Perceptions of High School and College Students with Autism Related to Their Obstacles and Strategies to Academic Success

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Abstract

Despite an increasing number of young adults with autism pursuing postsecondary education, limited research has been devoted to high-functioning students with autism transitioning to college and attending postsecondary education. This preliminary study surveyed 109 high school and undergraduate students with high-functioning autism. Participants were asked about their perceptions regarding their compensatory strategies, everyday hindrances, areas of perceived strength, and areas of academic and career interest. Results of this study add to the existing literature by revealing significant differences between responses for high school and postsecondary students. Additional significant differences are noted between male and female respondents.

Keywords: autism; high-functioning autism; high school transition; transition to college

Plain Language Summary

- Despite a growing number of young adults with autism pursuing college, little research has been devoted to high-functioning students with autism transitioning to and attending higher education.
- This study surveyed 109 high school and undergraduate students with high-functioning autism. Participants of this study were asked about their thoughts on the strategies they used, everyday problems, strengths, and academic and career interests.
- Results of this study add to what we know by showing differences between responses for high school and college students. Male and female students also responded differently.

Since the 1990's, there has been a significant increase in young people being diagnosed with autism spectrum disorder (ASD) and who go on to pursue a postsecondary education (Baio et al., 2018; Chown & Beavan, 2012; Hees et al., 2015). Although approximately 31% of individuals diagnosed with an autism spectrum disorder (ASD) have an IQ in the intellectually-disabled to borderline range (IQ = ≤ 70 – 84), the other 69% possess average

to above-average intelligence (IQ $\geq$ 85) and are considered to have high-functioning autism (HFA), formerly known as Asperger's syndrome (Baio et al., 2018; National Center on Birth Defects and Developmental Disabilities, 2018). Despite possessing average to above-average intelligence, individuals with autism continue to struggle throughout their lives with deficits in socialization, communication, organization, time management, and adaptation to changes in routine (Barnhill, 2016; Dymond et al., 2017). In light of these deficits, it is estimated that 47% of individuals with autism and no accompanying intellectual disability attend college compared to 2% of postsecondary students with autism and intellectual disability (Nasamran et al., 2017).

Moreover, on a yearly basis, nearly 50,000 adolescents with autism graduate from high school, but only 17,500 of youth with the disorder attend college annually (Shattuck et al., 2014; Wei et al., 2015). This is compared to approximately 19.6 million students without the disorder attending postsecondary education (Anderson et al., 2016; National Center for Education Statistics, 2019). Despite the continued influx of students with autism into postsecondary education, rates of college participation for youth with ASD are significantly lower than that of the general population (Newman et al., 2011; Shattuck et al., 2012). According to the National Longitudinal Study – 2, about 47% of young adults with autism enrolled in college within six years of graduating from high school and only 35% earned a degree (Shmulsky & Goboo, 2013; Sanford et al., 2011). For comparison, the college completion rate for all individuals with disabilities was 38% and 51% for the general population (Shmulsky & Gobbo, 2013).

Additionally, it has been reported that enrollment in postsecondary education among students with autism was lower than enrollment rates of six other disability groups (Nasamran et al., 2017). These six other disability groups include students with learning disabilities, other health impairments, speech/language impairments, hearing impairments, and visual impairments (Nasamran et al., 2017). In spite of the everyday struggles those with autism face, it is anticipated that the rate of students with autism attending college will continue to grow due to heightened public awareness, early identification, improved ability to identify autism, and educational support (Hees et al., 2015).

Postsecondary enrollment and attendance rates for individuals with autism may be lower for several reasons. For instance, Wei et al. (2014) reported that 68% of students with autism drop out of college, fail to apply for admittance to higher education, or are not accepted into four-year postsecondary education programs. Additionally, though 73% of high school students with disabilities take part in their transition-planning into adulthood, it is estimated that only 23% of high school students with autism participate in such planning (Fiedler & Danneker, 2007; Shogren & Plotner, 2012). A more recent study revealed that while adolescents with autism were included in transition-planning meetings 85% of the time, they only led the transition team in 5% of cases (Hatfield et al., 2018). Research has shown that students with autism who participate in transition-planning en route to college are more likely to enroll in postsecondary education and experience enhanced success in college (Wei et al., 2015).

Experiences of Individuals with of Autism Spectrum in College

The transition to college may pose unique challenges for students with autism. Unlike primary and secondary education, many students who formerly received special education services and modified curriculum under the Individuals with Disabilities Act (IDEA) no longer automatically receive specialized programming in college (Brown & Coomes, 2015). Instead, students have to self-identify and self-advocate to receive accommodations and modifications in postsecondary education, while the educational curriculum largely remains the same. Additionally, since ASD represents impaired social and communication skills, college students with autism may experience difficulties related to their disability, such as interacting with their professors and classmates, understanding others' points of view, meeting assignment deadlines, coping with schedule changes, maintaining appointments, living independently, prioritizing schoolwork, and learning self-advocacy skills (Longtin, 2014; Zeedyk, et al., 2016).

Although there has been an increase in students with ASD attending college, scholarly literature on postsecondary students with autism and their everyday successes/challenges is considerably lacking. Most research that does exist on students with autism consists of case studies or small qualitative studies, or has relied exclusively on the expertise of professionals who have worked with the disorder (Cai & Richdale 2016; Gelbar et al., 2014). To highlight the need for more research on high school and postsecondary students with autism, Anderson et al. (2017) and Gelbar et al. (2014) both conducted comprehensive literature reviews. More specifically, between Anderson et al. (2017) and Gelbar et al. (2014), 38 studies were examined that investigated the experiences and services received by high school and college students with ASD. Across these two literature reviews, only one study by Beardon and Edmonds (2007) had a very large sample size, while the other 37 studies had very small sample sizes that ranged from one to thirty-five participants. Due to the small number of participants the other 37 studies examined, it is difficult to generalize findings from these studies.

Moreover, even though Beardon and Edmonds' (2007) study consisted of 135 participants, it focused on the needs of adults with ASD with regard to topics like transportation, route to a diagnosis, and mental health. Therefore, only a small portion of the study focused on postsecondary students with autism. Consequently, since existing studies typically have a small number of participants and are qualitative, both Anderson et al. (2017) and Gelbar et al. (2014) believe that there is a substantial need for more quantitative studies with larger sample sizes to better understand the needs and experiences of high school and college students with autism.

Research that does exist on postsecondary students with autism reveals common themes. For example, previous research found that, when compared to their neurotypical peers, college students with autism experienced difficulties in dealing with ambiguity, organization, time management, procrastination, socialization, communication, sensory sensitivities, concentration, change in routine, and mental health concerns (stress, anxiety, depression, and fatigue) (Anderson et al., 2017; Gobbo & Shmulsky, 2014). Similarly, a qualitative study of 14 college-bound high school students with autism noted

that anxiety, social skills, and ability to manage coursework and life were viewed as potential barriers to their success in postsecondary education (Accardo, 2017).

A few studies have investigated the accommodations needed by students with ASD, with results revealing that students with autism most often requested to have extended time on exams, to have days off between tests, to take exams in a distraction-free environment, to meet regularly with the disability counselor about mental health concerns, to utilize note takers, and to have the option to complete alternative assignments instead of group work (Hees et al., 2015; Gelbar et al., 2015). A more recent qualitative study by Accardo et al. (2019) involving 23 participants further added to the literature on the common accommodations students with autism receive. The study noted that common accommodations and compensatory strategies used by students with autism included completing academic coaching, receiving a copy of instructor notes, and attending a freshman summer transition program (Accardo et al., 2019).

Although the findings from the aforementioned studies are interesting, they are based on qualitative studies and contain small sample sizes. Moreover, despite individuals with autism experiencing difficulty related to common traits of the disorder, they often possess areas of great strength. Previous studies have noted strengths in individuals with autism in the areas of having a higher-than-average need to "feel correct," possessing better attention to detail, exhibiting strong analytical skills, displaying strong memory, and being very knowledgeable in their area(s) of interest (Gobbo & Shmulsky, 2014; Hees et al., 2015). Furthermore Anderson et al. (2017) found that postsecondary students with autism attribute their success to persistence, determination, and an intense interest in the subject they are studying.

In summary, previous studies and literature reviews show that students with autism experience significant difficulty transitioning to and navigating the postsecondary environment (Anderson et al., 2017; Accardo, 2019). These deficits tend to revolve around the greater themes of deficits in organization and time management, socialization, sensory sensitivity, and mental health. To overcome these deficits, high school and college students with autism utilize a number of compensatory strategies and accommodations, such as taking time off between exams, completing alternative assignments, or taking exams in a distraction-reduced environment. As more individuals with autism graduate high school and enter college, there is an increased need to learn about the preventative barriers to their retention and graduation. Moreover, given the growing body of research that suggests symptoms of autism may present differently in males and females, there is an additional need to explore the possible gender differences regarding the aforementioned issues in this population. Therefore, results from this study may assist in understanding the academic and transitional needs of students with autism who are pursuing or attending college.

Purpose of the Current Study

The current quantitative study utilized a metacognitive theoretical approach along with previous literature on high school and college students' acquisition of knowledge to explore participants' perceptions on how they learn. The construct of metacognition is one

of the major theoretical concepts in cognitive psychology and can be defined as awareness about one's own learning and thought processes (Wilkinson et al., 2010). According to previous studies in cognitive and educational psychology, metacognition plays a significant role in students' effective learning and success (Wang et al., 1993; Wilkinson et al., 2010). Therefore, this study sought to explore participants' insight about how they learn, what they are good at, what they struggle with (challenges), and how they compensate and overcome the obstacles and challenges to their learning. More specifically, this study inquired about the following research questions:

(1) What are the major perceived obstacles to academic success?
(2) What are the most common compensatory methods and strategies used to enhance success in school?
(3) What are the most self-identified sources of strength?
(4) What are the most pursued areas of academic and career interests?
(5) Are there significant differences in participants' responses related to education level (high school vs. college)?
(6) Are there significant gender differences in participants' responses?

Method

Participants

This study was approved by the university's Institutional Review Board and informed consent was obtained from all participants or the legal guardians of participants who took part in this study. Participants in this study consisted of 109 high school and undergraduate students who were recruited across the United States through the Interactive Autism Network (IAN) research database. The IAN research database consists of more than 20,000 children and adults with autism and is governed by the Johns Hopkins Medicine Institutional Review Board (Lee et al., 2010; Marvin et al., 2014). The database has been designed to facilitate ASD research efforts by informing participants about studies for which they qualify via email (Lee et al., 2010; Daniels et al., 2012; Marvin et al., 2014). Report of ASD diagnosis was validated through IAN by a review of parent and professional provided medical records (Lee et al., 2010; Marvin et al., 2014).

The demographic information of the sample is depicted in Table 1. In the current study, 33 (30.2%) participants were female and 76 (69.7%) were male. Seventy-six (69.7%) were high school students and 33 (30.3%) were undergraduate students. Ninety-one (83.5%) of the participants were Caucasian, 10 (9.2%) were Hispanic/Latinx, 3 (2.80%) listed themselves as other, 2 (1.80%) were American Indian or Alaskan Native, 2 (1.80%) were African-American, and 1 (0.90%) was Asian or Pacific Islander.

With regard to class standing of high school students, 18 (23.7%) were freshman, 21 (27.6%) were sophomores, 17 (22.4%) were juniors, 17 (22.4%) were seniors, and 3 (3.9%) students were in their fifth year of high school. For students attending college, 8 (24.2%) were freshman, 15 (45.5%) were sophomores, 5 (15.2%) were juniors, and 5 (15.2%) were seniors. Of the postsecondary students surveyed, twenty-six (78.8%) were enrolled in a public college and 7 (21.1%) were enrolled in a private college. Finally, with

regard to the size of postsecondary education institutes attended, seven (21.2%) students reported attending a small college (between 1,000 to 5,000 students). Twenty-two students (66.7%) reported attending a medium-size college (between 5,001 students to 15,000 students). Lastly, 4 students reported attended a large college (more 15,000 students; see Table 1).

Data Collection Materials

Development of the surveys involved an initial search of scholarly databases including ERIC, PsychInfo, MEDLINE, and GoogleScholar for peer-reviewed articles on high school and college students with autism. More specifically, the following keywords were searched: autism, high-functioning autism, college, postsecondary education, learning, metacognition, compensatory learning strategies, barriers to academic success, obstacles to academic success, accommodations, modifications, intrinsic motivation, extrinsic motivation, academic achievement, and career interests. After locating articles pertinent to the current study, an examination of the reference lists was conducted to identify other germane articles. Additionally, the items in the self-report questionnaires incorporated areas of deficit outlined in the scholarly literature and in the Diagnostic and Statistical Manual of Mental disorders, Fifth Edition (DSM-5) for individuals with autism. More specifically, an emphasis was placed on the three core deficits individuals with autism face with regard to impaired communication, impaired social interaction, and repetitive and stereotyped patterns of behaviors or interests (American Psychiatric Association, 2013; Masi et al., 2017). Through the aforementioned development process, four self-report surveys were created and asked of high school and college students with autism about their obstacles to academic success, strategies and methods utilized to enhance their success in school, insights about their own sources of strength, and their interest in academic and career subject areas (See appendices A through D).

An evaluation of the questionnaires was conducted by four faculty members at a midwestern university, each of whom specialized in autism. In addition to these four reviewers, the questionnaires were further evaluated by three expert clinicians who work with high-functioning teens and adults at a local autism clinic. Feedback from these experts was incorporated into the questionnaires to enhance survey item appropriateness for this population and to further improve content, clarity, layout, and wording.

Aside from seeking expert reviews to improve content and clarity of the survey questions, the questionnaires were pilot-tested with a group of fourteen participants who had a documented diagnosis of HFA at a local autism clinic. This pilot-testing of the questionnaires was utilized to confirm that participants in the study would be able to respond to the questions in the survey. Feedback and reflections from this group were utilized to further refine the questionnaires. These approaches led to improvements in the questionnaires' clarity and usability.

The following four questionnaires were posted and completed by participants online through SurveyMonkey. The participants were asked to check the issues that they perceived to cause problems for them and prevent their academic success, indicate the strategies they apply to deal with these obstacles, and identify their own strengths, as well

as their areas of academic and career Interests. A description of each questionnaire follows.

Perceived Obstacles to Academic Success Survey

The Obstacles to Success Survey asked students with autism to identify problems that hindered their academic success in high school or college. After reading the introductory statement, "Some issues that cause problems for me and prevent my academic success include…," students were asked to check a box to as many of the 33 obstacles to success items they identified to complete the initial statement. For example, a student may have checked a box next to the item of "being forgetful" making the whole statement read, "Some issues that cause problems for me and prevent my academic success include being forgetful" (See Appendix A).

Methods and Strategies to Ensure Academic Success Survey

The Methods to Ensure Academic Success Survey asked students to identify ways in which they attempted to be academically successful. The survey began with one general statement that read, "In order to help me be academically successful…." After reading the introductory statement, 39 compensatory strategies were listed to complete the initial general statement. Students were asked to click on a box to endorse each compensatory strategy that they believed assisted them in being academically successful. For example, a student may have endorsed the compensatory strategy of "I maintain an everyday routine" which would make the whole statement read, "In order to help me be academically successful, I maintain an everyday routine" (See Appendix B).

Sources of Personal Strength Survey

The Sources of Personal Strength Survey asked students to identify attributes they thought they were good at and might have contributed to their academic success. Upon reading the question, "In your opinion, what are the things you are good at?" students were provided 10 items and asked to check a box to as many of the items listed that they identified with. For example, after reading the question, "In your opinion, what are the things you are good at?" a student may have checked the box "I am very observant in my area of interest/pay great attention to detail" to identify an area that they viewed as a strength (See Appendix C).

Areas of Academic and Career Interest Survey

The Areas of Academic and Career Interest Survey asked students to determine areas of interest and abilities in relation to their scholarly and career pursuits. The survey began with one general statement that read, "I believe that I have great interest and strong abilities in the following academic and career subject areas…" After reading the introductory statement, 16 academic and career subject areas were listed. Subsequently, students were asked to check a box next to each academic and career subject area they believed they had great interest in. For example, a student may have checked the box of

"Marketing (e. g., advertising agent, purchasing agent, public relations, sales representative)" to identify their area of interest and strong ability (See Appendix D).

Data Analysis

Participant responses to survey items were numerically coded in order to perform a univariate analysis on each survey item. Responses were coded "1" if a student endorsed a survey item and "0" if a student did not endorse a survey item. A relative frequency distribution was created yielding a percentage of endorsements for each survey item based on student responses. Data was further analyzed using a chi-square analysis to determine if relationships existed between items endorsed, education level, and gender. Cramer's *V* is reported, indicating the strength of association between significant variables.

Results

The results of male and female high school and college students' responses to each research question will be presented in the following sections.

What are the major perceived obstacles to academic success?

As Table 2 shows, high school students with autism reported their top obstacle to success was feeling constantly anxious/nervous (55.3%, n = 42). However, the undergraduate students with autism reported procrastinating on assignments as their greatest obstacle to their academic success (75.8%, n = 25).

Are there significant differences in participants' perceived obstacles to academic success and participants' education level (high school vs. college)?

A chi-square analysis was conducted to examine the relationship between education level and perceived obstacles to academic success. In terms of the items that were significant at $p < .01$, the obstacles were significantly more of an issue for undergraduate students than high school students and were experienced by a majority of the undergraduate students (see Table 3).

Are there significant gender differences in participants' responses about obstacles to academic success?

Males and females with autism reported different obstacles to their academic success (See Table 4). The top reported academic hindrance for males was procrastinating on assignments (57.9%, n = 44), whereas for females the top reported obstacle was noisy classrooms (66.7%, n = 22). A chi-square analysis was conducted to examine the relationship between gender and obstacles experienced. Only two obstacles were significant at $p < .01$ and were experienced by a majority. Females (61%, n = 20) were significantly more likely to experience the obstacle of perfectionism compared to males (34%, n = 26), χ^2 (1, N = 109) = 6.57, p = 0.01; Cramer's V = 0.25. Females (67%, n = 22)

were also significantly more likely to experience the obstacle of classrooms being too noisy compared to males (36%, 27), χ^2 (1, N = 109) = 9.02, p = 0.003; Cramer's V = 0.29.

What are the most common compensatory methods and strategies used to enhance success in school?

The participants answered a number of questions regarding the methods and strategies they apply to remain academically successful. Results revealed that these 109 students with autism used an array of compensatory strategies to assist them in overcoming the academic obstacles to remain academically successful. These compensatory strategies differed for high school and undergraduate students. The top three strategies utilized for both groups are reported in Table 5. For high school students, the top reported strategy was maintaining an everyday routine, 67.1% (n = 51). Undergraduate students reported studying in a quiet location (i.e. library, empty classroom) to minimize distractions as their top strategy, 81.8% (n = 27).

Are there significant differences in participants' most common compensatory methods and strategies utilized to enhance academic success and participants' education level (high school vs. college)?

A chi-square analysis was conducted to examine the relationship between education level and strategies utilized. There were a few items significant at p < .01 (see Table 3). The strategies were significantly utilized more by undergraduate students than high school students and by a majority of the undergraduate students (see Table 6).

Are there significant gender differences in methods and strategies utilized by participants to ensure academic success?

With regard to gender differences and compensatory strategies utilized, the top three strategies utilized for both males and females are reported in Table 7. For females, the top reported strategy was maintaining an everyday routine, 69.7% (n = 23) while males reported taking prescribed medications as their top strategy, 63.1% (n = 48). A chi-square analysis was conducted to examine the relationship between gender and strategies utilized. Only one strategy was significant at p < .01, and was utilized by a majority. Females (52%, n = 17) were significantly more likely to listen to music as a strategy compared to males (24%, n = 18), χ^2 (1, N = 109) = 8.17, p = 0.004; Cramer's V = 0.27.

What are the most self-identified personal sources of strength?

Through the Sources of Strength Survey, students reviewed a number of items regarding what they perceived themselves to be good at to assist them in being academically successful. For high school students, 61.8% (n = 47) reported that they believed themselves to be very observant in their area of interest/pay great attention to detail compared to their peers. For undergraduate students, the most endorsed item was seeing themselves as possessing above-average intelligence compared to their peers (66.6%, n

= 22). See Table 8 for the top 3 reported sources of strength for both high school and undergraduate students.

Are there significant gender differences in participants' most self-identified sources of personal strength?

As Table 9 depicts, the top reported source of personal strength for females was having developed an extreme interest and passion in an area greater than my peers (72.7%, n = 24). Males reported their top source of strength as being very observant in one's area of interest/paying great attention to detail (61.8%, n = 47). See Table 9 for the top three reported sources of strength for males and females.

A chi-square analysis was conducted to examine the relationship between gender and sources of strength. Only one source of strength was significant at $p < .01$. Females (66.6%, n = 22) were significantly more likely to believe that they are more creative and talented in certain areas than others compared to males (36.8%, n = 28), χ^2 (1, N = 109) = 8.24, p = 0.004; Cramer's V = 0.28.

What are the most pursued areas of academic and career interests?

Regarding academic and career subject areas, students were asked to indicate the areas that they possess the greatest competence and interest. They could select more than one. The top selected area for both high school (50%, n = 38) and undergraduate students (63.6%, n = 21) was in the area of arts, audio/visual technology, and communication (e.g. actor, film editor, musician, video game designer). The same holds true for males (48.7%, n = 37) and females (66.7%, n = 22). See Tables 10 and 11 for the top three selected areas for both high school and undergraduate students and males and females.

Discussion

Research suggests that an increasing number of young adults with autism are pursuing college (Dymond et al., 2017). However, this growing population of students experiences significant difficulty with retention and graduation compared to their peers without autism. Consequently, there is an increasing need to identify barriers to their retention and graduation. This study examined the perspectives of high school and college students with autism with regard to their metacognitive strategies in the areas of identifying their perceived obstacles to academic success and their strategies utilized to overcome these challenges.

Most of the findings in this study support and complement the results of previous research. For example, our findings support previous studies in that students with autism utilize a number of strategies and accommodations to assist them behaviorally and academically (Accardo et al., 2019; Gelbar et al., 2015; Hees et al., 2015). Students with autism in the current study were asked about factors that prevent their academic success. The high school students reported that their top two barriers to success were feeling constantly anxious, followed by procrastinating on assignments. The endorsement of elevated anxiety reported by the high school students in this study is similar to findings by previous

research on secondary students with autism who report that they experience high levels of anxiety (Accardo, 2017; Jackson, et al., 2018; van Steensel & Heeman, 2017). However, the undergraduate students with autism in this study reported that their top two obstacles to success were procrastinating on assignments and maintaining an irregular sleep schedule. Interestingly, results of this study found that both high school and undergraduate students reported difficulty with procrastination on assignments as one of the top obstacles to their academic success and are consistent with findings from Anderson et al. (2017).

Several obstacles were reported to be significantly more of a hindrance for undergraduate students than high school students and included maintaining an irregular sleep schedule, procrastinating on assignments, and being a perfectionist. Further analysis revealed that female participants were significantly more likely to report classrooms being too noisy as an obstacle to their academic success compared to males. Additionally, results revealed that female participants were significantly more likely to experience perfectionism as an obstacle to their academic success compared to males. Results of the present study appear to support previous research which noted that postsecondary students with autism appear to view sensory sensitivity as an obstacle to their success, along with a stronger-than-average need to "feel correct" and attend to detail compared to their peers (Anderson et al., 2017; Gobbo and Shmulsky, 2014).

In this study, high school students cited their most common compensatory strategy for overcoming their disability as maintaining an everyday routine. On the contrary, undergraduate students reported that studying in a quiet location was their most utilized strategy. Compensatory strategies that were significantly utilized more by undergraduate students than high school students included asking for help from instructors and peers, taking lecture notes in the classroom, contacting the instructor when in need of help, asking for clarification on assignments/projects, and studying in a quiet location to minimize distractions. Compared to males, females were significantly more likely to report listening to music as a strategy to assist them in being academically successful in high school and in college. Compensatory strategies utilized most frequently by undergraduate students with autism in the current study are in contrast to previous findings in which extended time on exams and taking exams in a quiet room were two of the most frequently requested strategies utilized (Accardo et al., 2019; Gelbar et al., 2014). Results from previous studies may vary from the current study due to differing survey items and methodologies in how previous studies were conducted (i.e. quantitative study design vs qualitative study design).

In the current study, participants revealed diverse insights about their personal sources of strength. Over half of the high school students on the autism spectrum reported their greatest area of strength was in being observant in their area of interest/paying great attention to detail compared to their non-autistic peers. In contrast, over half of the autistic college students reported their greatest area of strength to be in the area of possessing above-average intelligence compared to their peers. Additionally, compared to high school students with autism, undergraduate students were significantly more likely to identify having above-average intelligence compared to their peers as an area of strength. When comparing male and female participants in our study, females were significantly

more likely to believe that they were more creative and talented in certain areas compared to males.

Finally, an analysis of participants' response to the Areas of Academic and Career Interest Survey revealed that high school and undergraduate students each listed arts, audio/visual technology, and communications as their number one area of academic and career interest, followed by science, technology, engineering, and mathematics (STEM majors). Findings contradict results found by Jackson et al. (2018) in which 56 adults ranging in age from 18 – 57 reported that their first areas of concentration were equally split between science (e.g. physics, math, and chemistry) and social science (e.g. psychology, sociology, and education).

Significance of the Study and Implications

The current study is the largest quantitative study of its kind focusing on the obstacles encountered, strategies utilized, sources of personal strength, and academic interests of high school and college students with autism. Prior to the current study, most research conducted on students transitioning to and attending college was qualitative in nature with small sample sizes ranging from one to thirty-five participants (Anderson et al., 2017; Gelbar et al., 2014). In addition to being the largest study to quantitatively survey the perceptions of high school and college students with autism with regard to transitioning to and attending college, the current study is the only one to examine the possible gender differences between high school and college students with autism about these issues. Existing literature on the presentation of autism across genders tends to focus on differing traits between males and females found in childhood (Matheis et al., 2019).

Moreover, the current study remains the only one that has examined age and developmental differences between high school and college students with autism with regard to their perceptions of academic obstacles, compensatory strategies, sources of personal strength, and academic interests. Consequently, this study not only examines the differences in the aforementioned topics from a developmental perspective between high school and college students but between genders as well. The education and gender differences have significant implications for disability service provider professionals, such as school counselors, school psychologists, and college disability coordinators. These findings may assist disability service providers to plan and implement age-, gender-, and developmentally-appropriate interventions, services, and accommodations to meet the academic and mental health needs of students with autism in high school and college settings.

For example, at the secondary level, school psychologists and school counselors can work with students with autism to teach them strategies to cope and manage their anxiety, such as using deep breathing or muscle tension and relaxation exercises. Such suggested strategies may prove useful with high school students with autism since results of this study were consistent with findings from previous research that indicated that high school students with autism cited anxiety as the top barrier to their academic success (Accardo, 2017; Jackson et al., 2018). On the contrary, college disability counselors may want to work with postsecondary students with autism to overcome their barriers to

academic success by teaching them methods to overcome procrastination and in developing and maintaining a regular sleep schedule. Both the current study and results from the Anderson et al. (2017) literature review found that postsecondary students with autism experience difficulty in the area of procrastination.

With regard to gender differences, school psychologists, school counselors, and college disability coordinators may want to assist female students with autism in developing strategies to overcome sensory sensitivities to noisy classrooms. For example, school-based practitioners and disability coordinators may want to work with female high school or college instructors to develop a predictable classroom routine and help them find and select courses with fewer students in a smaller classroom setting. Finally, secondary school-based practitioners can help individuals with autism identify the strategies that make them academically successful and assist them in generalizing such strategies to the college environment. Overall, school-based practitioners and college disability coordinators must work together to ensure the successful transition and retention of youth with autism attending postsecondary education.

Limitations and Suggestions for Future Research

When interpreting the results of this study, several limitations should be noted. First, although great efforts were made to recruit ethnically diverse students with autism, most participants in this study were Caucasian. Additionally, although a non-autistic comparison group is currently being recruited as a follow-up to this study, future studies should seek to include non-autistic comparison groups in order to better analyze whether the responses to the surveys administered were specific and unique to high school and undergraduate students with autism. Aside from not including a non-autistic comparison group, the current study did not recruit high school and college participants who had an intellectual disability or autism and an accompanying intellectual disability. Therefore, future studies should include participants that have a diagnosis of an intellectual disability or autism and an accompanying intellectual disability. Moreover, future studies should evaluate differences between male, female, and non-binary students with autism regarding their compensatory strategies, obstacles to success, sources of strength, and academic/career areas of interest. Ultimately, more quantitative research involving students with autism is needed to promote the success, inclusion, and retention of high school and postsecondary students with this disorder.

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Table 1

Participants' Demographic Information (n = 109)

	Frequency (n)	(%)
Gender		
Female	33	30.2
Male	76	69.7
Education level		
High school	76	69.7
Undergraduate	33	30.2
Ethnicity		
Caucasian	101	92.7
Hispanic / Latinx	11	10.1
American Indian / Alaskan Native	3	2.80
African-American	3	2.80
Asian or Pacific Islander	2	1.80
Class standing high school students		
Freshman	18	23.7
Sophomore	21	27.6
Junior	17	22.4
Senior	17	22.4
Fifth year	3	3.9
Class standing college students		
Freshman	8	24.2
Sophomore	15	45.5
Junior	5	15.2
Senior	17	15.2
Institute enrolled in		
Public College/University	26	78.8
Private College/University	7	21.1
Size of postsecondary institute attended		
Small (1,000 – 5000 students)	7	21.2
Medium (5,001 – 15,000 students)	22	66.7
Large (15,001 or more students)	4	12.1

Table 2

Results of the Perceived Obstacles to Academic Success Survey for High School Students (n = 76) and Undergraduates (n = 33)

Rank	Obstacle to Success	Frequency(n)	%
High school			
1	Feeling constantly anxious/nervous	42	55.3
2	Procrastinating on assignments	40	52.6
3	Having poor organizational skills	40	52.6
Undergraduates			
1	Procrastinating on assignments	25	75.8
2	An irregular sleep schedule	22	66.7
3	Zoning out in class	22	66.7

Table 3

Results of the chi-square analysis examining the relationship between education level and obstacles to success (N=109).

Obstacle	High school *n* = 76	Undergraduate *n* = 33	Chi-square Test df (3, 109) p<.01	Cramer's *V* Statistic
Irregular sleep schedule	32 (42%)	22 (67%)	$\chi^2 = 5.55$	.23
Procrastinating on assignments	40 (53%)	25 (76%)	$\chi^2 = 5.11$	.22
Being a perfectionist	27 (36%)	19 (58%)	$\chi^2 = 4.59$	.21

Table 4

Results of the Perceived Obstacles to Academic Success Survey for Males (n=76) and Females (n = 33)

Rank	Obstacle	Frequency(n)	%
Males			
1	Procrastinating on assignments	44	57.9
2	Having poor organizational skills	43	56.6
3	Having poor time management skills	41	53.9
Females			
1	Experiencing classrooms being too noisy/loud	22	66.7
2	Procrastinating on assignments	21	63.6
3	Being a perfectionist	21	63.6
3	Feeling constantly anxious/nervous	21	63.6
3	Dwelling on irrelevant issues	21	63.6

Table 5

Results of the Most Common Compensatory Methods and Strategies to Ensure Academic Success Survey for High School Students (n = 76) and Undergraduates (n = 33)

Rank	Compensatory Strategy Used	Frequency(n)	%
High school			
1	Maintain an everyday routine	51	67.1
2	Take my prescribed medications daily	44	57.9
3	Feel like I have to work longer and harder than my peers to get good grades	36	47.4
Undergraduates			
1	Study in a quiet location to minimize distractions	27	81.8
2	Obtain an outline or syllabus from each instructor on what to expect in class	25	75.8
3	Contact my instructor through office/classroom visits, phone, or email when help is needed	23	69.7
3	Ask my instructor to explain and clarify assignments, projects, etc. when feeling confused	23	69.7

Table 6

Results of the chi-square analysis examining the relationship between education level and compensatory strategies utilized (N = 109).

Compensatory Strategy Used	High school *n* = 76	Undergraduate *n* = 33	Chi-square Test df (3, 109) p<.01	Cramer's *V* Statistic
Ask for help from instructors and peers	24 (32%)	22 (68%)	$\chi^2 = 11.6$	.33
Study in a quiet location to minimize distractions	34 (45%)	27 (82%)	$\chi^2 = 12.8$	.34
Take lecture notes in the classroom	17 (22%)	22 (67%)	$\chi^2 = 19.6$	.42
Contact my instructor when help is needed	23 (34%)	23 (70%)	$\chi^2 = 117$	.33
Ask for clarification on assignments, projects	30 (40%)	23 (70%)	$\chi^2 = 8.4$	.28
Seek extended time on tests	25 (33%)	21 (64%)	$\chi^2 = 8.9$	.29

Table 7

Results of the Methods and Strategies to Ensure Academic Success Survey for Males (n = 76) and Females (n = 33)

Rank	Compensatory Strategy Used	Frequency(n)	%
Males			
1	Take my prescribed medications daily	48	63.1
2	Maintain everyday routine	47	61.8
3	Study in a quiet location to minimize distractions	41	53.9
Females			
1	Maintain everyday routine	23	69.7
2	Study in a quiet location to minimize distractions	20	60.1
3	Use coping strategies to deal with sensory issues	19	57.5

Table 8

Results of the Sources of Personal Strength Survey for High School Students (n = 76) and Undergraduates (n = 33)

Rank	Source of Strength	Frequency(n)	%
High school			
1	Am very observant in my areas of interest	47	61.8
2	Having above-average intelligence	40	52.6
3	Having an extreme interest and passion in an area	39	51.3
Undergraduates			
1	Have above-average intelligence	22	66.7
2	Believe college will provide me a greater opportunity and freedom to study my area of expertise	22	66.7
3	Having an extreme interest and passion in an area	19	57.6

Table 9

Results of the Sources of Personal Strength Survey for Males (n = 76) and Females (n = 33)

Rank	Source of Strength	Frequency	%
Males			
1	Am very observant in my areas of interest	47	61.8
2	Strength thinking in pictures and visualizing concepts/ideas	41	53.9
3	Having an extreme interest and passion in an area	38	50.0
Females			
1	Having an extreme interest and passion in an area	24	72.7
2	I am more creative and talented in certain areas than others	22	66.7
3	Am very observant in my areas of interest	21	63.6

Table 10

Results of the Areas of Academic and Career Interest Survey for High School Students (n = 76) and Undergraduate Students (n = 33)

Rank	Areas of Academic and Career Interest	Frequency(n)	%
High school			
1	Arts, Audio/Visual Technology, and Communications	38	50.0
2	Science, Technology, Engineering, and Mathematics (STEM)	27	35.5
3	Informational technology	15	19.7
Undergraduate			
1	Arts, Audio/Visual Technology, and Communications	21	63.6
2	Science, Technology, Engineering, and Mathematics (STEM)	12	36.3
3	Education and Training	9	27.3

Table 11

Results of the Most Pursued Areas of Academic and Career Interest Survey for Males (n = 76) and Females (n = 33)

Rank	Areas of Academic and Career Interest	Frequency(n)	%
Males			
1	Arts, Audio/Visual Technology, and Communications	37	48.7
2	Science, Technology, Engineering, and Mathematics (STEM)	26	34.2
3	Informational technology	15	19.7
Females			
1	Arts, Audio/Visual Technology, and Communications	22	66.7
2	Science, Technology, Engineering, and Mathematics (STEM)	13	39.4
3	Human Services	11	33.3

Appendix A

Obstacles to Academic Success Survey

Some issues that cause problems for me and prevent my academic success include…(Mark all that apply to you.)

Item #		Answer Choices
1	☐	An irregular sleep schedule.
2	☐	Procrastinating on assignments.
3	☐	Being a perfectionist.
4	☐	Having poor organizational skills.
5	☐	Not taking my prescribed medications.
6	☐	Feeling depressed/sad.
7	☐	Abusing prescription drugs.
8	☐	Abusing non-prescription drugs.
9	☐	"Zoning out" in class.
10	☐	Having poor time management skills.
11	☐	Feeling constantly anxious/nervous.
12	☐	Feeling bored with a class.
13	☐	Being forgetful.
14	☐	Spending too much time with friends.
15	☐	Feeling constantly tired.
16	☐	Not seeking help from instructor(s) when confused about classroom assignments.
17	☐	Having anger management difficulty.
18	☐	Experiencing frequent mood swings (i.e. happy, sad, angry, irritable).
19	☐	Being absent or tardy to class frequently.
20	☐	Difficulty concentrating while reading course material.
21	☐	Making assignment deadlines.
22	☐	Difficulty in writing down lecture notes and organizing notes to compile PowerPoint presentations or assignments.
23	☐	Feeling lonely.
24	☐	Forgetting materials necessary for coursework (i.e. pen, pencil misplacing textbook).
25	☐	Dwelling on irrelevant issues instead of completing coursework.
26	☐	Having difficulty prioritizing schoolwork.
27	☐	Not attending class on a regular, daily basis.
28	☐	Spending too much time playing video games and/or watching television.
29	☐	Having difficulty adjusting to sudden changes in routine (i.e. class starting late or early, change in assignment deadline, change in class location etc,).

30	☐	Having difficulty working with others (i.e. group projects, group classwork etc.).
31	☐	Experiencing classrooms or lecture halls being too noisy/loud.
32	☐	Experiencing classrooms or lecture halls being too bright/dark.
33	☐	Experiencing classrooms or lecture halls being too crowded.

Appendix B

Methods and Strategies to Ensure Academic Success Survey

Directions: The following are a list of strategies that may enhance students' success in school. Please check the box next to any of the statements that apply to you.

In order to help me be academically successful…(Mark all that apply to you.)

Item #		Answer Choices
1	☐	I have the instructor provide me with a printed summary of the lecture notes or PowerPoint.
2	☐	I use highlighters when reading classroom materials.
3	☐	I maintain an everyday routine.
4	☐	I feel like I have to work longer and harder than my peers to get good grades.
5	☐	I use a daily planner to record upcoming due dates for tests and other classroom assignments.
6	☐	I use a daily planner or phone app to create a "to-do" list.
7	☐	I study with a peer to prepare self for tests and upcoming classroom assignments.
8	☐	I use paper or digital index cards to study for quizzes and tests.
9	☐	Because of my autism, it's my responsibility to ask for help from instructors and peers.
10	☐	I study in a quiet location (i.e., library, empty classroom) to minimize distractions.
11	☐	I arrange to take my exams in a quiet location at a campus disability service office or resource room.
12	☐	I listen to music to help me focus while completing an assignment
13	☐	I use coping strategies to deal with sensory issues (i.e., music, dimmed lights, quiet room).
14	☐	I use post-it notes as a reminder tool.
15	☐	I ask friends, family members, or others to help me when feeling overwhelmed.
16	☐	I seek and utilize an instructor and/or peer for assistance or guidance.
17	☐	I summarize reading assignments.
18	☐	I take lecture notes in the classroom.

19	☐	I contact my instructor through office/classroom visits, phone, or email when help is needed.
20	☐	I ask my instructor to explain and clarify assignments, projects, etc. when feeling confused.
21	☐	I use a teacher's aide or note-taker to assist with lecture notes.
22	☐	I read assigned chapters more than once.
23	☐	I work in short spurts.
24	☐	I seek permission to receive extended time on tests.
25	☐	I seek permission to receive extended time on assignments.
26	☐	I set short-term goals concerning schoolwork to avoid becoming overwhelmed.
27	☐	I sit in the front of the classroom to hear the classroom instructor better or to avoid/minimize distractions.
28	☐	I have an exercise regimen (i.e. biking, walking, running, lifting).
29	☐	I read along to the recording of my textbooks.
30	☐	I contact the university's mental health or school's counseling center to seek help when struggling with stress, anxiety, anger, or other difficulties.
31	☐	I use colored binders to store lecture notes and other classroom materials for each course.
32	☐	I set deadlines to prepare myself for upcoming tests and other classroom assignments.
33	☐	I have a designated location to complete my schoolwork.
34	☐	I take my prescribed medications daily.
35	☐	I have a driver's license and drive myself to campus to attend scheduled classes.
36	☐	I obtain an outline or syllabus from each instructor on what to expect in class.
37	☐	I have regular one-on-one check-in sessions with my academic advisor or counselor.
38	☐	I talk to my counselor or academic advisor to reduce the number of courses when feeling overwhelmed.
39	☐	I visit instructors to share with them about my autism diagnosis and the reasonable accommodations that I need in the classroom.

Appendix C

Sources of Strength Survey

In your opinion, what are the things you are good at? (Mark all that apply to you.)

Item #		Answer Choices
1	☐	See myself as possessing normal intelligence.
2	☐	See myself as possessing above average intelligence compared to my peers.
3	☐	Have developed an extreme interest and passion in an area greater than my peers.
4	☐	Believe college has or will provide me a greater opportunity and freedom to study my area of expertise.
5	☐	Have a memory that is stronger compared to my peers.
6	☐	Am very observant in my area of interest/pay great attention to detail.
7	☐	Am dedicated to my area of study/interest more than others my age.
8	☐	Have a love of learning in my area of interest/always want to learn and study in my area of interest.
9	☐	Have a great strength in thinking in pictures and visualizing concepts/ideas.
10	☐	Believe that I'm more creative and talented in certain areas than others.

Appendix D

Areas of Academic and Career Interest Survey

I believe that I have great interest and strong abilities in the following academic and career subject areas. (Mark all that apply to you.)

Item #		Answer Choices
1	☐	Architecture and Construction (e. g., architect, carpenter, electrician, plumber, construction working)
2	☐	Agriculture, Food, and Natural Resources (e. g., baker, farmer, animal caretaker, zoologist, meat butcher, park ranger)
3	☐	Hospitality and Tourism (e. g., chef, waitress, tour guide, travel agent, hotel clerk, janitor)
4	☐	Marketing (e. g., advertising agent, purchasing agent, public relations specialist, sales representative)
5	☐	Transportation, Distribution, and Logistics (e. g., mechanic, bus driver, truck driver, deckhand, locomotive engineer)
6	☐	Business Management and Administration (e. g., stock clerk, secretary, bookkeeper, customer service representative)
7	☐	Law, Public Safety, Corrections, and Security (e. g., mediator, police officer, corrections officer, paralegal, firefighter)
8	☐	Manufacturing (e. g., cabinetmaker, locksmith, jeweler, machinist, welder)
9	☐	Arts, Audio/Visual Technology, and Communications (e. g., actor, film editor, musician, video game designer)
10	☐	Health Sciences (e. g., dentist, radiologist, pharmacist, surgeon, nurse, athletic trainer)
11	☐	Human Services (e. g., social worker, clergy, barber, psychologist, cosmetologist, massage therapist)
12	☐	Information Technology (e. g., database administrator, computer programmer, information security analyst)
13	☐	Science, Technology, Engineering, and Mathematics (STEM) (e. g., engineer, chemist, historian, cartographer, archeologist)
14	☐	Finance (e. g., accountant, insurance agent, financial analyst, investment broker, banker)
15	☐	Government and Public Administration (e. g., building inspector, license clerk, postal service worker, property assessor)
16	☐	Education and Training (e. g., teacher, archivist, professor, librarian, school counselor, curator)