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SUCCESS INDICATORS OF COLLEGE STUDENTS WITH
AUTISM SPECTRUM DISORDER

A Thesis
Presented to
The Faculty of the Department of Psychology
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Master of Arts

By
Megan M. Prickett

August 2015

SUCCESS INDICATORS OF COLLEGE STUDENTS WITH
AUTISM SPECTRUM DISORDER

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This study examined the executive functioning skills as students with Autism Spectrum Disorder (ASD) entered college. The participants consisted of 95 college students with ASD who attended the Kelly Autism Program (KAP) on Western Kentucky University's campus in Bowling Green, Kentucky. The individuals in the sample were categorized three groups: individuals who graduated from college, individuals who were still attending college, and individuals who dropped out of college. The results indicated that the executive functioning skills of inhibiting and initiation were statistically significantly different between the three groups and additional skills were significantly different when comparing only the group that graduated from college with the group that dropped out of college.

Introduction

Autism Spectrum Disorder (ASD) is categorized in the latest version of the *Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition* (American Psychiatric Association [APA], 2013) as a persistent impairment in social functioning and communication, and is often accompanied by repetitive behaviors and stereotyped interests. Individuals with ASD have difficulty with social-emotional reciprocity, non-verbal communication, and understanding relationships. ASD can also include repetitive motor movements, insistence on sameness, fixated interests, and sensitivity to sensory input (APA, 2013). The causes for ASD are not yet known, but hypothesized to have both genetic and environmental components. A diagnosis of ASD can be made as early as age two (APA, 2013).

Determining a diagnosis of ASD can be difficult due to (a) comorbid impairments, (b) changes in characteristics with age, and (c) the severity level of ASD. ASD is often comorbid with developmental delays (e.g., intellectual disabilities, language impairments) and other medical conditions, which might make it difficult for the clinician to recognize the presence of ASD (Volkmar & Klin, 2005). Furthermore, the characteristics of ASD change greatly with age. Symptoms present during the preschool years can be very different than those present in the school age years (Chawarska & Volkmar, 2005; Loveland & Tunali-Kotoski, 2005; Shea & Mesibov, 2009). Finally, the severity level of ASD differs greatly across individuals. Indeed, the “spectrum” part of Autism Spectrum Disorder acknowledges that individuals fall anywhere from high to low functioning (APA, 2013). For example, within the communication area, some

individuals may only have slight language delays while others may be completely nonverbal (Paul, 2005).

ASD is rapidly becoming more prevalent in the population. In 1980, the Diagnostic and Statistical Manual (*DSM-III*) reported that Autism was diagnosed for two to four out of every 10,000 births (APA, 1980). Similarly, in 1987, the *DSM-IV* reported that Autism was diagnosed in four to five out of every 10,000 births (APA, 1987). However, by 2013, the *DSM-5* stated that one in every 88 children was diagnosed with ASD, with males being four times more likely to be diagnosed than females (APA, 2013). Currently, the Centers for Disease Control and Prevention report that one in every 68 children receives a diagnosis of ASD (CDC, 2015).

Individuals with ASD are entitled to receive special education and related services within the public school system. The Individuals with Disabilities Education Act (IDEA, 2004) is a federal law that requires schools to provide services to students with disabilities. Individual Education Programs (IEPs) are commonly developed for students with ASD (Ruble, McGrew, Dalrymple, & Jung, 2010). The purpose of an IEP is to determine the student's strengths and weaknesses, and to identify a timeline for achieving specific goals. The IEP includes areas such as the student's current performance level, measureable goals, and any program modifications that need to be made (Ruble et al., 2010). Individuals under IDEA can receive services until they graduate from high school or are 21 years old (IDEA, 2004).

While these services are greatly beneficial at the elementary and high school levels, high functioning students with ASD may be unprepared for the challenges of college and/or independent living in adulthood. The transition process from high school

to college can be especially challenging for students with ASD. Due to common characteristics of the disorder, individuals with ASD often have an insistence on sameness and an inflexible adherence to routines (APA, 2013). Van Bergeijk, Klin, and Volkmar (2008) noted that individuals with ASD often experience stress when transitioning from one major life task to another, and as a result, these individuals often require more preparation for postsecondary education than the average college student (Van Bergeijk et al., 2008).

The literature review for this thesis will examine the scant research on adults with ASD, college students with ASD, and executive functioning. The purpose of this thesis is to examine some of the characteristics of students with ASD that are associated with success in college. Specifically, aspects of executive functioning skills related to college completion will be examined. This exploratory research focuses on which executive functioning skills, if any, are correlated with dropping out or completing college. Scores from nine areas of executive functioning, as measured by the Behavior Rating Inventory of Executive Function-Adult Version (Roth, Isquith, & Gioia, 2005), were obtained for a sample of college students with ASD. Scores for those who dropped out will be compared to scores for those who are still in college or who have graduated from college.

Literature Review

Adults with Autism Spectrum Disorder

There is little research on adults with ASD. To illustrate such a point, only four of the 53 chapters included in the two-volume *Handbook of Autism and Pervasive Developmental Disorders* (Volkmar, Paul, Klin, & Cohen, 2005) included the topic of adults with ASD. Chapters that included adults focused mostly on employment and residential services. In her chapter, Howlin (2005) noted the research examining social, occupational, and mental health outcomes of adults with ASD needed to be interpreted with caution due to methodological problems with the research. Gerhardt and Holmes (2005) noted high rates of unemployment for all adults with disabilities and delineated various models of employment support (e.g., supported employment, sheltered workshops). Shea and Mesibov (2005) described specific psychological characteristics (e.g., intelligence quotient, adaptive behavior, language abilities, behavior difficulties) of adults with ASD. Sullivan (2005) described a parent's personal perspective of having an adult son with ASD.

Many research studies on adults with ASD focus on student placement after high school. For example, Taylor and Seltzer (2011) conducted a study with 66 individuals who had recently graduated from high school. The individuals in the sample graduated from high school between 2004 and 2008, and their mean age was 23 years. The sample consisted of 80% males. The researchers interviewed the participants' mothers for the study and asked a series of questions about their child's involvement in any of the following areas: post-secondary education, a competitive job, supported employment, sheltered workshop, day activities, or volunteer work (Taylor & Seltzer, 2011).

The results indicated that 14% of the 66 participants were taking classes to obtain a post-secondary degree. These participants were enrolled in a variety of colleges including two-year colleges, four-year colleges, and culinary schools. Most of these individuals were also working part-time in addition to their college classes. Only 6% were solely employed in competitive jobs in the community, meaning they did not receive supplemental support or attend adult day services. The individuals who were competitively employed worked between 20 to 30 hours each week. Some of the competitive jobs included working in the kitchen at a hotel and bussing tables at a restaurant. Furthermore, 12% of the participants were working in supported employment environments. The supported employment jobs included rolling silverware at restaurants, working in grocery stores, and washing dishes. The largest group in the study consisted of the 56% of participants who attended adult day services, where they completed jobs in the community with assistance. There were also 12% of the sample who were not involved in any activities, or involved in activities that lasted less than 10 hours each week (Taylor & Seltzer, 2011). Nationally, federal statistics indicate that 68.4% of high school graduates enroll in college and that 72.7% of high school graduates who do not immediately go on to college join the labor force (Bureau of Labor Statistics, 2015).

The results of this study (Taylor & Seltzer, 2011) show the low rate of employment in competitive jobs and post-secondary involvement for individuals with ASD. It is also important to note that none of the individuals in the sample were employed full-time. The researchers found that the participants who held jobs usually performed menial or simple tasks. More research is needed in this area to determine better transition strategies for individuals with ASD as they leave high school.

Shattuck et al. (2012) conducted a study that sought to examine the prevalence of postsecondary education and employment among individuals with ASD. The researchers collected data from the National Longitudinal Transition Study 2, which is a study about youth who receive special education services. The researchers used data from 2007-2008, which gave them access to 500 youth with different disabilities who had left high school. Shattuck et al conducted phone surveys with the 500 parents/guardians or youth themselves who were capable of answering questions. All participants were asked to answer questions about paid employment and postsecondary education since leaving high school (Shattuck et al., 2012).

The sample included individuals between the ages of 19 and 23. The results showed that 34.7% of individuals with ASD from the sample attended post-secondary education. However, graduation rates were not reported due to the young age of the participants in the sample. It was noted that participants with ASD were found to have the poorest postsecondary education and employment outcomes when compared to individuals with Specific Learning Disabilities and Speech/Language Impairments. Shattuck et al.'s (2012) results indicated that individuals with ASD found it difficult to participate in work and school after they completed high school. The researchers found that individuals with ASD who come from lower income homes have more difficulty attending college. Overall, the results of this study conclude that individuals with ASD have more difficulties in postsecondary education when compared to individuals with other disabilities (Shattuck et al., 2012).

College Students with Autism Spectrum Disorder

Little research has been conducted on college students with ASD. This may be due, in part, to the lack of resources for these students. As of 2015, only about 25 colleges in the United States offer specific programs for students with ASD (College Autism Spectrum, 2015). These programs incorporate services such as tutoring, mentoring, helping with class selection and providing distraction free environments for test taking. The following research includes articles that describe college students with ASD and their experiences with postsecondary education.

Gobbo and Shmulsky (2014) created focus groups with experienced faculty in England who worked directly with students who were diagnosed with ASD. The 18 faculty members who were recruited all worked full time at a university that specializes in serving college students who have Attention-Deficit/Hyperactivity Disorder, ASD, and dyslexia. The researchers sought to identify areas of difficulty and strengths for students with ASD and provide promising instructional methods. The researchers created two focus groups from the faculty that each met for one 2.5-hour session. The average amount of teaching experience was about 18 years for the faculty chosen for the study. All sessions were recorded and transcribed. The researchers identified terms and ideas that were most commonly used by the faculty (Gobbo & Shmulsky, 2014).

The focus groups revealed three major perceived strengths of students who had ASD. These major strengths were passionate interests, a drive to acquire knowledge, and a strict adherence to rules. The faculty found that passionate interests can make students with ASD more motivated to learn about that topic, and they often become experts in the areas in which they are most interested and gain confidence in those subjects. The

faculty reported that most college students with ASD have a desire to be correct, which motivates them to do more research if necessary to find the correct answer. They also found that students with ASD tend to have a strict adherence to the rules, which motivates them to be on time for class, meetings, and assignments (Gobbo & Shmulsky, 2014).

The researchers also identified four major deficits to succeeding in college classes; these included difficulties with social skills, difficulties in the classroom, critical thinking challenges, and issues with anxiety. The faculty indicated students with ASD often miss important nonverbal cues of both their peers and professors; for example, they may cut peers off when they speak or seem unaware of subject changes. Students with ASD may lack eye contact and have difficulty working in groups with others. The faculty also noted that students with ASD often stand too close during conversations and lack physical boundaries. They reported that individuals with ASD often miss social cues and have difficulty communicating with others. Students with ASD often have difficulties with critical thinking skills and being inflexible. The faculty noted that students with ASD frequently could not see the bigger picture of a concept, but they could easily identify the smaller parts-or vice versa in some cases. The professors also indicated that these students have difficulty identifying what others are thinking or lack awareness about others' needs. Anxiety was also mentioned often and was easily observable for the faculty. They indicated that they noticed students with ASD withdrawing and disengaging when they became anxious about a task or group work (Gobbo & Shmulsky, 2014).

Gobbo and Shmulsky (2014) also examined teaching approaches that were most effective for students with ASD. The faculty reported that providing structure was essential for these students. The professors stated that they laid out instructions, expectations, clear due dates, and procedures for students with ASD to provide as much structure as possible. The faculty also believed that it was important to provide students with ASD an opportunity to utilize their strengths, such as working individually instead of in a group or allowing them to write a paper on something about which they are most interested. The focus group also agreed that attending to these students' emotional needs is important in the classroom. The faculty reported that they commonly allowed these students to take breaks from the classroom environment or attempt to reduce their stress by doing one-on-one discussions instead of classroom presentations. Overall, this study provided more knowledge and faculty perceptions about ASD and how these students may differ from the general college population. The researchers found that the instructors' common themes of theory of mind, executive functioning, and central coherence were consistent with the general beliefs about ASD (Gobbo & Shmulsky, 2014).

Gelbar, Smith, and Reichow (2014) conducted a brief review of articles that described the experiences of college students with ASD. The researchers examined 20 articles that met the criteria of students with ASD describing their collegiate experience. The articles were collected from PsychInfo, Medline, and Embase during 2013. Within the 20 articles, there were only a total of 60 participants who described their collegiate experiences. Of these 60 participants, 41 were males, and 19 were females (Gelbar et al., 2014).

The findings indicated that 71% of the college students with ASD reported having feelings of anxiety during their college experience, while 53% reported feeling lonely, and 47% reported symptoms of depression during their college experience. Furthermore, in 24% of the articles, the students reported feeling rejected or isolated from peers. One student reported his “peers starting a petition to have [him] removed from a dormitory” (Gelbar et al., 2014, p. 2,596). The participants reported housing and roommate concerns in 18% of the articles.

The participants described academic accommodations they received; 67% of the participants reported having extended test times, 56% received lecture notes from instructors, 33% received extended assignment deadlines, 22% received lecture notes from peers, 11% were allowed to take oral exams, and 11% received help from professors on group projects. The results also indicated that 45% of the participants received non-academic support such as peer mentorship, assigned counselors, aids, or liaisons (Gelbar et al., 2014).

The researchers discussed their difficulty finding articles and reported that the type of information in the literature about college students with ASD is fragmented and future research should be more methodologically sound. Gelbar et al. (2014) found that most of the literature about ASD focused on case studies. They reported that only two of the 20 studies were structured as experiments. The researchers stated that future research should focus more on transition planning and programming for college students with ASD (Gelbar et al.).

White, Ollendick, and Bray (2011) studied college students who have high functioning ASD and potential comorbid mental health problems such as anxiety and

depression. The researchers surveyed 667 undergraduate students who were enrolled in a large public university in the southeastern part of the United States. For Phase 1 of the study, all participants were asked to fill out the Autism Spectrum Quotient (ASQ). The ASQ is a 50-item questionnaire that assesses symptoms of ASD. Scores of 32 and above indicate clinically significant levels of ASD traits. The participants were also asked to complete the Social Responsiveness Scale, Buss and Perry Aggression Questionnaire, Social Phobia and Anxiety Inventory, and Patient Health Questionnaire. Any participant who scored higher than a 32 on the ASQ was then contacted and asked to participate in Phase II, which consisted of the Early Development Questionnaire (EDQ), and Autistic Diagnostic Observation Schedule (ADOS). The researchers had 13 of the 667 participants complete Phase II of the study (White et al., 2011).

Based on the results, the researchers estimated that between 1 in 130 and 1 in 53 college students meet criteria for High Functioning ASD. They also found that five of the 13 who met criteria had not received a diagnosis of ASD prior to the study. Most of the students with ASD in the sample majored in Engineering and Computer Science. White et al. (2011) also found that college students with ASD may have a hard time adjusting to schedule changes, may not receive enough guidance, or may suffer from social isolation (White et al., 2011).

Individuals with ASD have been found to gravitate toward majors relating to science, technology, engineering and mathematics (STEM). Wei, Yu, Shattuck, McCracken, and Blackorby (2013) conducted a study to examine what majors college students with ASD choose in comparison to other disability groups. The researchers collected data from the National Longitudinal Transition Study-2 (NLTS2). The NLTS2

data was collected from 2001 to 2009 and consists of parent interviews, mail surveys, school program surveys, student assessments and student interviews of over 11,000 individuals who received special education services. Wei et al. chose to interview 660 young adults with ASD or their parents. The parents or individuals with ASD were asked to answer questions about post-secondary enrollment, their majors, demographic variables, and mental functioning skills. Wei et al. compared their findings to other disability groups that included: learning disabilities (LD), speech/language impairment (SLI), intellectual disabilities (ID), emotional disturbances (ED), hearing impairments (HI), visual impairments (VI), orthopedic impairments (OI), other health impairments (OHI), traumatic brain injuries (TBI), and multiple disabilities (MD).

The results revealed that individuals with ASD were more likely to be male than any other disability category. Individuals with ASD were the least likely to enroll in post-secondary education than all other disability categories aside from ID or MD. The participants with ASD were also more likely to major in STEM related areas than any other disability group. Of the STEM related majors, most individuals in the sample with ASD (34.3%) chose to concentrate on science or computer science. Wei et al. reported that the ASD group chose to major in STEM more often than the general population (22.8%).

Van Hees, Moyson, and Roeyers (2015) investigated the challenges and needs of students with ASD in higher education using a qualitative design. The researchers conducted interviews with 17 men and 6 women. The participants were all college students from Belgium who attended higher education. The interviews were conducted

individually, and primarily used open-ended questions about education, student life, independent living, and transitioning to employment (Van Hees et al., 2015).

The participants identified the challenges of education as struggling with new situations and unexpected changes, making social contact, time management and information processing, hesitancy to disclose their diagnoses to others, and struggling with mental health issues such as depression, stress, and anxiety. The participants often spoke about searching for structure and routines in college. They reported that time management was difficult, and having unpredictable events come up hindered their ability to plan. The participants reported that they found social interactions in college difficult. They stated that it was difficult to learn when to ask questions during class, how to talk to a professor, and how to participate in group activities (Van Hees et al., 2015).

Along with the difficulties, the participants described their own strengths. The strengths mentioned were having a strong memory, precision, dedication, and willingness to listen to others. Furthermore, the participants described what recommendations they would make to improve their college experience. The participants reported wanting more academic accommodations, an individualized approach to education, leisure activities, and psychosocial support. They described that it would be helpful if professors and peers had a better understanding of the challenges of ASD. The participants reported that they would enjoy having someone to contact who was familiar with ASD to speak with about their problems. They also emphasized the need for therapy and seeing a psychologist for problems such as anxiety and stress (Van Hees et al., 2015).

Zager and Alpern (2010) researched existing literature about college-based programming for transition-age students with ASD. They reported that individuals with ASD are often not given the services needed in college, especially those who have been diagnosed with high functioning ASD. Prior to college, individuals with ASD are often placed in special education classes, with younger peers who are not progressing at the same level. One solution the authors suggested for these individuals is a Campus-Based Inclusion Model (CBIM), where public schools partner with a local college campus. In a CBIM program, the students are enrolled in high school, but attend classes on a college campus. This allows for the preparation of postsecondary education or adult living (Zager & Alpern, 2010).

Executive Functioning

Executive functioning is defined as “an umbrella term that encompasses various higher-order cognitive processes considered to be necessary for preparing and performing complex goal-directed behaviors in situations in which autonomic (habitual) behaviors are not sufficient” (Blijd-Hoogewys, Bezemer & van Geert, 2014, p. 3,089). Simply put, executive functioning is the process of “managing cognitive, emotional, and behavioral functions” (Gioia, Isquith, Guy, & Kenworthy, 2000, p. 1). The management of those functions is a developmental process with maturation of executive functioning skills thought to occur around age 25 in normally developing individuals (Dawson, 2014). The number of specific skills thought to comprise executive functioning varies greatly. However, Dawson and Guare (2009) assert the 11 most common executive functioning skills are: response inhibition, working memory, emotional control, flexibility, sustained

attention, task initiation, planning, organization, time management, goal directed persistence, and metacognition.

Executive functioning deficits are thought to be present in people with several different disorders (e.g., Attention/Deficit-Hyperactivity Disorder, Learning Disabilities) as well as in people without diagnosed disorders (Meltzer, 2007). Deficits in executive functioning skills are also common among individuals with ASD (Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002). Ozonoff and Schetter (2007) described initial research from the 1980s that noted executive functioning deficits in children with ASD using specific neuropsychological tests. Most research on executive functioning, however, has studied children (Ozonoff & Schetter, 2007). This literature review focused on executive functioning with adults with ASD and studies that used any version of the Behavior Rating Inventory of Executive Functioning (BRIEF) with individuals with ASD. Studies examining the BRIEF were included because that instrument was also used in the present study. Definitions and examples of the 11 most common executive functioning skills described by Dawson and Guare (2009), as well as the corresponding skills measured on the adult version of the BRIEF, are in Table 1.

Researchers van den Bergh, Scheeren, Begeer, Koot, and Geurts (2014) examined age-related executive functioning deficits in 118 children and adolescents, ages 6 to 18 with ASD. All parents of the participants were given the parent version of the BRIEF. The BRIEF parent version includes eight areas of executive functioning; however, the researchers decided to only examine four areas: inhibition, working memory, shifting, and planning/organizing (van den Bergh et al., 2014).

Table 1

Descriptions of Executive Functioning Domains

Dawson and Guare (2009) Domains	Corresponding BRIEF-A Domains	Description	Example
Response inhibition	Inhibit	The ability to inhibit, resist, or not act on an impulse.	Looking both ways before crossing a street.
Flexibility	Shift	The ability to move from one task to another.	Moving from a homework assignment in English to an assignment in mathematics.
Emotional control	Emotional control	The ability to modulate emotional responses.	Refraining from knocking over a desk after receiving a bad grade.
Metacognition	Self-monitor	The degree to which an individual perceives himself as aware of the effect that his behavior has on others.	Understanding that saying a rude comment to someone while working on a group project would not be received favorably.
Task initiation	Initiate	Beginning a task or activity, as well as independently generating ideas, responses, or problem-solving strategies.	Beginning a large homework project a week in advance of the due date.
Working memory	Working memory	The capacity to hold information in mind for the purpose of completing a task.	Remembering information such as phone numbers or directions.
Planning/prioritization	Plan/organize	The ability to manage current and future-oriented task demands.	Performing each step of a task in the appropriate order.

(continued)

Dawson and Guare (2009) Domains	Corresponding BRIEF-A Domains	Description	Example
Goal-directed persistence	Task monitor	The assessment of work-checking habits.	Checking an assignment for spelling and grammatical errors before turning it in.
Organization	Organization of materials	A measure of orderliness of work, leisure, and storage spaces.	Keeping study materials in one's dormitory room organized.
Sustained attention	(not applicable)	The capacity to keep paying attention to a situation or task.	Sticking with and completing an assignment with only brief breaks.
Time management	(not applicable)	The capacity to estimate how much time one has, how to allocate it, and how to stay within time limits and deadlines.	Establishing a schedule as to when to complete various assignments.

Note. Descriptions and examples of the domains are synthesized from Dawson and Guare (2009), Gioia et al. (2000), and Roth et al. (2005).

The results of van den Bergh et al.'s study (2014) indicated that there were some age-related differences for inhibition and planning skills. As might be expected, the 6- to 8-year-old participants had more trouble with inhibition and planning than older children and adolescents. Unexpectedly, the results indicated that planning skills were more difficult for participants ages 12 to 14 than for children 9 to 11 years old. Given the executive functioning scores were based on the parents' ratings, these results suggest that the deficits in planning may simply become more apparent in the transition period from primary to secondary school for individuals with ASD. There were no age-related differences in cognitive flexibility (i.e., shifting) or working memory (van den Bergh et al., 2014).

Van Eylen, Boets, Steyaert, Wagemans, and Noens (2015) examined how executive functioning relates to the severity of ASD symptoms in a sample of Dutch children between the ages of 8 and 18. There were 59 participants diagnosed with ASD. The researchers matched a group of typically developing (TD) individuals for gender, age, and intelligence quotient. After matching the groups on these variables, the final sample consisted of 50 individuals with ASD and 50 TD individuals (Van Eylen et al., 2015).

All participants were given an abbreviated version of the Dutch Wechsler Intelligence Scale for Children (WISC-III) or the Wechsler Adult Intelligence Scale (WAIS-III). They were asked to complete a computerized task called Go/No-Go to assess the executive functioning skill of inhibition. To measure other executive functioning skills, all participants were asked to complete the Wisconsin Card Sorting Task With Controlled Task Switching (WCST-WCTS) to assess cognitive flexibility, the Uses of Objects task to measure generativity, the Spatial Working Memory test to measure retention and manipulation of spatial information, and the Tower Test to measure planning. Finally, the BRIEF was used as another measure of four executive functioning skills: inhibition, shifting, working memory, and planning (Van Eylen et al., 2015).

Van Eylen et al. (2015) found that individuals in the ASD group displayed impairments on all four executive functioning domains on the BRIEF in comparison to the TD group. Specifically, the shifting domain on the BRIEF displayed the highest difference between the two groups. The researchers also indicated that the ASD group appeared to have the most difficulty with cognitive flexibility (also known as shifting) as

measured by the WCST-WCTS test. The researchers also found that problems with inhibition were more pronounced for the children with ASD in the sample than the adolescents with ASD in the sample. The ASD group made more errors on the Go/No-Go inhibition task when compared to the TD group. The ASD group was able to respond to the generativity questions at the same rate as the TD group; however, the ASD group did not get as many questions correct as the TD group. The researchers did not find any significant differences in planning between the two groups. Overall, these findings indicate that executive functioning deficits are prominent in individuals who were diagnosed with ASD (Van Eylen et al., 2015).

Sachse et al. (2013) chose to examine executive and visuo-motor functioning in a sample of adolescents and adults in Germany. The researchers selected 30 participants with High Functioning ASD (HFASD) who were between the ages of 14 and 33. The researchers included a control group of 28 individuals who were matched on intelligence, age, and gender. All participants were given the Stocking of Cambridge assessment to measure spatial planning. The Intradimensional/Extradimensional Set Shifting Tasks were given to assess attention shifting and flexibility. The researchers gave the Spatial Working Memory Task to measure working memory. The Motor Screening Test was given to determine reaction time. The Big Circle/Little Circle Task was given to measure response latency. The Stroop test was also given to determine speed and interference control (Sachse et al., 2013).

According to the results, the HFASD group did not display impairments in planning or cognitive flexibility processing in comparison to the control group. However, the HFASD group had impairments on the spatial working memory tasks. The

HFASD group also displayed impairments on the visuo-motor information processing tasks when compared to the control group (Sachse et al., 2013).

Christ, Kanne, and Reiersen (2010) examined the executive functioning skills of a sample of college students with subthreshold autistic traits. The initial sample consisted of 1,847 undergraduate students from Introductory Psychology classes. All participants were asked to complete the Social Responsiveness Scale (SRS) and an Attention-Deficit/Hyperactivity Disorder (ADHD) questionnaire. The SRS is a self-report measure that was used to screen for autistic traits. The researchers selected individuals who scored in the top fifth percentile to include as the high trait group, which resulted in 85 students. None of the individuals in the high trait group had ever been diagnosed with ASD; however, they displayed a greater amount of autism symptoms than the general population. A low trait group of 259 students, with few characteristics of autism, was matched to the high trait group on age, sex, and ADHD symptomology (Christ et al., 2010).

After the two groups were selected, the researchers gave each participant the BRIEF-A to examine executive functioning skills. It is important to note that higher scores on the BRIEF-A indicate more dysfunction. The results indicated the high trait group scored significantly higher on all three overall indices and seven of the nine domains of the BRIEF-A than the low trait group. The only two domains that were not significant were Inhibit and Organization of Materials. The executive functioning skill of Shifting had the largest effect size, indicating that it was more likely to be problematic for the high trait group than the low trait group. These findings demonstrate that individuals

in the general population who have higher levels of ASD traits have a greater chance of experiencing deficits in executive functioning skills (Christ et al., 2010).

Purpose of Present Study

Research on college students with ASD needs to be expanded. Existing research has determined that students with ASD can be successful in postsecondary education if they are given the appropriate services (Gelbar et al., 2014). Increasing exposure to executive functioning skills during high school and middle school could perhaps help increase the graduation rates of college students with ASD. This study is necessary to learn more about executive functioning skills of students who enter college and those who graduate from college.

For the purpose of this study, executive functioning will be determined using the Behavior Rating Inventory of Executive Function – Adult Version (BRIEF-A, Roth et al., 2005), an instrument that assesses nine different aspects of executive functioning skills. This study evaluates previously collected data from college students with ASD who attend, or attended, a program designed to assist students with ASD be successful in college.

The hypothesis for this thesis is that students with ASD who dropped out of college will have higher T scores (meaning more dysfunction) on the BRIEF-A than students who graduated from college.

Method

Participants

All participants were selected from the Kelly Autism Program (KAP) in Bowling Green, Kentucky. KAP is located on Western Kentucky University's (WKU) campus and serves approximately 40 college students at a time. The leadership staff at KAP consists of an individual with a Doctor of Special Education degree and an individual with a Masters of Special Education degree. Several undergraduate and graduate students are hired to work with individuals with ASD. KAP provides four major areas of assistance for students with ASD, including providing private dormitory rooms, study tables, mentors, and social activities. The private dormitory rooms are provided to all participants. This allows students to have more quiet and spacious living environments. Each student at KAP is expected to attend study tables four times a week. The undergraduate and graduate students at WKU staff the study tables and assist the KAP students as needed. All KAP participants are also assigned an undergraduate or graduate student staff member as a mentor. The mentors and students meet weekly for various activities, such as lunch and sporting events. The mentors provide support for the KAP students and answers questions about activities on campus. The final area of assistance is social activities. KAP organizes a few social activities for the participants each month, including pizza parties, movies, and group outings to theme parks.

Institutional Review Board approval was obtained to access the students' data from their files at KAP (see Appendix). The participants were all diagnosed with ASD prior to the study. The participants were divided into three groups. The first group consisted of students with ASD who graduated from college, the second group included

students who were attending college at the time of the study, and the third group consisted of students who dropped out of college. The total number of participants included 95 individuals. The sample consisted of 82 males and 13 females. See Table 2 for the number of participants, the gender of participants, and the overall average ACT scores for each of the three groups. All participants enrolled in their first semester of college at WKU between the years of 2008 and 2013.

Table 2

Number, Gender, and ACT Scores of Participants by Group

Group	<i>n</i>	% of Group	% of Total Sample	<u>ACT Scores</u> Mean (<i>SD</i>)
Graduated				
Males	13	72.2	13.7	
Females	5	27.8	5.2	
Total	18	100.0	18.9	19.2 (4.5)
Attending				
Males	22	91.7	23.2	
Females	2	8.3	2.1	
Total	24	100.0	25.3	22.7 (5.4)
Dropouts				
Males	47	88.7	49.5	
Females	6	11.3	6.3	
Total	53	100.0	55.8	22.2 (5.9)

Materials

The BRIEF-A (Roth et al., 2005) is for people ages 18 to 90 and consists of 75 questions with available responses on a three-point frequency scale (1 = *never*, 2 = *sometimes*, 3 = *often*). There is a parent version and a self-report version of the BRIEF-A. Examples of questions from the self-report version include: “I make careless errors when completing tasks” and “I am bothered by having to deal with changes.”

The BRIEF-A was normed on a sample of 1,136 adults, and provides evidence of validity and reliability within its manual. For example, the authors provide evidence of convergent validity with other tests of executive functioning (Roth et al., 2005). Although the use of rating scales to assess psychological constructs can be problematic (e.g., rater bias), the use of a rating scale to assess executive functioning is actually thought to have more ecological validity than individually administered tests (Meltzer & Krishnan, 2007; Ozonoff & Schetter, 2007).

The rating scale assesses nine specific areas of executive functioning for each individual: Inhibit, Shift, Emotional Control, Self-Monitor, Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials. See Table 2 for definitions and examples of the nine domains. The BRIEF-A also contains three broad indices: Behavioral Regulation Index, Metacognition Index, and Global Executive Composite. The Behavioral Regulation Index is a combined score for the Inhibit, Shift, Emotional Control, and Self-Monitor domains. The Metacognition Index is a combined score for the Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Material domains. The Global Executive Composite provides an overall score for all nine domains of executive functioning.

Procedure

The researcher collected data from existing student files at the KAP office. Each participant completed a BRIEF-A each semester that he or she attended WKU to determine differences in executive functioning skills. For the purposes of this study, only the scores from the first BRIEF-A questionnaire were collected from the participants in order to assess their executive functioning skills when they entered college. Many students' files also contained their overall score from the ACT test of college readiness and those scores were also collected. The staff at KAP provided information on which students had graduated, still attended the program, or dropped out of college.

Results

Other than scores on the BRIEF-A, the only other assessment information available was the participants' ACT scores. To determine if the three groups (i.e., graduates, current students, dropouts) differed in relation to their ACT scores, a one-way ANOVA was used. There was not a statistically significant difference between the three groups on their mean ACT scores, $F(2, 69) = 1.91, p = .156$. Thus, the results of the ANOVA suggest any differences between the groups cannot be attributed to differences in aptitude, at least as measured by the ACT.

A Multivariate Analysis of Variance (MANOVA) was used to examine differences among the three groups on the 12 domains of executive functioning from the BRIEF-A. Results showing the mean scores for each group and the MANOVA test results are in Table 3. Only two of the 12 domains were statistically significantly different: Inhibit and Initiate. A Tukey post hoc analysis indicated the significant difference was the result of the difference between the graduates and dropouts for both domains, with p values of .017 for Inhibit and .010 for Initiate. For both of these domains, there were medium effect sizes (partial eta squared) if Cohen's (1988) standards of small = .010 - .059, medium = .060 - .139, and large = $\geq .140$ are applied. Figures 1 and 2 graphically illustrate the results of the mean scores for the Inhibit and Initiate domains for all three groups. The graphs illustrate that the dropout group showed the highest levels of executive dysfunction, while the graduated group showed the lowest level of executive dysfunction. The scores for the group of current students fell in between those two groups.

Table 3

Mean Scores and MANOVA Results on the BRIEF-A Scales of Executive Functioning

Domain	Means (<i>SD</i>)			<i>F</i>	<i>p</i>	<i>ES</i>
	Graduates	Active	Dropouts			
Inhibit	50.8 (8.4)	55.0 (8.8)	58.2 (10.5)	4.09	.020*	.082
Shift	60.8 (10.2)	62.8 (11.4)	61.0 (12.5)	0.23	.792	.005
Emot. Control	50.8 (9.2)	53.5 (10.2)	53.8 (10.7)	0.59	.558	.013
Self-Monitor	52.8 (9.8)	54.2 (11.9)	58.7 (11.0)	2.59	.081	.053
BRI	53.7 (8.7)	57.4 (10.6)	58.5 (10.6)	1.45	.239	.031
Initiate	54.1 (9.5)	60.1 (8.9)	61.4 (8.8)	4.49	.014*	.089
Work. Memory	59.6 (8.9)	61.2 (10.6)	61.9 (10.0)	0.37	.693	.008
Plan/Organize	55.7 (11.0)	59.8 (9.8)	61.5 (11.0)	1.94	.149	.041
Task Monitor	56.6 (9.1)	60.6 (11.6)	59.8 (8.9)	0.98	.379	.021
Org. of Materials	51.3 (9.5)	56.1 (9.8)	57.3 (9.7)	2.56	.083	.053
Metacognition	56.9 (9.1)	61.6 (9.1)	63.4 (10.7)	2.80	.066	.057
Global Comp.	55.4 (9.4)	60.0 (10.0)	61.5 (9.8)	2.56	.083	.053

Note. The effect sizes (*ES*) are partial eta squared. Emot. Control = Emotional Control; BRI = Behavioral Regulation Index; Work. Memory = Working Memory; Org. of Materials = Organization of Materials; Metacognition = Metacognition Index; Global Comp. = Global Executive Composite.

* $p < .05$.

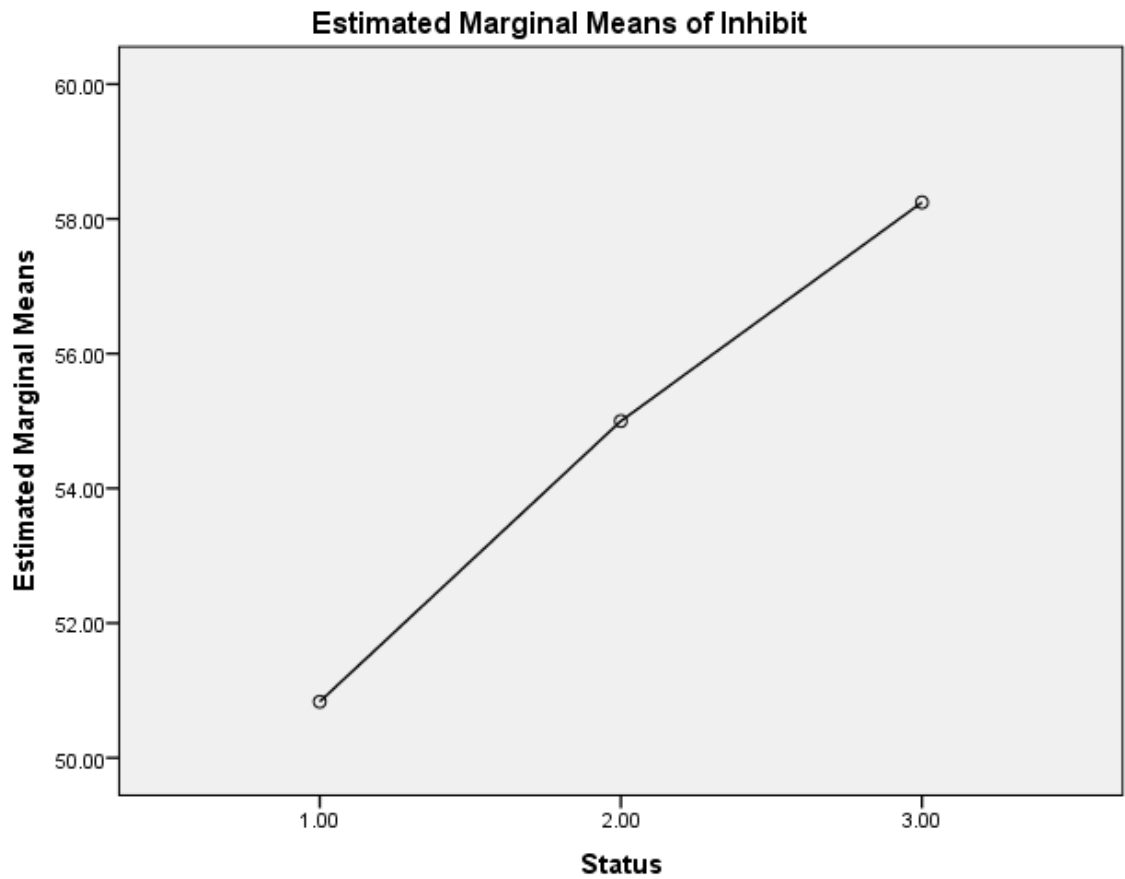


Figure 1. Visual representation of means for the Inhibit domain. Status 1 = graduates; 2 = current students; 3 = dropouts. Higher scores indicate more problems. Higher scores indicate more problems with that executive functioning skill.

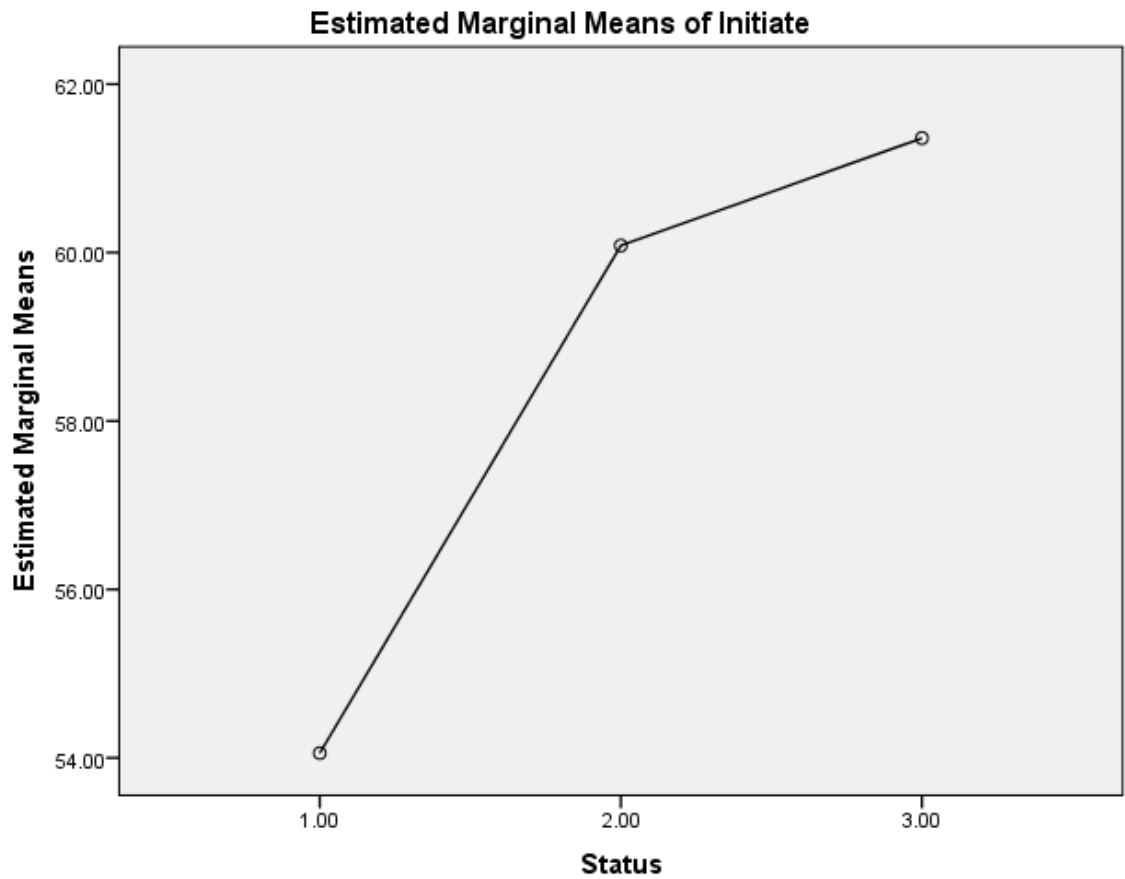


Figure 2. Visual representation of means for the Initiate domain. Status 1 = graduates; 2 = current students; 3 = dropouts. Higher scores indicate more problems. Higher scores indicate more problems with that executive functioning skill.

As a post hoc analysis, *t*-tests were conducted between the graduated group and the dropout group to determine if any differences were statistically significant only between those two groups. Table 4 illustrates the means, *p*-values, and effect sizes (Cohen's *d*) between the graduated group and the dropout group. The independent samples *t*-tests indicated that there were significant differences on the following domains and indices: Inhibit, Self-Monitor, Initiate, Organization of Materials, Metacognition Index, and the Global Executive Composite. Of all the differences that were statistically significant, all had moderate effect sizes if Cohen's (1988) standards of small = .20 - .49, medium = .50 - .79, and large = \geq .80 are applied.

Table 4

Mean Scores and t-test Results Contrasting Only the Graduates and Dropouts on the BRIEF-A Scales of Executive Functioning

Domain	Means (SD)		<i>t</i>	<i>p</i>	ES
	Graduates	Dropouts			
Inhibit	50.8 (8.4)	58.2 (10.5)	-2.72	.008**	.781
Shift	60.8 (10.2)	61.0 (12.5)	-0.04	.969	.011
Emotional Control	50.8 (9.2)	53.8 (10.7)	-1.07	.289	.302
Self-Monitor	52.8 (9.8)	58.7 (11.0)	-2.02	.048*	.565
Behavioral Regulation Index	53.7 (8.7)	58.5 (10.6)	-1.72	.090	.491
Initiate	54.1 (9.5)	61.4 (8.8)	-2.98	.004**	.795
Working Memory	59.6 (8.9)	61.9 (10.0)	-0.88	.385	.245
Plan/Organize	55.7 (11.0)	61.5 (11.0)	-1.92	.059	.522
Task Monitor	56.6 (9.1)	59.8 (8.9)	-1.30	.198	.353
Organization of Materials	51.3 (9.5)	57.3 (9.7)	-2.26	.027*	.619
Metacognition Index	56.9 (9.1)	63.4 (10.7)	-2.30	.024*	.652
Global Executive Composite	55.4 (9.4)	61.5 (9.8)	-2.28	.025*	.628

Note. The effect sizes (ES) are Cohen's *d*.

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

Discussion

The current study was designed to examine differences in executive functioning skills among college students with ASD at the beginning of their college careers. The hypothesis was that individuals with ASD who graduated from college would have lower (better) executive functioning scores on the BRIEF-A than students with ASD who dropped out of college. This hypothesis was partially supported by the results of the MANOVA and the independent *t*-tests between the group that graduated and the group that dropped out of college.

The results of the MANOVA suggested that the only differences among the three groups (i.e., graduates, current students, dropouts) were on the Inhibit and Initiate domains. Post-hoc analyses indicated the primary difference occurred between the graduates and the dropouts. This means that college students with ASD who dropped out displayed a greater amount of dysfunction in these two domains as compared to the students with ASD who graduated from college. The executive functioning skill of inhibiting could be important to these students' social interactions both socially and in the classroom. Having appropriate inhibition skills implies that these students refrain from interrupting others, making rude comments, or making hasty decisions that could impair their college experience. It is possible that the executive functioning skill of initiation is related to important aspects of college such as going to class (rather than skipping often), starting homework assignments on time, turning in assignments on time, and being at meetings in a timely manner. All of these factors are important parts of the college experience, and may make students with ASD who have higher initiation skills more successful.

The results of the independent *t*-tests suggested there were even more differences in executive functioning skills between the group of graduates and the group of dropouts. These domains were Inhibit, Self-Monitor, Initiate, Organization of Materials, Metacognition Index, and the Global Executive Composite. In addition to the advantages of inhibiting and initiating skills already described, it seems reasonable that students who are better at self-monitoring their behaviors and being organized would perform better in a college environment. The differences on the Metacognition and Global Executive Composite suggest that all of the executive functioning skills play a role in college success.

No significant differences between groups were found for the Emotional Control, Behavioral Regulation Index, Working Memory, Plan/Organize, or Task Monitor domains. These results suggest that all three groups displayed similar levels of these executive functioning skills. Specifically, on the Emotional Control domain and the Behavioral Regulation Index all of the groups appeared to be functioning at an average level. On the Working Memory and Plan/Organize domains, the group who graduated appeared to be doing slightly better than the other two groups. Additionally, on the Task Monitor domain, the group who graduated appeared to have more skill mastery, followed by the group who dropped out, and then the group who was attending college.

Furthermore, these findings could be a result of self-selection. Individuals with ASD in this sample may have applied for college knowing that they possess some of the executive functioning skills that can aid in success in college. Individuals with ASD who do not get into college or who do not apply for college might struggle more with

executive functioning skills, and therefore refrain from post-secondary education opportunities.

No significant differences between the groups were found for the Shift domain. This finding is somewhat inconsistent with Van Eylen et al.'s (2015) results, where the Shift domain revealed the most differences between the ASD group and the typically developing group. The difference between the two studies, however, could be attributed to the age differences of the sample or the fact that the current study only used those with ASD while the Van Eylen et al. sample had typically developing participants.

Christ et al. (2010) also found that the Shift domain had the highest effect size in their study. Again, however, their comparison group was a typically developing sample. Christ et al. (2010) also found only two domains that were not significant, one being the Inhibit domain. In comparison, this thesis found the Inhibit domain to be one of the few where there were significant differences. Christ et al. (2010) also had a high trait group that consisted of 50% males, whereas, this thesis had a sample consisting of 86% males.

Implications

This thesis research found that students with ASD who graduated from college were more successful on certain BRIEF-A executive functioning skills than those that dropped out, particularly with skills in the areas called Inhibit and Initiate. With this knowledge, it might be important to focus on these skills at the middle school or high school levels for students with ASD. If these skills are taught to individuals with ASD at a younger age, it could potentially make them more likely to graduate from college. An increasing number of colleges and universities are designing programs for students with ASD. These results imply such programs need to screen the entering students' executive

functioning skills and target those skills for the students with difficulties in those areas. At least some of the college programs for students with ASD currently try to enhance students' social skills. These thesis results suggest that it might be more beneficial to target specific social skills related to the identified executive functioning areas, rather than general social skills, preferably within the first semester of college.

Strengths and Limitations

One strength of this study is that this appears to be the first study that compared the executive functioning skills of college students with ASD who were successful in completing college to those who were unsuccessful. A second strength is that there were no significant differences found between ACT scores for each of the three groups. This removed one possible limitation of an intellectual ability difference between groups from the study. A third strength is that all of the surveys reflected the semester that the participant entered college. During this time, the participants did not have much exposure to college, and were using executive functioning skills that they had learned prior to post-secondary education.

One limitation of this thesis is that all participants were selected solely from WKU. This reduces the generalizability of the results. Another limitation is that the BRIEF-A was the only assessment included, which provided a limited amount of information about executive functioning skills. Additionally, the BRIEF-A is a self-report scale, and self-report scales are susceptible to intentional or unintentional bias. Furthermore, this thesis solely examined executive functioning as a factor of college success when there are certainly other factors involved. Another limitation is that comorbid mental disabilities such as ADHD, anxiety, or depression were not assessed.

Related types of disabilities could potentially interfere with the regulation of executive functioning skills.

Future Research

College success/dropout rates for students with ASD could be attributed to numerous other factors such as motivation, finances, comorbid disorders, proximity from home, and other personal factors. Future studies could examine a number of these factors along with executive functioning skills. A phone interview or face-to-face interview would provide more qualitative information about students' reasons for dropping out of college. Future research could also incorporate more than one type of assessment of executive functioning. Additionally, executive functioning skills could be assessed at the time students with ASD graduate from college. This would provide more information about which executive function skills have been refined during the college years, and which ones may still be deficient. An implication of this study is that there are certain executive functioning skills that college students with ASD need to be successful. Future research needs to replicate this finding and also determine if intervention programs designed to target those skills help increase the graduation rate of college students with ASD.

Conclusion

This thesis added to the research of executive functioning skills in college students with ASD. Unlike previous research that compared college students with ASD to the general population of college students, this study examined three groups of college students with ASD, including a group who graduated from college, a group who was still attending college, and a group who had dropped out of college. Scores on the BRIEF-A

indicated that students with ASD who graduated from college appeared to be better at specific executive functioning skills than those that dropped out of college. This research provides intriguing results with implications that could increase the graduation rates of college students with ASD. Additional research needs to determine if intervention programs at various levels (e.g., middle school, high school, college) designed to improve those executive functioning skills do indeed help students with ASD to graduate from college.

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Appendix: Institutional Review Board Approval Letter



*INSTITUTIONAL REVIEW BOARD
OFFICE OF RESEARCH*

DATE: March 31, 2015
TO: Megan Prickett, B.S
FROM: Western Kentucky University (WKU) IRB
PROJECT TITLE: [735959-1] SUCCESS INDICATORS OF COLLEGE
STUDENTS WITH AUTISM SPECTRUM DISORDER
REFERENCE #: IRB 15-357
SUBMISSION TYPE: New Project
ACTION: APPROVED
APPROVAL DATE: March 31, 2015
REVIEW TYPE: Exempt from Full Board Review

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission regarding analysis of de-identified data. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Exempt from Full Board Review based on the applicable federal regulation.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Paul Mooney at (270) 745-2129 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Western Kentucky University (WKU) IRB's records.