need for academic success.

Previous studies have identified the extent to which having a mental health condition can impact academic success. In a survey of college students with mental health conditions, the

National Alliance on Mental Illness found that of the students who discontinued college, 64% reported their mental health was the reason (Gruttadaro & Crudo, 2012). Of those who dropped out, 45% reported not receiving accommodations from the university (Gruttadaro & Crudo, 2012). Due to inadequate support, students commonly alter aspects of their college experience in response to their mental health conditions including reducing their course load, delaying graduation, and avoiding classes that require participation with peers through in-class discussions or group work (Kirsh et al., 2016). Students often face a cyclical pattern of poor academic performance negatively impacting their mental health and conversely, mental health struggles leading to negative academic performance including poor grades and attrition (Markoulakis & Kirsh, 2013). Hysenbegasi et al. (2005) found university students experiencing depression had a one-half point grade point average less than individuals without a mental health diagnosis (e.g., 2.5 vs. 3.0). Thus, research is needed to examine potential services and supports to enhance academic outcomes for college students with mental health conditions.

Assistive Technology for Mental Health within Higher Education

The growing number of college students with mental health issues has prompted some post-secondary institutions to seek ways to better support these students through the provision of academic-related accommodations. Assistive technology (AT) services are one such specific tool to aid students in academic success. Legislation in title II of the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act, mandates students with disabilities have equivalent access as students without disabilities at the higher-education institutions they attend (Malcolm & Roll, 2019). Within these mandates, assistive technology (AT), referred to as auxiliary aids within the legislation, serves to support students to fulfill academic requirements. The Assistive Technology Act defines assistive technology as, “any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to

increase, maintain, or improve functional capabilities of individuals with disabilities,” (“Assistive Technology Act,” 2004, p. 1710). The National Center for Education Statistics reported that 70% of post-secondary institutions in the United States consider AT a vital resource for meeting the needs of students with disabilities (Snyder & Dillow, 2013).

Research has indicated use of AT, including universal design features in everyday technology, can support cognitive functioning (Gitlow et al., 2017). This includes mediating the cognitive symptoms common with mental health conditions that contribute to academic success in college students such as emotional regulation, attention, planning, organization, time-management, and memory (Gillespie et al., 2011; Ko & Petty, 2020). Specific to post-secondary students with a mental health condition, AT solutions include universally designed features in everyday technology, as well as low to high-tech software or devices to aid areas of cognition impacted by a mental health condition. Examples of these AT accommodations include graphic organizers, time management systems, text-to-speech, and notetaking software (Gitlow, 2021).

Research has demonstrated the benefits of AT for student learning and academic outcomes for the general population of college students with disabilities, including for students with cognitive or social limitations like those seen with mental health conditions. Within post-secondary education, AT use was related to improved student ratings of academic performance related to reading, writing, note-taking, and test-taking across all diagnosis categories with 84% of students reporting a positive impact in grades with the use of AT (Malcolm & Roll, 2017a, 2017b). Minton et al. (2017) found 75% of post-secondary students with a traumatic brain injury felt AT helped them perform academically with many students experiencing cognitive and social impairments like those seen in individuals with a mental health condition. In their systematic review of the literature, McNicholl et al. (2021) concluded AT successfully enabled college students to access academic content and activities more easily, increasing their academic

performance and ability to connect with other students regarding academic tasks and goals. Furthermore, AT was related to positive psychological change in users increasing ratings of hope, confidence, motivation, autonomy, self-expression, and sense of belonging (McNicholl et al., 2021). For these students, AT provided support beyond academics to promote the intrinsic psychosocial factors (i.e., self-efficacy, confidence) related to their role as a student.

Although AT services improve a range of outcomes, many students dealing with mental health related disabilities are not exposed to assistive technology to aid in their academic goals. Recent work demonstrated students with mood disorders had far less exposure to assistive technology prior to beginning their post-secondary studies when compared to students with other types of disabilities, such as physical or learning (Ko & Petty, 2020; Malcolm & Roll, 2017a). This trend extends into higher education as students with a mood-disorder are less likely to seek AT services. Research indicates that within post-secondary institutions, individuals with less-apparent disabilities (as is often the case for students with MHC) are less likely than students with visible disabilities, such as physical or sensory disabilities, to seek supports or follow through with AT services (Malcolm & Roll, 2019; Newman & Madaus, 2015). For students with a mental health condition, this is often related to fear of stigma with self-disclosure and limited self-advocacy skills required to obtain needed supports (Belch, 2011; McEwan & Downie, 2013).

Self-Confidence and Advocacy

For college students with less apparent disabilities, including mental health conditions, Vaccaro et al. (2015) noted the importance of self-advocacy and mastery of the student role, including receiving good grades and completing academic tasks, as two primary factors to promote a sense of belonging. The ability to self-advocate is a consistent limiting factor for

college students with mental health conditions in obtaining the supports they need to be successful in their courses and graduate (McEwan & Downie, 2013). Characteristics related to self-advocacy include the ability to communicate and knowing one's self, involving a student feeling confident in their academic abilities and identifying how they learn best (Vaccaro et al., 2015).

Through the use of assistive technology, students gain improvements in confidence and communication, allowing them to more adequately advocate for their educational needs to professors and peers. Malcolm and Roll (2017b) demonstrated the relationship between AT use by post-secondary students and increased self-perceived ratings of performance and satisfaction with academic tasks. When AT was utilized for students with less-apparent disabilities, students with a mood disorder experienced a greater increase in satisfaction and performance ratings related to their academic achievements compared to students with behavioral, learning, or visual disabilities (Malcolm & Roll, 2017a). This satisfaction with performance and academic outcomes promotes the student's self-confidence of their mastery of their role as a college student. Further research noted improvements in self-confidence, sense of autonomy, how the student felt others perceived them, and their ability to communicate and work with peers and professors after utilizing assistive technology (McNicholl et al., 2021). When college students' AT needs were fully met students scored higher on academic self-efficacy, had a better ability to cope with the stress and time demands of school, and improved classroom verbal and non-verbal communication and participation (McNicholl et al., 2020). By using AT to promote success in multiple aspects of their collegiate roles, students have increased confidence regarding their academic potential and their ability to advocate for themselves with professors and peers.

Purpose of the Study

While research indicates the benefit of AT utilization for the broader population of college students with disabilities, little evidence exists specific to those with a mental health condition. Given the rising and sizeable number of students who have a MHC, the field needs information regarding the extent to which AT utilization influences academic outcomes for this population. Research also demonstrates the relationship of AT use to increase self-advocacy and self-confidence, but whether this relationship is related to the student's GPA, or other demographic factors, is unclear. To address these gaps and provide evidence that informs service guidelines and policies around accessible learning, this study will determine how the utilization of assistive technology services relates to final cumulative GPA as well as academic-based self-confidence and advocacy for individuals with a mental health condition compared to students with non-mental health-related disabilities. To fulfill the need for this knowledge, this study will address three questions:

1. While adjusting for demographics, to what extent does having a mental health condition predict utilization of referred AT services?
2. While adjusting for demographics, to what extent does the presence of a mental health condition or receiving AT services predict final cumulative GPA?
3. While adjusting for demographics, to what extent does having a mental health condition and final cumulative GPA predict self-ratings of academic self-advocacy and self-confidence for students who utilize AT services?

Methods

This retrospective study analyzed the relationship between having a mental health condition and utilization of assistive technology services as well as the influence of those services on final cumulative grade point average. Additionally, the relationship between having a mental health condition and final cumulative grade point average (GPA) on ratings of self-confidence and advocacy related to academics was assessed.

Secondary Data

This study utilized de-identified secondary data from individual students attending Colorado State University (CSU) who were referred to the Assistive Technology Resource Center (ATRC) between Fall of 2015 and Spring of 2021. These data were collected in end of semester surveys in which students answered questions using an ordinal scale. This survey was designed by the ATRC for the purpose of compiling student feedback and quality of service measures and not all questions were specifically designed to be utilized for research purposes. Additional data regarding students' diagnosis(es) were provided from the ATRC and the Student Disability Center (SDC). De-identified data regarding final cumulative grade point average, class, and demographics was used from the Institutional Research (IR) office at CSU. Participants were excluded from analysis if data were missing from any of the independent or dependent variables of focus in that research question. Participants missing a variable of interest in all three research questions (i.e., mental health condition status or demographics) were excluded from the study. Please see Figure 1 for the full exclusion process.

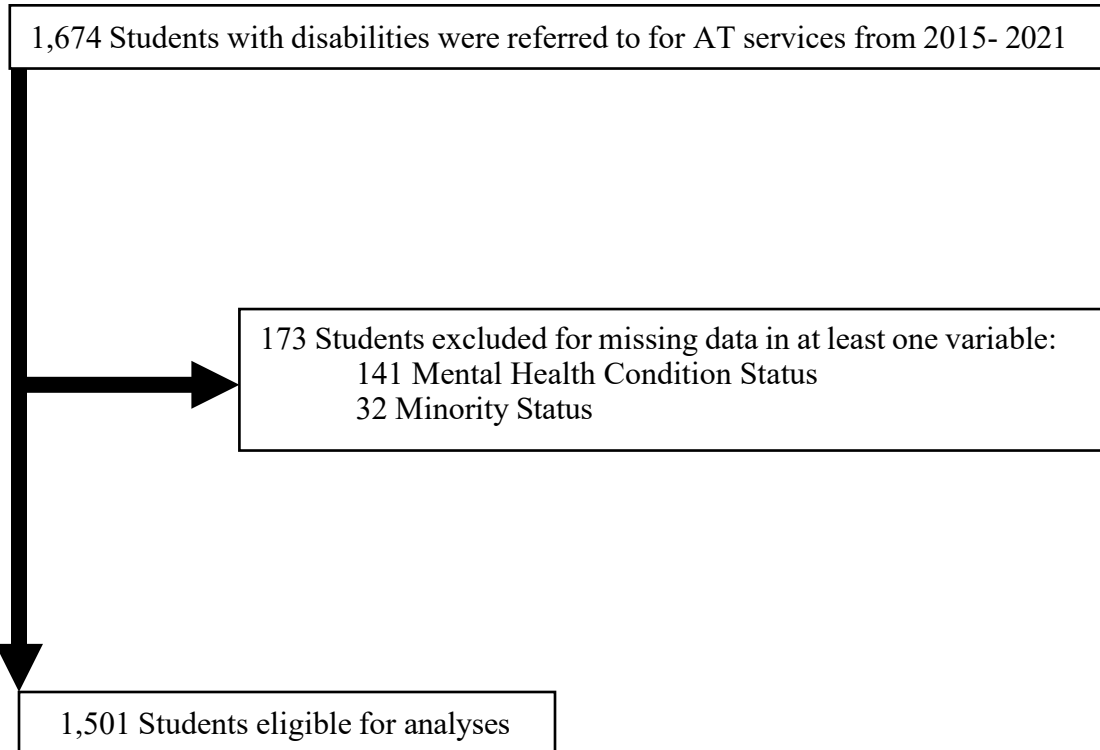


Figure 1. Diagram Depicting the Exclusion Process

Special focus was made to compare students with a mental health condition and those without. Students listed as having a mental health condition in the ATRC and SDC databases had it listed as their primary or secondary disabling condition or comorbidity. For students with a listed mental health condition in the ATRC database, formal documentation of the diagnosis was not necessarily required, as students with another documented primary disability did not require documentation for a secondary disabling mental health condition and could therefore self-identify as having the condition. Individuals with a primary disability in another category (physical, learning disability, etc.), may have utilized AT selected to primarily address academic needs resulting from that disability rather than AT targeting the student’s needs arising from a mental health condition. All data in this study were de-identified prior to disclosure to researchers.

Variables

For the purposes of this study, the following variables were studied. Demographic data, including minority status, gender (male or female), age, first-generation status (first-generation or not), and socioeconomic status based on receiving the Pell Grant (received Pell Grant or not), were assessed. The presence of a mental health condition included students with a formal diagnosis from a medical professional, and those with a self-identified diagnosis. Receiving AT services was defined as attending one or more appointments with the ATRC. Final cumulative GPA was defined as the average grade point average earned across all semesters on a four-point scale. Self-advocacy and self-confidence were measured using the average score of four survey questions embedded in a larger service-provision survey offered by the ATRC related to self-advocacy and self-confidence in academics and are described in the following section.

Assessment

Data were collected from the end of semester survey sent to each student receiving services from the ATRC between Spring of 2018 and Spring of 2021. For students receiving services over multiple semesters, only their most recent survey results were considered. Within the survey, two topics addressed in multiple questions were analyzed: feelings of comfort to self-advocate for academic needs and self-confidence to identify assistive technology needs that fit their learning. Though the semantics of the questions varied slightly between academic years, examples of these statements include “I am now confident in choosing the types of assistive technology that best fit my learning needs/styles,” and “I now feel comfortable advocating with my instructors about my learning needs and styles.” These questions used a Likert scale in which the person can select how strongly they agree or disagree with a statement. For data analyses, the Likert scale values were equated to the following numerical values: 1= strongly

disagree/very uncomfortable, 2= disagree/uncomfortable, 3= neutral, 4= agree/comfortable, and 5= strongly agree/very comfortable.

Disability Service of Focus

As referenced above, the disability service focused on in this study is the use of assistive technology and universally designed mainstream technology, and the related services, to support the participant's role as a post-secondary student. At Colorado State University, the ATRC provides assistive technology for students and employees with disabilities and advises on physical and electronic accessibility in accordance with section 504 of the Rehabilitation Act and titles I and II in the ADA. For the purposes of this study, all participants referred to the ATRC were sent from the Student Disability Center (SDC).

Student services at the ATRC were conducted by two registered and licensed occupational therapists (OT), and at times by other trained OT graduate students. The Center utilized the Human Activity Assistive Technology (HAAT) Model during service provision. This model emphasizes consideration of the person's abilities and the elements of the activity they are wanting to participate in, to find how assistive technology can fit the person, activity, and contexts of its use. Additional consideration of the contexts affecting the person and activity, such as the physical environment or social stigma, contributed to the identification of possible AT solutions (Cook & Polgar, 2015). The typical service model involved an initial evaluation which consists of a structured interview to better understand what the person's strengths and challenges were with typical post-secondary tasks such as note-taking, organization, writing, or reading, and to assess what barriers may exist in the higher education learning environment. A second appointment was typically needed to introduce AT solutions including device demonstrations and trials, and for the student and OT to assess the usefulness of tools for relevant academic tasks. Once the AT were selected, the person may return for additional

training if needed with a focus on the application of technology on the student tasks such as writing papers or taking notes. Similarly, follow-up appointments were encouraged to ensure all needs are met. Assistive technology devices and software were loaned to the student for the duration of the semester, or if applicable, for the remainder of their time as a student at CSU. As part of the end of semester services in the ATRC, the student is emailed a link to complete the survey related to their experience interacting with AT service providers, AT to support specific academic tasks, and how AT supported their academic and psychosocial outcomes related to their role as a student.

Case Vignette

“Tessa,” an anonymous student at CSU, was seen at the ATRC. Her primary diagnosis leading to her referral to the ATRC from the SDC is listed under the “Mental illness/psychological or psychiatric condition” category, specifically Bipolar depression and anxiety. Tessa has a secondary diagnosis of ADHD. During the initial evaluation, Tessa reported she was most concerned with her ability to comprehend course readings and stay focused on academic tasks. Further analysis into specific academic tasks revealed she commonly feels overwhelmed during note taking and studying, has trouble comprehending readings requiring her to re-read passages often, and often has trouble finding words when writing and organizing her papers. She also relayed trouble with time management due to inconsistent work and routine patterns related to her bipolar disorder as well as trouble with attention finding a method to organize time. After trialing multiple AT solutions, Tessa began using Sonocent Audio Notetaker, Kurzweil 3000, and Mindview Online. These software technologies supported Tessa with note taking by reducing the time needed to hand-write or type notes and reducing anxiety of missing information by recording the material in an audio format while also ensuring adequate note taking with inconsistent energy brought on from her bipolar depression. Kurzweil 3000 is a

literacy support software program to help organize academic materials, with text-to-speech features to read texts aloud, and tools to look-up and organize material to study more easily from later. Mindview is a mind mapping software to organize ideas and concepts when planning out projects or papers more easily.

Statistical Analysis

The data collected from the university's office of IR were merged with data collected at the ATRC. A cross-walk between IR and ATRC datasets was in place, using student identification numbers. Once linked, student identification numbers were removed. Table 1 summarizes the variables and statistical methods for each research question.

To answer the first research question, a binary logistic regression was used to determine if any relationship exists between the dependent variable of receiving assistive technology services and the independent variables of the presence of a mental health diagnosis and demographics. To determine the extent to which the independent variables predict if the student received assistive technology services, the Nagelkerke R^2 value was used. This value ranges from 0.00-1.00 signifying the proportion of variance in AT service utilization related to the independent variables. An odds ratio was used to compare the degree of contribution of each independent variable (Szumilas, 2010). The second research question was analyzed using multiple linear regression to find if a relationship exists between final cumulative GPA and the independent variables of the presence of a mental health condition and utilization of AT services. Various demographic information were additional independent variables to account for any variation these factors may contribute. The coefficient of determination, or R^2 , was used to determine the proportion of variance in final cumulative grade point average predicted by the independent variables. R^2 values range between 0.00 to 1.00 with values closer to 1.00 indicating a stronger correlation between the variance of the independent variable with the variance of final

cumulative GPA (Portney, 2020). Standardized coefficients were used to better compare the degree to which each independent variable influences the outcome as those with greater influence had a larger standardized coefficient value (Portney, 2020). The *p*-value was also used to determine the statistical significance of the findings with values of 0.05 and below considered significant. Finally, the third research question also utilized a multiple linear regression to analyze the relationship between the self-rated academic self-advocacy and confidence ratings and the independent variables of demographics, presences of mental health diagnosis, and GPA. R^2 values were calculated to determine the magnitude of the correlation between the independent variables and dependent variables, standardized coefficients were applied to better represent the degree to which each independent variable determines final cumulative GPA, and the *p*-value was determined to reflect the statistical significance of the findings.

Table 1

Variables and Analyses

Research Question	Independent Variables	Dependent Variable	Hypothesis	Statistical analysis
Predictors of utilization of AT services following a referral	<ul style="list-style-type: none"> • Mental health condition (yes or no) • Demographics 	Attend 1+ appointments with the ATRC	Students with a mental health condition will have decreased utilization of AT services compared to those without a mental health diagnosis.	Binary Logistic Regression
Predictors of final cumulative GPA for students with disabilities with and without a mental health condition	<ul style="list-style-type: none"> • Mental health condition • Receipt of AT services (yes or no) • Demographics 	Final Cumulative GPA	Students with and without a mental health condition will have similar increases GPA when utilizing AT services.	Multiple Linear Regression
Predictors of academic self-confidence and advocacy scores	<ul style="list-style-type: none"> • Mental health condition • Demographics 	Rating on self-confidence/advocacy survey question	Higher GPA will relate to higher ratings of academic self-	Multiple Linear Regression

Research Question	Independent Variables	Dependent Variable	Hypothesis	Statistical analysis
for students with and without a mental health condition who utilize AT services	<ul style="list-style-type: none"> • Final Cumulative GPA 	(average score between 4 survey questions)	confidence and self-advocacy ratings, while presence of a mental health condition will relate to decreased ratings.	

Results

Descriptive Data

After applying exclusion criteria, 1,674 students with disabilities were included in the study (though the sample size varied by research question; see Table 2). Of the total population of students with disabilities referred for AT services sampled in this study, 42.8% received AT services. A greater proportion of males utilized AT services compared to females (46.9% versus 43.9%, respectively). Within the total sample, 14.1% of students had a MHC. Comparing students with and without a MHC, similar proportions utilized AT services (45.8% versus 45.1%, respectively). A higher proportion of students who identified as a minority race utilized AT services compared to students who did not identify as a minority (46.6% versus 44.8%, respectively). Students in the junior class had a higher percentage of utilization of AT services compared to other class levels (48.3%). The average age of students who utilized AT was nearly one year older compared to students who did not utilize AT services (25.34 years versus 24.42 years, respectively). The average final cumulative GPA of the students who utilized AT services was 2.59 (SD=1.24) compared to 2.49 (1.21) for students who did not utilize the referred AT services.

Table 2. Descriptive Statistics

Study Variable	Total (n = 1,501)	Receipt of AT Services	
		AT-yes (n = 678; 45.2%)	AT-no (n = 823; 54.8%)
Gender			
Women	861 (57.4%)	378 (43.9%)	483 (56.1%)
Men	640 (42.6%)	300 (46.9%)	340 (53.1%)
Mental Health Condition			
Yes	212 (14.1%)	97 (45.8%)	115 (54.2%)
No	1,289 (85.9%)	581 (45.1%)	708 (54.9%)
Minority Status			
Yes	339 (22.6%)	158 (46.6%)	181 (53.4%)
No	1,162 (77.4%)	520 (44.8%)	642 (55.2%)
Class			
Freshman	201 (13.4 %)	87 (43.3%)	114 (56.7%)
Sophomore	190 (12.7%)	82 (43.2%)	108 (56.8%)
Junior	236 (15.7%)	114 (48.3%)	122 (51.7%)
Senior	635 (42.3%)	282 (44.4%)	353 (55.6%)
Graduate, Second-Bachelors, Post-Graduation	237 (15.8%)	113 (47.7%)	124 (52.3%)
Missing Data	2 (0.1%)		
First Generation Status			
Yes	292 (19.5%)	134 (45.9%)	158 (54.1%)
No	1,209 (80.5%)	544 (45.0%)	665 (55.0%)
Pell Grant Status			
Yes	504 (33.6%)	226 (44.8%)	278 (55.2%)
No	997 (66.4%)	452 (45.3%)	545 (54.7%)
Age			
Age, Average (SD)	24.84 (7.552)	25.34 (8.000)	24.42 (7.140)
Cumulative GPA			
GPA, average (SD)	2.53 (1.225)	2.59 (1.24)	2.49 (1.21)

AT Service Utilization

The full binary logistic regression model (n=1287), with utilization of AT services as the outcome, was not significant, $\chi^2(6) = 4.287, p = 0.638$, explaining 0.4 % (Nagelkerke R^2) of the variance. Please see Table 3 for full binary logistic regression results.

Table 3. Binary Logistic Regression Results for Predictors of Utilization of AT Services.

Predictors	$p = 0.638$				
	B	Wald	OR	95% CI	
				Lower	Upper
Mental Health Condition (ref: no mental health condition)	0.102	0.373	1.107	0.799	1.534
First-Generation Status (ref: non-first-generation)	0.059	0.161	1.061	0.795	1.415
Gender (ref: men)	-0.140	1.501	0.869	0.694	1.088
Minority Status (ref: non-minority)	-0.007	0.003	0.993	0.757	1.302
Pell Grant Status (ref: not received)	0.009	0.005	1.009	0.787	1.294
Age	0.010	1.452	1.010	0.994	1.027

Note. OR = Odds ratio; CI = Confidence interval; Wald= Wald statistics; B= Regression coefficients; ref= reference category.

Final Cumulative GPA

The full multiple linear regression model (n=1287), with final cumulative GPA as the outcome, was significant, $F(7, 1297) = 7.358, p < 0.001$, explaining 3.9% of the variance (R^2). Comparing students who did and did not receive AT services, receipt of AT services was associated with a 0.130 higher GPA ($B = 0.130, t = 3.330, df = 1286, p < 0.001$). Comparing

student's gender, the female gender was associated with a 0.173 higher GPA ($B = 0.173, t = 4.351, df = 1286, p < 0.001$). Comparing students' first-generation status, first-generation classification was associated with a 0.187 lower GPA ($B = -0.187, t = -3.661, df = 1286, p < 0.001$). Comparing students who age, each year of increased age was associated with a 0.0210 higher GPA ($B = 0.010, t = 3.475, df = 1286, p < 0.001$). Mental health disability, receipt of the Pell Grant, and minority status were not significantly associated with final GPA. Please see Table 4 for full multiple linear regression results.

Table 4. Multiple Linear Regression Results for Predictors of Final Cumulative GPA.

Predictors of Final Cumulative GPA							
Dependent variable	GPA (continuous)						
Regression result	$R^2 = 0.039, F = 7.358, df = 1286, p < 0.001$						
Coefficients							
Predictor variable	B	S.E. B	β	t	p	95% C.I. for B	
						Lower	Upper
Mental Health Condition (ref: no mental health condition)	-0.053	0.058	-0.025	-0.912	0.362	-0.166	0.061
AT Service Utilization (ref: No use)	0.130	0.039	0.091	3.330	<0.001*	0.054	0.207
First-generation (ref: non-first-generation)	-0.187	0.051	-0.107	-3.661	<0.001*	-0.287	-0.087
Gender (ref: men)	0.173	0.040	0.121	4.351	<0.001*	0.095	0.251
Minority Status (ref: non-minority)	-0.035	0.048	-0.020	-0.725	0.469	-0.129	0.059
Pell recipient (ref: not received)	-0.013	0.044	-0.009	-0.294	0.769	-0.099	0.074
Age	0.010	0.003	0.101	3.475	<0.001*	0.004	0.016

* $p < .05$

Academic Self-Advocacy and Self-Confidence

The full multiple linear regression model ($n=199$), with average self-advocacy and self-confidence survey ratings as the outcome, was not significant, $F(7, 191) = 0.779, p = 0.606$,

explaining 2.8% of the variance (R^2). Please see Table 5 for full multiple linear regression results.

Table 5. Multiple Linear Regression Results for Predictors of Average Self-Advocacy and Self-Confidence Survey Ratings (RQ3)

Predictors of Average Self-Advocacy and Self-Confidence Survey Ratings							
Dependent variable	Self-Advocacy and Self-Confidence Rating (continuous)						
Regression result	$R^2 = 0.028, F = 0.779, df = 198, p = 0.606$						
Coefficients							
Predictor variable	B	S.E. B	β	t	p	95% C.I. for B	
						Lower	Upper
Mental Health Condition (ref: no mental health condition)	-0.125	0.139	-0.067	-0.897	0.371	-0.399	0.149
Cumulative GPA	-0.023	0.080	-0.021	-0.286	0.775	-0.181	0.135
First-generation (ref: non-first-generation)	-0.009	0.131	-0.005	-0.066	0.947	-0.267	0.250
Gender (ref: men)	0.000	0.101	0.000	-0.001	0.999	-0.199	0.199
Minority Status (ref: non-minority)	-0.155	0.121	-0.093	-1.282	0.201	-0.393	0.083
Pell recipient (ref: not received)	0.028	0.112	0.020	0.250	0.803	-0.194	0.250
Age	0.012	0.007	0.129	1.625	0.106	-0.002	0.026

Discussion

The purpose of this study was to gather information regarding the extent to which AT utilization influences academic outcomes for students with a mental health condition.

Multivariate models for predicting AT service utilization as well as self-advocacy and self-confidence scores were not significant, however several predictors of GPA were found. The following sections will discuss each research question.

Predictors of GPA

Similar to findings from Simpson et al. (2022), utilization of AT services was associated with a 0.130 higher GPA. Prior research demonstrated the link between AT service use and GPA may be positively influenced by a student's perception of, and satisfaction with their academic performance in specific tasks such as note-taking, test-taking, and writing (Malcolm & Roll, 2017b, 2019). Additional studies have demonstrated students' improvements in overall academic engagement and performance, including increased class communication with peers and in-class discussions, increased ease to interact with course material and complete academic tasks, and improved course grades (McNicholl et al., 2021; McNicholl et al., 2020). These findings support the positive influence of the utilization of AT services on academic outcomes for students with disabilities in higher education with and without a mental health condition. AT utilization enables students to interact with course material and complete academic tasks, such as note-taking or studying, in a manner more conducive to their academic success, improving their satisfaction with academics through bolstered self-efficacy and motivation to continue engaging with academic material (McNicholl et al., 2020). Additionally, a study by McNicholl et al. (2020) demonstrated the relationship between post-secondary students' AT needs being met and increased academic self-efficacy for completing academic tasks, making it more likely for students to fully participate in the academic process.

First generation status was also predictive of lower GPA, a finding supported in other

similar studies (Lombardi et al., 2012; Simpson et al., 2022). This association may extend to students without disabilities, as studies have found mixed results regarding the relationship between first-generation status and academic outcomes. Schelbe et al. (2019) and Douglass and Thomson (2012) found a decrease in academic outcomes for first-generation students, calling for the need for additional academic supports. Alternatively, Strayhorn (2006) found a slight improvement in GPA for first-generation students. The differences in findings may be due to the difference in samples studied, as Schelbe et al. and Douglas and Thomson focused on either first-generation students already in a program to promote academic success or first-generation students in “highly selective” universities, while Strayhorn’s population included national statistics of first-generation students attending a variety of post-secondary institutions. Across studies, researchers found other variables, which are more frequently present in first-generation students compared to continuing-generation students, were more significantly related to a decrease in GPA such as decreased academic preparedness for college, taking developmental education courses, and decreased psychosocial supports (Noel et al., 2021; Strayhorn, 2006). Together, these findings emphasize the need to allocate more funding and to revise campus policies to increase academic supports for first-generation students (Kim et al., 2020). Specific to students with disabilities, research from Lombardi et al. (2012) demonstrated the cumulative effect of first-generation status and disability to lower the student’s likelihood of academic success. That is the intersectionality of identities involving the barriers to student success for students with disabilities, including receipt of necessary accommodations, coupled with the reduced social and economic support for first-generation students, results in increased obstacles to academic achievement for these students. For first-generation students with disabilities, assistive technology alone may not provide adequate academic support to mediate this cumulative effect, and other academic supports to mediate factors related to first-generation status are necessary.

Gender was predictive of final cumulative GPA as female students with disabilities had a 0.173 higher GPA compared to male students with disabilities. This finding is consistent with other research indicating that amongst students with disabilities, females experienced a larger increase in academic performance compared with males (Malcolm & Roll, 2019). The relationship between gender and academic outcomes extends to the general population of students where the female gender is predictive of higher GPA and rates of completion of a higher education degree compared to males (Buchmann & DiPrete, 2006; McDaniel, 2012). While consistent with gender differences in academic outcomes for the larger population of post-secondary students, these results draw into question additional factors that may influence the male student's GPA that are not as significant for female students. This may include academic factors such as increased likelihood for males to have a STEM major or the increased tendency for females to have higher expectations for themselves related to education (Buchmann et al., 2008; McDaniel, 2012).

Student age was also predictive of final cumulative GPA with each additional year of age related to a slightly higher (0.021) GPA. Other research has similarly demonstrated the relationship between older age with higher course grades and academic achievement for the general population of post-secondary students (Cantwell et al., 2001; Vella et al., 2016). One possible explanation for this finding includes the tendency for older students to have increased resilience, a factor highly correlated with academic success (Chung et al., 2017; Hartley, 2011). For students with disabilities, resilience may play a more prominent role in academic outcomes due to the increased barriers they face in achieving post-secondary success (Lindsay et al., 2018).

A primary aim of this study was to identify the extent to which having a mental health condition might relate to academic outcomes. We found having a MHC was not significantly related to final cumulative GPA. This differs from Malcolm and Roll (2017a) findings that

students with a mood disorder experienced a significantly greater difference in self-rated academic performance compared to other disability categories, though self-rated academic performance may differ from objective measures. Similarly, research on the general population of college students found that students with a mental health condition face negative academic impacts, including a lower GPA, due to their mental health condition (Hysenbegasi et al., 2005; Wyatt et al., 2017). In their research on academic success for college students with psychiatric disabilities, McEwan and Downie (2019) found certain mental health conditions were related with lower final cumulative GPA. Though differing from other literature, this result from our study is valuable in demonstrating that compared to other students with disabilities, mental health condition status was not significantly impactful on the student's academic success, but rather other variables (e.g., AT utilization, first-generation status) have a larger influence on GPA. While the impact of a mental health condition cannot be generalized to the larger population of students without disabilities, it does validate the necessity of disability services, including assistive technology services, for students with a mental health condition in line with students with other types of disabilities. McEwan and Downie (2013) demonstrated the tendency for students with a mental health condition to not seek services due to fear of stigmatization, not receiving accommodations in previous academic settings, and lack of self-advocacy skills. Because of these barriers, this population may benefit from further outreach from student disability services to make them aware of the resources available to them.

Receipt of the Pell Grant and minority status were also not significantly associated with final GPA for students receiving disability services. This aligns with previous research on post-secondary students with disabilities (Simpson et al., 2022), which similarly showed no significant relationship between GPA and receipt of the Pell Grant or minority status for students with disabilities. However, it differs from research focused on the general population of post-

secondary students finding that receipt of the Pell Grant was related to a slightly lower GPA (Douglass & Thomson, 2012). Additional studies from Greene et al. (2008) and Palacios and Alvarez (2016) found that for the general population of post-secondary students, being of a minority status was related to lower GPA. The lack of statistical significance of receipt of the Pell Grant and minority status in predicting GPA in this study may demonstrate that while these variables are predictive of lower GPA for the general population of post-secondary students, for students with disabilities these factors do not have as large of an impact on GPA. Rather other variables may play a more significant role for this population. For example, we were unable to account for class-level (e.g., freshman, sophomore, etc.), academic self-efficacy, number of credits taken, receipt of other supportive services or self-advocacy skills within this regression, all of which have been previously demonstrated to be predictive of GPA for post-secondary students with disabilities (Eakman et al., 2019; Kinney & Eakman, 2017; Simpson et al., 2022).

Insignificant Predictors of AT Service Utilization

Our model to predict AT service utilization based on mental health condition status, first generation status, gender, minority status, receipt of the Pell grant, and age, was not significant. This finding is beneficial by demonstrating that contrary to prior studies, the variables in questions did not significantly influence the likelihood of students utilizing recommended AT services. Previously, Malcolm and Roll (2019) found that nearly half of the post-secondary students with less-apparent disabilities referred for AT services did not follow-through with the referral. Because previous studies have found statistically significant findings related to AT service utilization, this indicates that additional variables not considered in this study may be of more significance in predicting AT service utilization. Other variables found to relate to AT service utilization that were not included in this study are class level and disability category (Malcolm & Roll, 2019; Simpson et al., 2022).

As was true of GPA, we found having a mental health condition was not related to AT service utilization. The lack of significant relationship between MHC and AT service utilization is surprising due to prior findings indicating decreased utilization of student services for this population. Specific to students with a mental health condition, a previous study found that having a cognitive or psychological disability category was related to decreased utilization of AT services (Simpson et al., 2022). Similarly, studies have demonstrated decreased utilization of disability services by post-secondary students with a mental health condition (Collins & Mowbray, 2005; McEwan & Downie, 2013). Research indicates fear of disclosure, fear of stigma, lack of knowledge of available services, and a lack of perceived necessity are common barriers post-secondary students with mental health related disabilities list as preventing them from utilizing disability services (Collins & Mowbray, 2005; Eisenberg et al., 2013). To receive an AT service referral, the sample population of students in this study had to first be seen by the general disability services office at the post-secondary institution. Therefore, students who do or do not utilize the AT service-referral have already sought other disability services, surpassing many barriers that have been noted to prevent students with a mental health condition from seeking services. This could have led to findings inconsistent with other literature. Alternatively, in their analysis of the American College Health Association National College Health Assessment datasets across a seven-year time span, Oswalt et al. (2020) found that use of mental health services and willingness to utilize services by students with a mental health condition has increased over time. In line with this finding, it is possible that disability service utilization from this population has increased as well to similar levels as other disability categories. Further research should be conducted to identify if a similar trend is evident in student disability services including AT services.

Of importance, previous studies of this population focused on students with a primary

condition being a mental health disorder. Additionally, these studies have frequently separated findings specific to different categories of mental health disorders, such as schizophrenia, bipolar disorder, depression, and anxiety. Due to the lack of specificity in the data utilized in this study, researchers were unable to isolate findings unique to mental health condition category or if the mental health condition is a primary or secondary disabling condition for the individual. This was a weakness in the study design that may have attributed to a lack of significance related to the presence of a mental health condition and AT service utilization.

Insignificant Predictors of Self-Advocacy and Self-Confidence

Our model to predict self-advocacy and self-confidence ratings based on mental health condition status, final cumulative GPA, first generation status, gender, minority status, receipt of the Pell Grant, and age, was not statistically significant. This indicates that other variables not included in this study might better explain students' self-rated self-advocacy and self-confidence. Specific to self-advocacy skills, a previous study from Kinney and Eakman (2017) demonstrated that first-generation status was related to lower self-advocacy skills for student veterans with disabilities. Their study also found a relationship existed between increased self-advocacy skills and increased GPA. Related to students' self-confidence ratings, a previous study demonstrated the relationship between AT use and increased psychosocial well-being including confidence ratings (McNicholl et al., 2021). A separate study found a relationship existed between increased self-confidence and academic participation and engagement for students using AT, ultimately impacting overall academic outcomes (McNicholl et al., 2020). Additionally, a study from Kim and Kutscher (2020) found a relationship between academic self-confidence and gender and that increased GPA was related to increased self-confidence. Other significant variables found to relate to self-advocacy and/or self-confidence that were not considered in our study include disability type, mother's education level, exposure to a supported education program, number of

credits taken, number of comorbid health and mental health conditions, and severity of mental health condition (Al-Asadi et al., 2014; Kim & Kutscher, 2020; Kinney & Eakman, 2017).

Future studies on self-confidence related to students with a mental health condition may benefit from inclusion of these variables.

Further investigation into the role of self-advocacy and self-confidence for students with a mental health condition is warranted as the ability to advocate for needs increases the likelihood of this population to receive the disability services available to them to support their academic success. Additionally, as hypothesized by Kinney and Eakman (2017), confidence may influence the student's motivation and perception of their ability to complete their academic workload. Specific analysis of what student services, including AT, may relate to an increase in these psychosocial measures would be of benefit to better understand how to utilize services for this population. Additionally, the survey questions used to measure the constructs were not written with the intent to use as a research outcome measure. These questions have not been tested for their reliability or validity to measure academic self-advocacy and self-confidence, and therefore future studies would be advised to implore proven outcome measures to more accurately measure these constructs. Finally, the survey questions in this study were only taken following AT use, rather than before and after, making it difficult to conclude any relationship between the two or with any increase in GPA.

Limitations

Findings from this study should be taken with consideration of the limitations. Due to the nature of the data related to student diagnosis, researchers were unable to stratify results based on the presence of other disabling conditions, including multiple mental health conditions. Because of this lack of specificity, researchers may have classified students too simply based on presence of a MHC without considering the impact of the presence of multiple disabling conditions on

their likelihood to utilize AT services, final cumulative GPA, and self-advocacy and self-confidence ratings. Further, differentiation between mental health condition as a primary versus secondary disability for which AT services were recommended was not able to be ascertained. This lack of differentiation limits the findings related to MHC status, as students with a different primary disabling condition may only have utilized AT services to mediate the academic challenges resulting from their primary disability while their secondary MHC may have little if any impact on their academic outcomes. Additional considerations related to student diagnoses that would strengthen the study include distinction of the type of mental health condition the student has, such as depression, anxiety, or bipolar, as well as the severity of their condition. This specificity in type of MHC would better support an understanding of how different types of MHCs impact the student's utilization of AT services, final cumulative GPA, and self-advocacy and self-confidence ratings.

Additionally, this study only analyzed students with disabilities from one post-secondary institution. This limits the generalizability of the findings. While it would be of benefit to include a wide array of universities across the United States in future studies, the researchers acknowledge that this may not be possible due to the varied structure of disability services across post-secondary institutions. The university in this study has a distinct AT office where occupational therapists and occupational therapy students with special knowledge of assistive technology evaluate, train, and follow-up with students to facilitate successful use of AT to support the student. This type of office and level of specificity in evaluation is not common in higher-education institutions so it may be difficult to find multiple universities with congruent or similar research settings.

Further, due to the retrospective nature of this study, many of the participants had missing data provided by either the ATRC or the university's IR office. Many students were missing one of the variables of interest and were therefore excluded from data analysis. Additionally, some

students had a 0.00 GPA in the data as they had not yet earned a GPA. These students were also excluded from data analysis for questions involving GPA as a variable.

Finally, related to the third research question focused on predictors of academic self-advocacy and self-confidence, a couple limitations exist. Because the survey questions used to measure these outcomes were only given to students who utilized AT surveys, this decreased the sample size. Additionally, the survey was optional for students to complete further limiting the number of students included in this analysis. Students who are more academically engaged may have been more likely to respond to the survey, which may have skewed results.

Conclusions

Due to the uptick in frequency of post-secondary students experiencing a mental health condition, higher education institutions must identify services to support these students not only medically, but also academically. Assistive technology is one such service that could be better utilized for this population. As this study demonstrated, utilization of AT is related to a higher final cumulative GPA for students with disabilities. Our research adds to existing literature to support the utilization of assistive technology to support post-secondary students with disabilities related to objective academic measures. Investigation into the influence of utilization of AT services on other objective measures, including retention and graduation rates, is warranted as well. Other variables found to impact academic outcomes for students with disabilities include gender, first-generation status, and age. This study also demonstrated that mental health condition status was not a significant predictor of AT service utilization, final cumulative GPA, or ratings of academic self-advocacy and self-confidence for post-secondary students with disabilities. These results are of value in identifying a possible discrepancy of the impact of a mental health condition for students with disabilities compared to the general population of students. Further research should investigate the influence of a mental health condition specific

to students with disabilities to identify predictors of academic and psychosocial outcomes to allow post-secondary institutions to better support this population.

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