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Academics, Anxiety, and Autistic Traits: a study on the relation of academic anxiety and autistic traits

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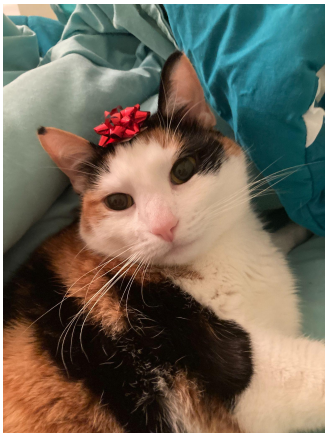

Figure 0. Photo of my cat

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Abstract

Autism Spectrum Disorder is a disorder in which an individual shows a marked deficit in ability in social communication and interaction, as well as behaviors, interests, or rituals which can be considered restrained or repetitive (American Psychiatric Association, 2013). Due to these symptoms, autistic individuals have a higher likelihood to struggle in an academic setting. This study investigates the connection between high levels of autistic traits, academic anxiety, and the self-perception of struggle in a college setting. I hypothesized that in populations of current undergraduate students ages 18-22 located within the continental United States, the number of autistic traits that a participant presents using the AQ-10 as a continuous measure will have a positive correlation with the amount of academic anxiety they experience as measured by the AAS, which will also be used as a continuous measure. Participants answered the Brief Autism Spectrum Quotient (the AQ-10) and the Academic Anxiety Scale (AAS) to gather data on their autistic traits and academic anxiety levels. A correlation using scores from the AQ-10 and the AAS showed a positive correlation between these variables.

Terminology

Autistic: of or relating to autism; alternatively, used to describe a person with autism spectrum disorder

Allistic: the inverse of autistic; non-autistic; used to describe a person who does not have autism spectrum disorder

Neurodivergent: people with a neurological or mental difference which changes the way they think; often used to refer to people who have ASD, ADHD, PTSD, CPTSD, and other mental differences

Neurotypical: the inverse of neurodivergent; of or relating to an individual who has regular thought patterns, or who is not neurodivergent

Autism

After careful thought and discussion surrounding terminology used surrounding autism, we have decided to use both person-first (ex. people with autism) and identity-first (ex. autistic people) language throughout this paper. Although person-first language is used in all legislation and is common practice in academic writings of the past few decades, a growing number of individuals are choosing to instead use identity first language, as the Employer Assistance and Resource Network on Disability Inclusion (EARN) states. Many groups of disabled individuals choose to identify with their disability using identify-first language, including the Deaf community and the Autistic community (American Psychological Association, 2019; Brown, L., n.d.).

Autism Spectrum Disorder (also known as autism or ASD) is a disorder characterized primarily by repetitive or restrained behavior and interests and a lack of reciprocation of social communication or social interaction with others (American Psychiatric Association, 2013).

Individuals with ASD tend to have impairments with executive function, as well as with making and understanding relationships. Commonly, autistic people will have problems with change, be that in their physical surroundings, their daily routine, or even something as simple as the clothes that they wear. Furthermore, there tends to be either a hypersensitivity or hyposensitivity to sensory stimuli, such as sounds, lights, and physical touch. Someone exhibiting hypersensitivity may show high levels of distress with loud sounds (like a car horn or fire alarm), while someone with hyposensitivity may show little to no reaction to pain or extreme temperatures. The majority of people with ASD have difficulty with day-to-day tasks such as completing assignments on time, an issue with one's executive function (Gurbuz et al., 2018). Understanding of autism as being a spectrum rather than a straight-on classification has grown in recent years, as awareness of the disorder has increased. Not every person with autism is identical in symptomatology– there is a wide range of experiences for autistic people. Comorbidity with other disorders (most commonly anxiety disorders and mood disorders) is significantly higher in populations of autistic adults as compared to neurotypical adults, with rates as high as 65% in a self-report study (Pinder-Amaker, 2014). According to the Diagnostic and Statistical Manual 5, 70% of individuals with autism may have at least one comorbid disorder and 40% might have two or more comorbid disorders (American Psychiatric Association, 2013). The prevalence of autism spectrum disorder as of 2013 was about one of every one hundred individuals, or 1%. Prevalence and comorbidity of autism will be elaborated on further in the paper.

History of Autism

Before the DSM-III. During the 20th century, the term autism was used to describe children with schizophrenia, meaning withdrawn and self-absorbed behavior, being used in both the DSM I and DSM II in this way (American Psychiatric Association, 1952, as cited in

Diagnostic criteria for Autism through the years, n.d.; American Psychiatric Association, 1968, as cited in *Diagnostic criteria for Autism through the years*, n.d.). It was also used in this way by Leo Kanner in his groundbreaking discussion of a set of eleven children he had worked with during the late 1930s and early 1940s who displayed common symptoms (Kanner, 1943). Many of the children had been diagnosed with other disorders such as childhood schizophrenia and "feeblemindedness", and at first multiple were thought to have been deaf due to their seeming lack of response to verbal commands or conversations, however Kanner ultimately came to the conclusion that this distinct symptom set was a separate disorder from others at the time (Kanner, 1943). Kanner noticed that as a whole despite their lack of engagement with the outside world the children seemed to have normal levels of intelligence and in some cases were capable of rather impressive feats, showing exemplary vocabulary and reading abilities, as well as incredible rote memorization of lists, poems, and music. The children were hesitant to or simply unwilling to interact with others, instead being utterly entranced by any objects in the room and treating any interferences in their play with said objects as unwanted and intolerable. Some did not speak, some muttered certain words over and over, and others would repeat things said to them in a fashion described as *echolalia*. Many had incredibly rigid daily structures and routines which, if not adhered to by their caretakers, would cause a massive tantrum and emotional distress on the part of the child, and pronoun reversal, or the tendency for the child to be incapable of using self-referent pronouns and other-referent pronouns correctly, was common. Another few notable authors on autism are Rimland, who created a checklist for symptoms of autism which was a basic version of the DSM diagnostic criteria, and Rutter, who created a new definition of autism which encompassed the delayed social interaction and repetitive behaviors,

both found in today's conception of autism (Rimland, 1964, as cited by Rosen et al., 2021; Rutter, 1978, as cited by Rosen et al., 2021).

The DSM-III. In 1980, Infantile Autism was added to the DSM-III as a diagnosable disorder. Criteria were as follows:

A. Onset before 30 months of age.
B. Pervasive lack of responsiveness to other people (autism).
C. Gross deficits in language development.
D. If speech is present, peculiar speech patterns such as immediate and delayed echolalia, metaphorical language, pronominal reversal.
E. Bizarre responses to various aspects of the environment, e.g. resistance to change, peculiar interest in or attachments to animate or inanimate objects.
F. Absence of delusions, hallucinations, loosening of associations, and incoherence as in Schizophrenia. (American Psychiatric Association, 1980, pp. 89-90).

Prevalence of the disorder was listed as only two to four individuals out of every ten thousand. Also in the DSM-III were two other relevant disorders: Childhood Onset Pervasive Developmental Disorder, or COPDD, and Atypical Pervasive Developmental Disorder, which would serve as a catch-all diagnosis for individuals who did not meet the diagnostic criteria for Infantile Autism or COPDD but still showed signs of a developmental disorder. Criteria for COPDD and Atypical Pervasive Developmental Disorder can be found in Appendix A. COPDD has a required window for onset of symptoms between thirty months and twelve years of age, distinguishing it from Infantile Autism, which must have an onset of symptoms prior to thirty months, while Atypical Pervasive Developmental Disorder does not have a required window for onset of symptoms beyond occuring at some point in childhood. COPDD symptoms also include sudden high anxiety, lack of or inappropriate affect, resistance to change, hyper-sensitivity or hypo-sensitivity to sounds, touch, sights, smells, tastes, etc., and abnormal speech (APA, 1980).

As mentioned previously, Atypical Pervasive Developmental Disorder was used as a diagnosis in cases where the person cannot be diagnosed with either Infantile Autism or COPDD, and therefore did not have its own diagnostic criteria beyond that it was for pervasive developmental disorders which could not be diagnosed as Infantile Autism or COPDD. Prevalence is listed for COPDD as being "extremely rare" and no information on prevalence is provided for Atypical Pervasive Developmental Disorder.

The DSM-IV. In 1994, the DSM-IV was released, and with it new developmental disorder diagnoses were made available. Infantile Autism was updated to create a new designation called Autistic Disorder, which gave a significant increase in breadth of the criteria used to diagnose the disorder, as well as increase the cut-off for onset of symptoms to three years of age, as opposed to the previous 30 months. Diagnostic criteria are as follows:

A. A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3)

(1) qualitative impairment in social interaction, as manifested by at least two of the following:
    (a) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
    (b) failure to develop peer relationships appropriate to developmental level
    (c) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g. by lack of showing, bringing, or pointing out objects of interest)
    (d) lack of social or emotional reciprocity

(2) qualitative impairments in communication as manifested by at least one of the following:
    (a) delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
    (b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others

(c) stereotyped and repetitive use of language or idiosyncratic language

(d) lack of varies, spontaneous make-believe play or social imitative play appropriate to developmental level

(3) restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

(a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus

(b) apparently inflexible adherence to specific, nonfunctional routines or rituals

(c) stereotyped and repetitive motor mannerisms (e.g. hand or finger flapping or twisting, or complex whole-body movements)

(d) persistent preoccupation with parts of objects

B. Delays or abnormal function in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play (APA, 2000, p. 75).

Furthermore, the prevalence of Autistic Disorder was updated to approximately 5 cases out of every 10,000 people, with estimates from studies ranging from 2 to 20 per 10,000. In addition to the updated form of Autistic Disorder provided in the DSM-IV, two other pervasive developmental disorders, as they were termed at the time, were described, with those being the disorders Asperger's Disorder (more commonly known as Asperger's Syndrome) and Pervasive Developmental Disorder Not Otherwise Specified, or PDDNOS. Full diagnostic criteria for these disorders is available in appendix B. Asperger's Disorder contains virtually the same diagnostic criteria as Autistic Disorder, but with the notable exception of delays in language, such that children diagnosed with Asperger's Disorder showed no evidence of delays in language understanding or production as seen in Autistic Disorder, as well as there being no "clinically significant delay in cognitive development or in the development of age-appropriate self-help skills" including eating and dressing oneself which, one might notice, are not present in the diagnostic criteria of Autistic Disorder (APA, 2000, p. 84). PDDNOS is the successor to Atypical

Pervasive Developmental Disorder as it is also a catch-all diagnosis intended for those who do not meet the more stringent diagnostic criteria for Autistic Disorder or Asperger's Disorder (or, in the case of the DSM-III, Infantile Autism or COPDD) but still show clinically significant impairment in development of social and communicative behaviors. Asperger's Disorder and PDDNOS do not have available information on prevalence in the DSM-IV.

The DSM-5. The DSM-5, released in 2013, changed the previous system of diagnosis for autism-like disorders. Instead of having three separate diagnoses of Autistic Disorder, Asperger's Disorder, and Pervasive Developmental Disorder Not Otherwise Specified as in the DSM-IV or the diagnoses of Infantile Autism, Childhood Onset Pervasive Developmental Disorder, and Atypical Pervasive Developmental Disorder, as found in the DSM-III, a single disorder is described which spans the previous multitude– that being Autism Spectrum Disorder (ASD). Autism Spectrum Disorder combines the previously separate diagnoses into one diagnosis with a note that says all individuals who have an established diagnosis of Autistic Disorder, Asperger's Disorder, or PDDNOS should have their diagnosis updated to be autism spectrum disorder (APA, 2013). Diagnostic criteria for ASD are as follows:

A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history…

1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
2. Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and nonverbal communication.
3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to

difficulties in sharing imaginative play or in making friends; to absence of interest in peers…

B. Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following, currently or by history…

1. Stereotyped or repetitive motor movements, use of objects, or speech (e.g., simple motor stereotypies, lining up toys or flipping objects, echolalia, idiosyncratic phrases).
2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior (e.g., extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to take same route or eat same food every day).
3. Highly restricted, fixated interests that are abnormal in intensity or focus (e.g., strong attachment or preoccupation with unusual objects, excessively circumscribed or perseverative interests).
4. Hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement)...

C. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life) (APA, 2013, pp. 50-51).

The rationale for the extreme change in categorization of Autism Spectrum Disorders from being six separate and distinct disorders to uniting under the title of a spectrum disorder is that they are in fact different symptom groupings and manifestations of the same underlying condition. One might notice that the criteria for diagnosis seem to be more aligned with those of Asperger's disorder with characteristics and criteria for Autistic Disorder mixed in as the criteria of social interaction and communication were separate and both required for the diagnosis of Autistic Disorder while combined in the criteria of ASD. As both were required for Autistic Disorder, an individual must present with both deficits in social interaction and in communication or they

would not be eligible for the diagnosis, leading them to instead be diagnosed with Asperger's. This led to all individuals who might have previously been diagnosed with Asperger's (regardless of whether or not they received diagnosis at the time) being eligible to receive a diagnosis of ASD.

Commentary on Prevalence and Comorbidity

People who have autism spectrum disorder often have comorbid disorders, as mentioned briefly in the introductory paragraph. Many individuals tend to associate autistic people with intellectual disability and structural language disorder, as both have a higher prevalence in ASD populations than in the general population (APA, 2013, pp. 58-59). Other commonly comorbid disorders include developmental coordination disorder, anxiety disorders, mood disorders, specific learning difficulties, and avoidant-restrictive food intake disorder. The DSM-5 states that about three of every four autistic people have a separate comorbid disorder, and just over half of those will have two or more comorbid disorders with their ASD diagnosis.

Another important aspect of ASD discussed in the DSM-5 is the prevalence of the disorder. Prevalence is listed at being about one out of every one hundred people– or about 1% of the population. This is a drastic increase from previous iterations of the disorder– even when tallied together, the other disorders come nowhere near this large number. As mentioned above, prevalence for Infantile Autism was about two to four per ten thousand, or about .03%; COPDD is listed simply as "extremely rare", and Atypical Pervasive Developmental Disorder, Asperger's, and PDDNOS each have no prevalence mentioned; and Autistic Disorder has a prevalence of about five cases per ten thousand people. There has been much ongoing debate by scholars surrounding the massive increase in rates of diagnosis for autism spectrum disorders. In the DSM-5, the prevalence statistic was continued with the following statement: "It remains

unclear whether higher rates reflect an expansion of the diagnostic criteria of DSM-IV to include subthreshold cases, increased awareness, differences in study methodology, or a true increase in the frequency of autism spectrum disorder." (APA, 2013, p. 55). Even prior to the combination of all autism spectrum disorders to be considered part of a single category, the prevalence of the disorder spiked in the late 90's and early 2000's, leading to a large cohort of individuals born within this time-frame being diagnosed with ASD (Gerhardt & Lainer, 2011). This indicates that the combination of all of the disorders into one does not solely account for the increase in prevalence.

Another common theory is that the prevalence has increased so much due to better understanding of what symptoms look like in diverse groups of people, along with an increased ability to receive a diagnosis for many individuals (Gerhardt & Lainer, 2011; Pinder-Amaker, 2014; Rivet & Matson, 2011). Over the past few decades, a significant increase in diagnoses can be seen in Hispanic and African-American populations, as well as in females as opposed to males, who, historically, were significantly more likely to be diagnosed (Pinder-Amaker, 2014; Rivet and Matson, 2011). This is thought to be due to symptomatology varying across the sexes, from a combination of inherent gender-based differences in the disorder's symptoms and from the different social training given to each sex as they age. Rivet and Matson (2011) discuss how there seems to be a large difference in the number of males diagnosed in comparison to females (at one point referencing a ratio of 15:1 diagnoses of males to females) but claim that there do not seem to be large differences in symptoms expressed in males vs females diagnosed with the disorder, except that females tend to show more severe symptoms in certain areas such as likelihood of comorbid intellectual disability. This, however, indicates that females are only being diagnosed with the disorder when their symptoms are both the same as those seen

commonly in males and are worse than are commonly seen in autistic males (APA, 2013, p. 57). This could be explained by significant differences in symptoms dependent on the individual's sex which would lead to ASD being diagnosed in males who have the more recognized and common symptoms while females with the disorder either are not diagnosed whatsoever or wait significant amounts of time before a diagnosis is given. Furthermore, perhaps the symptomatology of ASD in females is entirely unknown to the public and therefore parents do not even consider that their female child might have autism. The same argument applies to racial and ethnic minority groups– perhaps the populations' collective understanding of the disorder is not wide enough to fully contain the scope of all peoples who are impacted by autism spectrum disorder.

Autism SPECTRUM Disorder

The relatively recent understanding of autism as existing on a spectrum with a diverse set of symptoms such that two individuals diagnosed with the disorder may not have a single overlapping symptom between them begins to convey the reality of the disorder as it stands. In truth, ASD is an extremely heterogeneous disorder; while there are commonalities regarding outcomes into adulthood with the disorder, it is difficult to conceptualize what autism looks like for every autistic person. This has led to a conception of autism as, instead of a singular disorder marked by a set of particular symptoms shared by all autistic people, a set of traits commonly shared by not only individuals who meet the diagnostic criteria for autism but can be found within the wider population as well. Studies have been done which indicate that autistic traits such as these are not based entirely separately as a sort of personality trait in regards to autism spectrum disorder, but that these traits appear to exist along a continuum of which autism is the extreme end of said continuum (Lundström et al., 2012). In the 2012 Lundström et al. study,

monozygotic and dizygotic twins in Sweden were examined at the ages 9 and 12 and found higher similarity of both autistic traits and a possibility of diagnosis of the disorder in monozygotic twins as opposed to dizygotic twins, which indicates that there is a common genetic link between autistic traits and autism as a disorder. This model of thought surrounding the disorder suggests that every individual in the global population exists at some point along a continuous spectrum of autistic traits and, if one exhibits a high number of traits and symptoms, they can be diagnosed with the disorder. Less severe disorders (or, more accurately, versions of autism spectrum disorder which have less stringent diagnostic criteria such as Asperger's, PDDNOS, and atypical developmental disorder) exist as a section within said spectrum that falls under the area of diagnosis for ASD. This spectrum can also be seen within the DSM-5's specifications for severity of the disorder which an individual experiences– Level 1 indicates a need for support, level 2 indicates need for "substantial support", and level three "requires very substantial support" (APA, 2013, p. 52). In addition to this, there are many individuals who exhibit sub-threshold cases and do not meet the criteria for an autism spectrum disorder, but still experience some form of the disorder.

This understanding of autism spectrum disorder greatly influenced the planning and design of the current study. With the knowledge that autistic traits do not belong solely to those who can be diagnosed with autism, but that they can be found across the worldwide population, and that autism itself exists on a spectrum, it was decided to treat it as such in the current study. This allowed for the use of a continual measure of autistic traits as opposed to a grouped design of an autistic and non-autistic group, which was also advantageous considering that this study could not be a true randomized experiment as one could not randomly assign individuals to a group of autistic or non-autistic participants, nor is one allowed to or capable of causing

randomly chosen individuals to be autistic. Another major factor for the decision to use a continual measure of autism is that we as experimenters were not able to label participants as being autistic or non-autistic due to our lack of qualifications to diagnose said participants, as well as being unable to rely on self-diagnosis or medical diagnosis as being 100% accurate due to a) possible inaccuracies in the case of self-diagnosis, b) treatment disparities such that not all individuals would necessarily have the capability to receive a diagnosis should one be warranted, and c) possible withholding of or lack of willingness to share a diagnosis should a participant have been diagnosed (either self- or medically) but choose not to share that information. The study design could have implemented a measure that included a standardized cut-off point to distinguish between groups or could have utilized an extreme-groups design to separate the autistic and non-autistic groups, but it was felt that this would be less accurate in regards to the actual populace and would not allow for individuals with subclinical diagnoses to be represented in this study.

Sex and Gender Minorities in Autism

One issue in the diagnosis of autism is the differential in diagnoses between male and female populations. As noted above, there is a wide disparity between the numbers of males and females who are diagnosed with autism, and one reason as to why may be because females may present a different set of symptoms than males. In fact, Rivet and Matson (2010) found that among populations of ASD-diagnosed people females tended to have more severe impairments in certain areas than males, which may indicate that only females who are further along the autism spectrum and show more severe impairment are being diagnosed with the disorder. More recently it has been noted that there is a distinct “female autism phenotype” which highlights how sex-dependent characteristics may be important factors in the diagnosis of autism and other

disorders, as the disorder may be more well understood in one sex but not well studied or understood in the other (Strang et al., 2020). With the greater understanding of the ways autism presents in both males and females, the so-called female autism phenotype has grown in size. Autistic females tend to show less narrowed interests or special interests than males and have fewer repetitive behaviors, and seem to have better skills in social fields. It is debated as to whether this is due to sex-chromosome based differences, neurodevelopmental differences between males and females, or different socialization efforts in early childhood (Strang et al., 2020). The improved social skills over males may be due to an increased effort in social coping, also known as masking or camouflaging, which is an effort an autistic person makes either purposefully or subconsciously to seem less different in social interactions and processes to non-autistic people.

Beyond sex-based differences in autistic populations, there are also gender-based differences. As Kallitsounaki and Williams discuss in their 2022 paper, there is a proven link between autistic traits and gender dysphoria or incongruence, such that individuals with high levels of autistic traits also tend to present heightened levels of gender dysphoria. This may indicate that either autistic people are more likely to have gender dysphoria or people with gender dysphoria are more likely to have autism. This finding is echoed in studies of populations gender minorities and autistic traits, in that gender minorities (defined here as people who identify as transgender, nonbinary, agender, gender-fluid, or other) are also more likely to have more autistic traits than their cisgender counterparts on a number of different measures (Kung, 2020).

Autism in Higher Education

Over the past few decades, not only has the prevalence of autism itself been increasing, but the number of autistic people attending college and higher education has also increased (Pinder-Amaker, 2014). This could be related to the prevalence of autism itself increasing, the rates of diagnosis increasing to encapsulate more individuals due to a higher understanding of the disorder, or perhaps a higher number of people with autism attending college and university. In relation to the first suggestion, it is possible that the prevalence of autism itself has increased regardless of the increase in understanding of the disorder, and that, therefore, there are simply more people who can be categorized as autistic than there were in decades past were one to retroactively apply the same diagnostic criteria. Another possibility is that the percentage of people being diagnosed with the disorder has increased, but the actual number of people who would meet the current diagnostic criteria for autism spectrum disorder has remained the same. This means that, despite the same proportion of people being diagnosable by today's diagnostic criteria as were present in the past, a higher number of those people who can be diagnosed with ASD are being diagnosed due to a deeper understanding of the disorder and how it affects diverse populations. The third probable suggestion listed above is that college and higher education has become more accessible to people with autism, whether that be due to better systems of accommodations, more understanding of the disorder leading to greater acceptance of these students, or better support systems in general for autistic people. In any event, the situation remains the same– the number of autistic people attending college has increased substantially.

But, as Anderson and Butt discussed in their 2017 paper, just attending college is not the ultimate goal– the ultimate goal would be to make one's way through college, gaining a degree at the end, and being sent off to find a successful job. Some studies cite that as low as 40% of

autistic college students wind up finishing their studies (Gurbuz et al., 2018). In their study, Gurbuz et al. also found that there was a high proportion of autistic students reporting thoughts to withdraw from college, clearly showing that autistic students have needs that are not being met by the current support systems in place at their colleges and universities. While clearly there are those who succeed in their studies and will move on to have a successful adult life, there are also a large number of autistic students who are struggling in college and find it either significantly difficult or impossible to finish their studies.

What can be done to assist autistic students who struggle with their studies in the realm of academics? One clear option is the use of accommodations, defined by the Americans with Disabilities Act (the ADA) as "a modification or adjustment to a job, a work environment, or the way things are usually done" (Office of Disability Employment Policy, n.d.). Accommodations for schooling are gotten through a college or university's Disability Services office, or other relevant office which deals with the ADA. For many schools, students with disabilities must submit a letter from a relevant doctor detailing their disability and reasonable accommodations for said disability directly to their institution's Disability Services office. Through meetings with the office, the student and a representative of the office will come to an agreement on what accommodations are necessary and reasonable for their schooling. This list of accommodations will then be handed down to the professors whom the student requests them be given to, and accommodations are enforceable by ADA policy should a professor not grant them. Common accommodations for ASD students are access to pre-written lecture notes or a note-taker to write notes for them, separate assignments in place of group work should they be necessary, permission to wear sensory-blocking clothing or accessories (such as sunglasses, earbuds, and

hats), extra time on assignments, quizzes, and tests, written steps for the completion of an assignment, and permission to step out of class should they need to (Wheeler, 2014).

Academic Struggle & Anxiety

Taking into account that individuals with ASD are more likely to also have an anxiety disorder or mood disorder, and that they are more likely to struggle in academics generally, it follows that autistic individuals would be more likely to also experience academic anxiety. Cassady, Pierson, and Starling describe academic anxiety as a level of anxiety broader than specifically test anxiety, and more applicable to schooling in general. They argue for a nested model of academic anxiety, where test anxiety, math anxiety, and other specific anxieties are contained within academic anxiety, which is within the overarching neuroticism trait from the Big Five Inventory, a psychological inventory designed to test individuals' levels of five major traits (Cassady et al., 2019). Neuroticism as a trait is associated with high levels of general anxiety, as well as high levels of stress and emotional instability. Cassady and colleagues hypothesized that a level of anxiety existed between broad neuroticism and test anxiety, and suggested academic anxiety as an in-between, and that it could be used as a predictor for depressive symptoms. They found support for this theory and continue work on testing it. Due to the lack of information on academic anxiety, there were relatively few scales to choose from which measured it, so Cassady et al. created the Academic Anxiety Scale (AAS), originally a 20-question Likert-type scale with answers ranging from "Not at all typical of me" to "Very typical of me." In their 2019 study, the full 20 questions were used alongside the Beck Depression Inventory II (BDI-II), the Cognitive Test Anxiety Scale Revised (CTAR), and the Big Five Inventory (BFI) in order to run hierarchical regression analyses between the measures. In the end, they parsed down the 20-question version of the AAS to the questions which were found

to be most reliable and valid, which turned out to be 11 questions. Along with finding support for their theory of nested anxieties consisting of test anxiety, academic anxiety, and neuroticism, they also found partial support for these forms of anxiety being predictive of high levels of depressive symptoms. If high levels of academic anxiety are predictive of depressive symptoms and depression, and depression and anxiety disorders are both commonly comorbid with autism spectrum disorder, and that people with autism have a more difficult time in academics, it follows that autistic people may be more likely to struggle with academic anxiety. As per the Lundström et al. 2012 study, autism spectrum disorder can be thought of as a continuum of autistic traits where each individual can be categorized as having some number of those traits, and high numbers of autistic traits are intrinsically linked to being diagnosable with ASD. Therefore, the primary hypothesis to be tested in this study is that there exists a positive correlation between autistic traits and levels of academic anxiety. Other planned exploratory analyses relate to an individual's self-reported gender identity and year in school and their relation to their level of academic anxiety expressed as well as the number of autistic traits they express.

Method

Participants

Participants of the study were found using Prolific, an online service which connects survey- and study-takers with surveys and studies created by businesses and researchers. Participants input various demographic information into a profile on Prolific, which allows them to be matched with studies which might be applicable or interesting to them. As a result of this feature, the survey invite was sent to slightly over 1,200 people, with the first 100 to accept becoming the participants of this study. The final total number of participants included in the

Table 1.

Frequencies of Year

Year	Counts	% of Total	Cumulative %
1	17	17.2 %	17.2 %
2	17	17.2 %	34.3 %
3	28	28.3 %	62.6 %
4	37	37.4 %	100.0 %

Frequencies of Gender

Gender	Counts	% of Total	Cumulative %
F	39	39.4 %	39.4 %
M	52	52.5 %	91.9 %
N/A	2	2.0 %	93.9 %
NB	6	6.1 %	100.0 %

Frequencies of Transgender

Transgender	Counts	% of Total	Cumulative %
0	1	1.0 %	1.0 %
No	91	91.9 %	92.9 %
Yes	7	7.1 %	100.0 %

study was 99 participants, and the original number of participant responses was 106; six of these responses were duplicates, from participants completing the survey more than one time, and the other was an individual who indicated that they were not a current college student and thus did not meet the requirements for the study.

As can be seen in Table 1a, the majority of participants of this study were in their third and fourth years at college, comprising 28.3% and 37.4% of the sample respectively. The majority of the participants identified as male, as seen in table 1b. Six participants identified themselves as nonbinary, and two declined to answer. Table 1c shows the number of participants who identified themselves as transgender, with ninety-one indicating that they were not, seven indicating that they were, and one declining to answer.

Materials

The primary tool used for this study was Qualtrics, a survey-building website used by academics and businesses. The Qualtrics survey created for this study contained both the consent and debriefing statements, the demographic questions, and the measures used. The measures included the Academic Anxiety Scale (AAS) created by Cassady et al. in 2019, as well as the Brief Autism Spectrum Quotient (AQ-10) created by Allison et al. in 2012.

The Academic Anxiety Scale is a non-clinical measure for anxiety triggered by school or school-related activities. Instead of being tied to a specific activity or course, such as testing

anxiety or math anxiety, academic anxiety encapsulates all activities surrounding school or college. The AAS is an 11-statement scale with no reverse scoring and with each question's answer being coded as a zero through three point measure. The response "Not typical of me at all" constitutes a zero, while the responses "Somewhat typical of me" "Quite typical of me" and "Very typical of me" respectively constitute a one, two, and three. The point values across the 11 questions are summed to a score, which reflects the amount of academic anxiety one presents. A high score is indicative of a high level of academic anxiety. A few participants had a missing answer from the AAS, which was therefore coded as a "zero" on the scoring scheme in order to maintain the highest number of intact data as possible. In practice, this did not impact any analyses run on the data as the AAS is summed, not used to create a mean score, and therefore the inclusion of these data being coded as a "zero" did not cause a lower total score as opposed to running the analyses simply removing the non-answers from the participants' totals as it would have otherwise. The full AAS and its scoring can be found in appendix C.

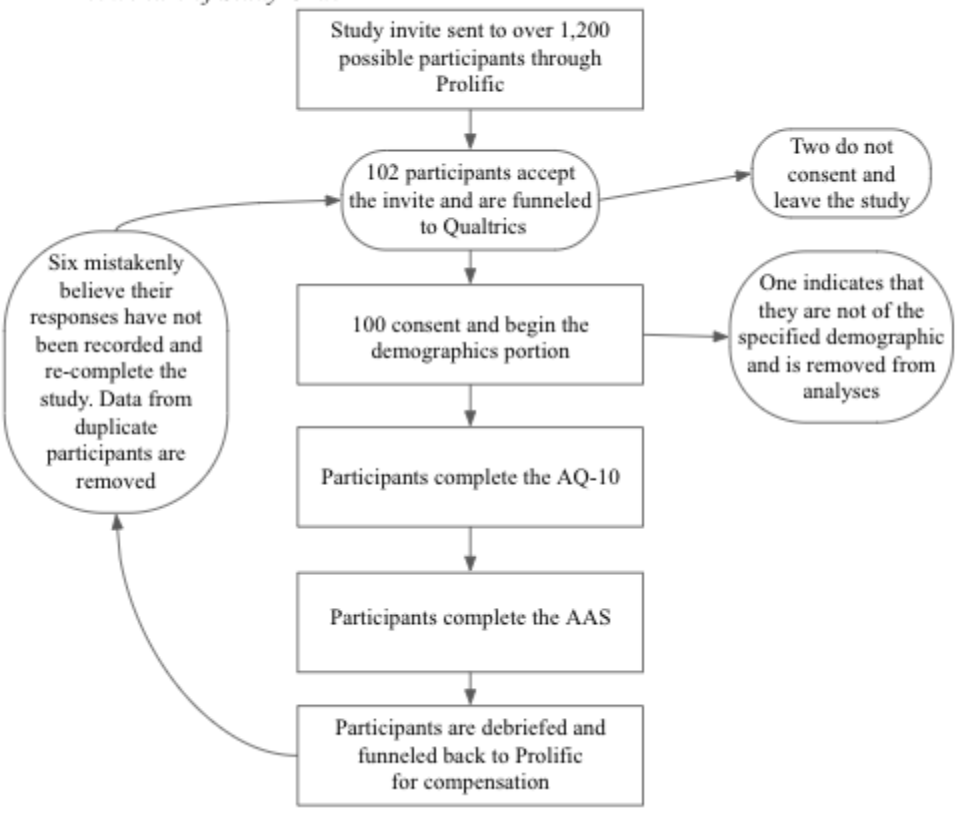
The AQ-10 is a measure intended for use by general practitioners as a screening for autistic traits in adults. It consists of a 10-statement scale with six questions being reverse-coded, and a four response Likert-type scale, each response ranging from "Definitely Disagree" to "Definitely Agree". One point can be gained for each question, with either the two "agree" options constituting a point or the "disagree" options constituting a point. Therefore, despite there being four possible answers to each statement, only one point will or will not be awarded for each question. In the original use of the scale, a score of six or higher would indicate that the practitioner administering the test should suggest to the person taking the test to seek further testing for autism, as the AQ-10 is not a diagnostic measure in and of itself. For the purposes of this study, the AQ-10 was instead used as a continuous measure of the number of autistic traits

each participant presents, with a high final score suggesting a higher number of autistic traits being present in the individual. The full AQ-10 and its scoring can be found in appendix D.

Procedure

After accepting the study via Prolific and having their starting time recorded, participants were funneled to Qualtrics, where they would first be prompted to read the Consent form and then choose to either consent to the study or choose to not. The consent form is available in appendix E. Participants who did not consent to the study were automatically forwarded to an "end survey" screen which prompted them back to Prolific to return the study, thus opening up their spot for a different individual to participate. Once participants consented to the study, they began the "Demographics" block of the survey, where first they answered questions to validate that they were of the population tested in the study (ages 18-22, current undergraduate students) and then were asked their year in college, gender, and whether they identified as transgender. After this, they were prompted to respond to each statement of the AQ-10, before being presented with the Debriefing statement (available in Appendix F). Finally, they were redirected to Prolific, which recorded their completion time of the study and were automatically compensated for their participation.

Figure 1.
Flowchart of Study Order



Results

A correlation analysis indicated that there was a positive correlation between score on the AQ-10 and score on the AAS in line with our primary hypothesis, $r(99) = .424$, $p < .001$, as can be seen in Table 2. This supports the hypothesis that academic anxiety is positively correlated with the number of autistic traits an individual presents. To elaborate, the higher number of autistic traits presented by an individual is correlated with a higher score on the AAS. Figure 2 shows a scatterplot of the data and a best-fit line showing the positive correlation between the score on the AQ-10 and the score on the AAS.

After the regression analysis was run and the line of best fit was generated, a one-way Welch's ANOVA was run using gender identity as the grouping variable and AQ and AAS scores as the dependent variables. Gender did not predict a difference on the AAS Score, $F(3, 4.66) = 1.83$, $p = .266$, though it was marginally significant on the AQ Score, $F(3, 4.43) = 4.80$, $p = .072$. Two sets of bar graphs with AAS and AQ scores on the y-axis and broken down by gender on the x-axis in Figure 3.

Table 2.
Correlation Matrix

		AQ SCORE	AAS SCORE
AQ SCORE	Pearson's r	—	
	p-value	—	
AAS SCORE	Pearson's r	0.424	—
	p-value	<.001	—

Figure 2.
Scatterplot with Best-Fit Line Showing AAS and AQ Scores

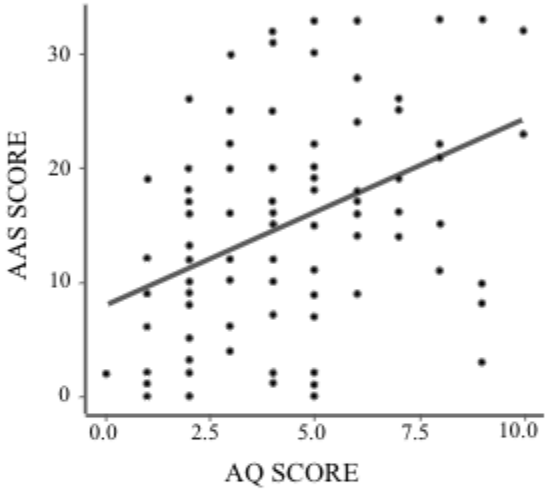


Table 3.
One-Way ANOVA (Welch's)

	F	df1	df2	p
AQ SCORE	4.80	3	4.43	0.072
AAS SCORE	1.83	3	4.66	0.266

Table 4.
Group Descriptives

	Gender	N	Mean	SD	SE
AQ SCORE	F	39	3.85	2.19	0.351
	M	52	4.23	2.45	0.339
	N/A	2	5.50	2.12	1.500
	NB	6	7.17	1.72	0.703
AAS SCORE	F	39	16.82	8.19	1.311
	M	52	12.73	9.67	1.340
	N/A	2	15.50	4.95	3.500
	NB	6	21.33	10.31	4.208

Figure 3.

Bar Graphs Means of Binary & Nonbinary groups on AQ and AAS Scores

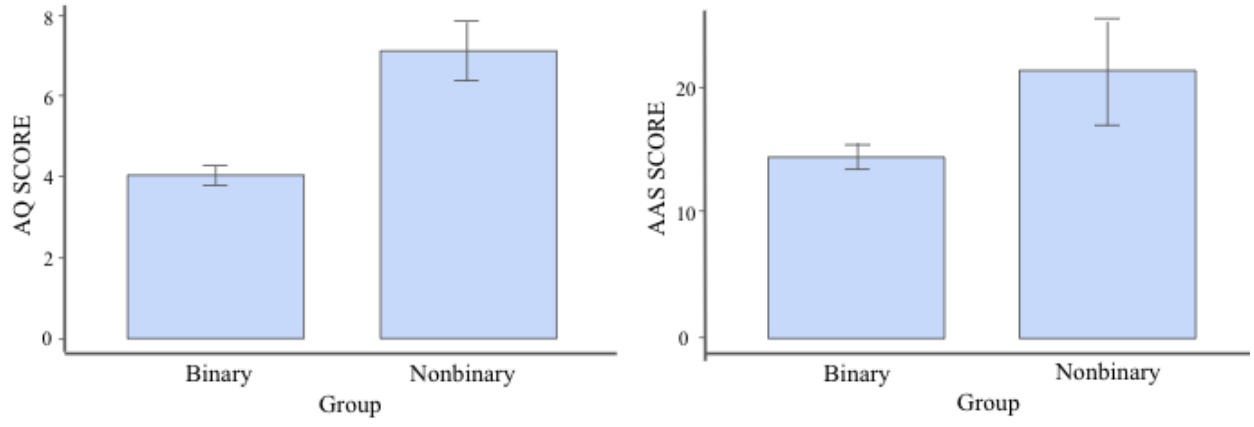


Figure 4.

Scatterplot showing Best-Fit Lines broken down by Gender

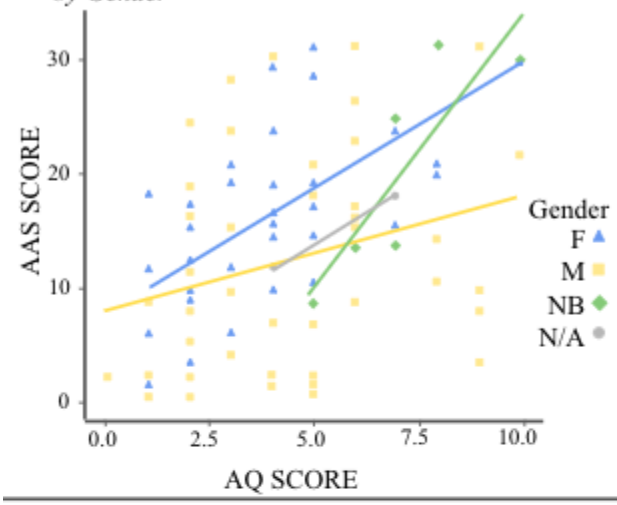


Table 5.

Independent Samples T-Test (Binary / Nonbinary)

		Statistic	df	p
AAS SCORE	Student's t	-1.75	95.0	0.084
AQ SCORE	Student's t	-3.19	95.0	0.002

Note. H_a μBinary ≠ μNonbinary

Table 6.

Independent Samples T-Test (Transgender / Cisgender)

		Statistic	df	p
AAS SCORE	Student's t	-4.88	96.0	<.001
AQ SCORE	Student's t	-2.55	96.0	0.012

Note. H_a μNo ≠ μYes

Table 7.

One-Way ANOVA (Welch's)

	F	df1	df2	p
AQ SCORE	0.956	3	44.3	0.422
AAS SCORE	1.079	3	43.6	0.368

Just because there was no statistical significance, however, that doesn't mean that the data broken down by gender are not interesting. As can be seen in Table 4 and Figure 4, both the score on the AQ-10 and the score on the AAS seem to have a higher mean for the students who identified themselves as nonbinary than other students. To analyze this, we ran a post-hoc t-test in which we combined the binary gender groups (those who reported their gender as male or female) and compared it to the nonbinary (NB) group, discarding the individuals who did not report a gender, and found that the score on the AQ-10 was significantly different between the binary and nonbinary gender groups, $t(95) = -3.19$, $p < .05$, but there was no significant result from the AAS, $t(95) = -1.75$, $p = .084$, as can be seen in Table 5.

Bar graphs showing the means for both AAS and AQ scores split by binary gender groups are also available in Figure 5. A t-test was also performed using transgender/cisgender as the grouping variable and AQ and AAS scores as the dependent variable and found statistically significant results for each, $t(96) = -4.88$, $p < .001$, and $t(96) = -2.55$, $p = .012$, respectively, as seen in Table 6. An One-Way Welch's ANOVA was run as an exploratory analysis with year in school (first year, second year, etc.) as a grouping variable and scores on the AQ-10 and AAS as dependent variables, but neither found significant results, with the AQ-10 being $F(3, 44.3) = 0.956$, $p = .422$, and the AAS being $F(3, 43.6) = 1.079$, $p = .368$, as can be seen in Table 7.

Histograms showed the distribution of data points for both the AQ score and the AAS score (Figure 6). The AQ score exhibited a positive skew, and the AAS did not seem to be normally distributed. This was confirmed using the Shapiro-Wilk Normality Test, and neither the AAS nor the AQ exhibited normality, $W = .965$, $p = .01$ and $W = .953$, $p = .0001$, respectively (Table 8). Levene's Homogeneity of Variance test was then used to confirm that the ANOVAs previously run could be considered valid, with $p = .51$ for the AQ and $p = .185$ for the AAS (Table 9).

Table 8.
Normality Test (Shapiro-Wilk)

	W	p
AQ SCORE	0.953	0.001
AAS SCORE	0.965	0.010

Note. A low p-value suggests a violation of the assumption of normality

Table 9.
Homogeneity of Variances Test (Levene's)

	F	df1	df2	p
AQ SCORE	0.776	3	95	0.510
AAS SCORE	1.642	3	95	0.185

Figure 5.
Bar Graphs Means of Gender groups on AQ and AAS Scores

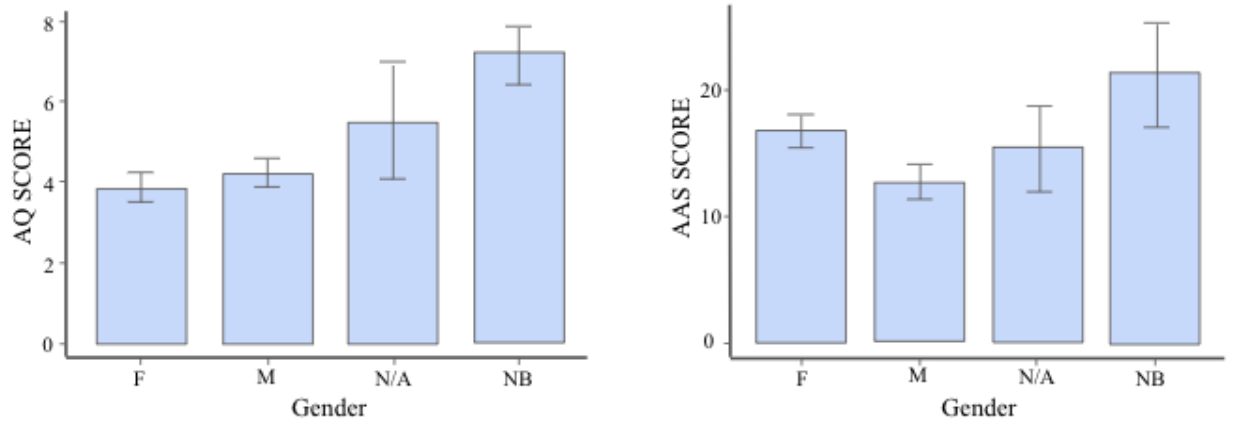
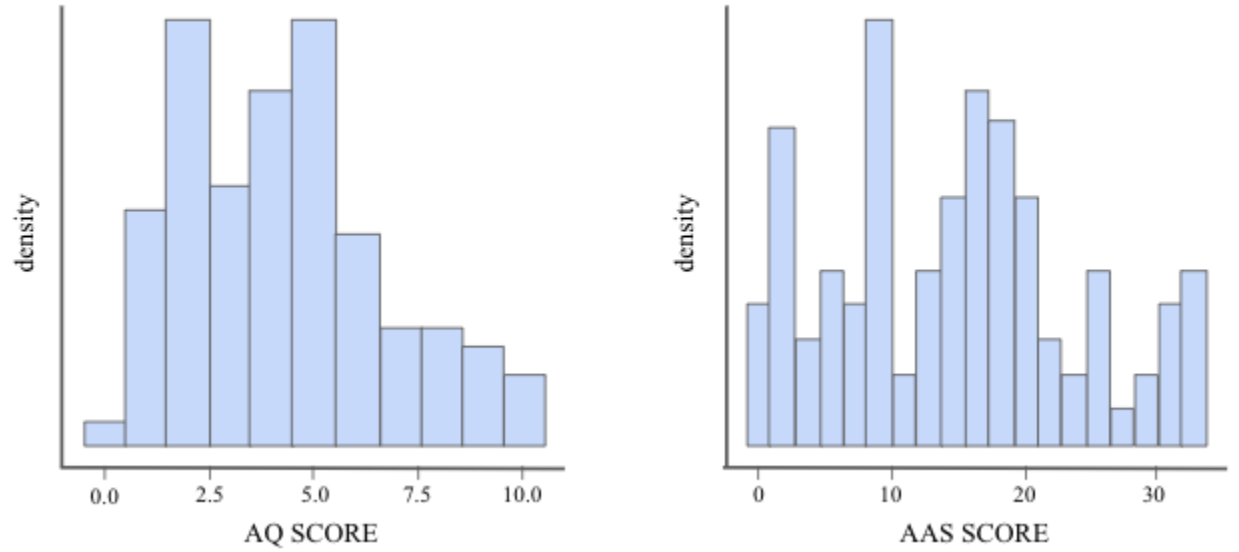


Figure 6.
Histograms of AQ and AAS Scores



Discussion

This study was spawned by the author's personal interest in autism spectrum disorder and the ways in which autistic people differ from allistic individuals, as well as how neurodivergent individuals interact and thrive in a world not made for them. Autistic people encounter numerous roadblocks on their journey through the world, between expectations of social interaction, academic structures, transition periods, and navigating career choices and life beyond schooling.

As discussed in the introduction, college and university can be particularly difficult periods for young adults with autism and, considering that the number of people identified as having autism has drastically increased in recent years, these difficulties are impacting a larger portion of the general population than they ever did previously. Beyond the stress of academics themselves, life at college or university can be more difficult for autistic people than for many others– the stress of moving to a new place and changing one's routines, acclimating oneself to a new schedule, and even difficulties in finding a safe place to eat between densely packed cafeterias and discovering safe foods for oneself, it is certainly no surprise that the stress of academic anxiety is higher than that for allistic students. Autistic individuals not only have a higher incidence of mental disorders such as anxiety disorders and depression, disorders which are already more common in university and college students regardless of neurodiversity (as discussed in Cassady et al., 2019), but as shown here students with higher amounts of autistic traits are also more likely to show heightened academic anxiety when compared with their neurotypical peers.

Prior to the beginning of data collection, the research plan was pre-registered on the Open Science Framework (OSF) using the template from AsPredicted, a web-based platform designed by the Wharton Credibility Lab in Pennsylvania. Both a link to the OSF pre-registration and the text from the AsPredicted template are available in Appendix G. The study began with collecting participants via Prolific, an online crowd-sourcing platform designed for academic studies and business surveys. Participants who were current undergraduate college students between the ages of 18 and 22 and were enrolled in a school within the continental US were gathered via the automatic software and 100 responses were taken within 5 hours of launching the study. There was no exclusion criteria based on anything other than what is mentioned in the previous sentence, and participants from across the autistic spectrum were gathered to have a

representative sample of the population. The plan to have only currently enrolled undergraduate students between ages 18-22 residing within the continental US was used in order to have a limited population to work with in the hopes that the relatively small sample size could be properly representative of the population– said population being college students within the United States. Due to this, the results of this study may not be generalizable to individuals from other geographic areas and cultures, and may not be generalizable to those of different age-groups, be it younger or older. This was considered acceptable because of the limited scope of the study, as the vast majority of college students are between the ages of 18-22 and the Academic Anxiety Scale created by Cassady et al. may not be applicable to non-student populations. In addition to this, the minimum age cut-off for this study being 18 was due both to the minimum age of participants on Prolific being 18 years and that it would not be feasible for parental consent to have been attained for each underage individual in the study.

After accepting the study invitation through Prolific, 102 prospective participants were redirected to Qualtrics where they were shown the Consent form, and at this step two participants declined to continue with the study and were sent back to Prolific to return their invitations, allowing space for the final two participants to access the study. After consenting, participants filled out demographic information mainly consisting of population checks (e.g., “What is your age?” “Are you currently enrolled as an undergraduate student?” etc.) which one person failed by indicating that they were not a current student (though the Prolific screening protocol, the information blurb on Prolific, and the consent form all indicated that college students were the intended demographic) thus bringing our participant pool down to 99 qualified participants. This is surprising given that, in order to have received the invitation to participate in the study, the individual must have had their “Student Status” filled out as being a current student and their

"Current Educational Level" listed as "Undergraduate degree (BA/BSc/other)". This individual may have graduated or dropped out of college and may not have reflected this change on their Prolific profile. Participants also answered questions surrounding their gender and year in school for further exploratory analyses, as discussed above. Next, participants were provided with first the AAS and then the AQ-10, and finally were debriefed and routed back to Prolific for compensation for their participation in the study. However, at this point 6 participants believed that they had not managed to complete the study successfully and thus returned to the beginning of the study and re-completed it, causing 6 duplicate responses to enter the system, which were then removed during the parsing of the data by the researcher. This issue may have been remedied by, instead of having the participant be automatically routed back to Prolific from Qualtrics, having them be given a "completion code" for them to manually enter in Prolific to receive their compensation. In fact, multiple participants anonymously messaged the researcher through Prolific to report that they hadn't received a completion code and expressed worry that they would not be paid for the study. It may be the case that a completion code being used for Prolific compensation is more commonly used than the automatic redirect system, and this may have caused these participants to enter duplicate responses in the hopes that they would be properly compensated.

There is a possibility that first filling out the AQ-10 may have caused some answers on the AAS to be swayed if a participant were to guess the purpose of the questions, but this was considered by the researcher to be less likely than the answers on the AQ-10 being swayed if the participants had first filled out the AAS. This is due to the AAS having questions that seem more negatively worded and focused on fault and anxiety rather than the AQ-10 which has more neutral-valenced questions. It may also be possible that first filling out the demographic

information at the beginning of the survey may have biased the participants in their answers, as the participants may have been aware of certain demographic information about themselves being linked to higher levels of anxiety, difficulty in school, and higher likelihood of being autistic. In the future, were the experiment to be replicated, perhaps the demographic information could be moved to the end of the study or, alternatively, deception could be utilized such that participants are not aware of the hypotheses being tested prior to their involvement in the study. As the introduction to the study, the title of the study, and the consent form all contained the key words autistic traits, academics, and anxiety, participants may have been on the lookout for questions which get at these concepts and thus changed their answers, perhaps unintentionally, to reflect what they believed their responses should be given based on their belief of what the study was about. In addition, both the AQ-10 and the AAS are fairly short measures, with 10 and 11 questions respectively. This is slightly detrimental as one cannot get a higher degree of specificity from questionnaires with so few questions. Although these measures were both used as continuous, more information would be gained from measures with more questions so that a greater spread of responses may be received for data analysis. This also may help with the issue of our data not fitting a normal distribution for either the AQ Score or the AAS Score variables, and allow for more successful analysis.

As seen in the demographics in Table 1 above, 6 individuals reported themselves as being nonbinary, and two did not answer the question. Furthermore, 7 individuals reported themselves being transgender, and 1 responded “Other / Prefer not to say”. The individual who answered “Other / Prefer not to say" had previously reported themselves as nonbinary. In addition to this, of the seven individuals who reported themselves as transgender, 4 could be considered as binary transgender with a gender transition of male to female or female to male, while the remaining 3

reported being nonbinary / third gender. This is interesting as it leaves two nonbinary people reporting themselves as not being transgender, along with the one mentioned previously who reported as other / prefer not to say. Some nonbinary individuals do not consider themselves to be transgender and believe that the term indicates a transition from one gender to the opposite gender, i.e. from male to female. In any event, as discussed in the Results section, gender did not significantly predict the number of autistic traits presented by an individual, but a post-hoc t-test indicated that there was a significant difference between those of binary genders and those who reported themselves as nonbinary / third gender. This aligns with what can be seen in Figure 3, in that the lowest score on the AQ-10 any nonbinary individual received was a 5 and how in Table 4 it can be seen that the mean AQ score for nonbinary individuals was 7.17, nearly double the mean score for females. Our rates of nonbinary and transgender participants, those being about 6% and about 7% respectively, are higher than the reported rates of nonbinary or transgender students country-wide (those being 4.6% and 3.7%, with the first percentage being the combined percentages of nonbinary, genderqueer, agender, and genderfluid, and the second being all who reported as being transgender) (American College Health Association, 2022). It is possible the overrepresentation of transgender and gender non-conforming students is due to a higher number of transgender and gender non-conforming individuals using Prolific, though the precise reason is unknown.

Due to the limited budget and amount of time allowed for this study, we were unfortunately only able to get a relatively small number of participants which may have impacted the results from analyses of our data and the conclusions that could be drawn from them. This likely impacts the external validity and generalizability of the conclusions of the data, in that we cannot know whether these results reflect the actual population at hand (that being college

students in the US, between ages 18 and 22) unless the study were to be replicated with a larger participant pool. Furthermore, on account of having so few participants who reported themselves as being nonbinary or transgender (6 and 7, respectively), it is impossible to draw concrete conclusions on the instance of high numbers of autistic traits in nonbinary or transgender populations. This was observed to be noticeably higher than those of binary or cisgender populations, which is in concordance with data from other studies which have found both an increased incidence of gender dysphoria in ASD populations and a higher incidence of ASD in populations with gender dysphoria.

In future studies, it would be valuable to have a larger participant pool and perhaps to utilize more measures. Other measures which could be included for autism and autistic traits would be a clinical interview in which a trained researcher could note whether a given participant meets diagnostic criteria for ASD, perhaps using the full version of the Autism Spectrum Questionnaire, with 50 questions, and perhaps another questionnaire or survey for autistic traits such as the RAADS-R. A clinical interview would be useful because it would allow for a grouped design along with the continuous measures of the questionnaires, as well as to validate the connection between autistic traits and the autism spectrum. The full AQ and the RAADS-R would allow for a larger possible range of points on each measure, giving a higher level of specificity than the AQ-10, with only 10 questions. This would allow for better analysis of the data and hopefully more impactful conclusions. In order to better measure academic anxiety and stress, a questionnaire such as the Depression, Anxiety, and Stress Scale 21 (the DASS-21) could be used along with the Academic Anxiety Scale. This would be useful as it contains subscales for depression, anxiety, and stress, and the anxiety subscale would be interesting to compare to the responses on the AAS to find whether a higher level of academic

anxiety is indicative of higher levels of anxiety in general, and thus whether academic anxiety could be a marker of a more intrusive or widespread condition. The depression subscale of the DASS-21 could be measured against the AAS to see whether the results of Cassady et al. (2019) are replicable in that academic anxiety can be a predictor for heightened depression in college students. The stress subscale could be used along with the anxiety subscale of the DASS-21 to find whether there is a correlation between the two and scores on the AAS. Finally, all subscales of the DASS-21 could be measured against the scores on the full Autism Spectrum Questionnaire to see whether a correlation between depression, anxiety, stress, and autistic traits can be found, as is indicated by the heightened comorbidity rates of ASD and depression and anxiety disorders.

A section which was a part of the original study design but was eventually taken out due to the lack of viability of the measure could also be adapted and used were the current study to be built upon. The original design called for a measure of perceived academic stress and perception of one's own grades, and it was planned that participants would first provide an average letter grade that they receive in their classes (A+, B, C-, etc.) and then would provide their actual GPA as written by their college. The letter grade would be translated to an approximate GPA, and the actual GPA would be subtracted from this approximate GPA to get a difference score. This difference score could then be used as a measure of one's perception of their own grades, in that a perfectly accurate guess of grade would give a difference score of 0, a high or positive difference score would indicate that they overestimate their grades, and a low or negative difference score would suggest that they underestimate their grades. The planned hypothesis attached to this was that people who scored high on the measure of autistic traits would also score high on the academic anxiety scale, and would underestimate their grades such that they self-report their grades as being lower than their actual GPA reflects. However it was

decided during the course of the study to remove the variable pertaining to one's perception of their own grades as it was too difficult to operationalize for this study, due to the possible confounds. Participants could have mistaken the first question and checked their GPA through their school website and not had a different response for each question; they may not wish to report their actual GPA in a study and could, instead, report an incorrect GPA or no GPA at all; and some participants may not have easy access to their GPA due to their school not providing an online portal to check academic status. Another option to remove the component of a self-reported GPA would be to have their college report their GPA directly to the researchers, but this would not be a viable strategy because it would ruin the anonymity of the study design and also it is illegal for colleges to release students' grades to outside parties without written consent from the student. We could also, given the more in-depth study design and possible in-person or online one-to-one communication with the participants, ask the participants to send us a record of their grades from their college, be it in the form of an official or unofficial transcript or some type of report card. Were the study to be replicated and built upon in future research, it would potentially be illuminating to investigate whether a connection exists between self-perceived academic achievement as measured by a difference score, the participants' levels of academic anxiety, general anxiety, stress, and depression, and the number of autistic traits they present and/or whether they qualify for an autism diagnosis or not.

Of course, there are limitations to the larger number of measures which would hopefully be utilized in future studies. Along with the increased time requirement for each participant due to filling out longer questionnaires and completing the clinical interview, the researchers would have to be trained in the process of interviews. In addition, the compensation rate for participants would be greatly increased due to the greater amount of time required for the study's completion,

as well as the researchers needing to be paid for their time. This would greatly increase the budget required for such a study as opposed to the rather limited budget utilized in the current study. Increasing the number of participants would also increase the cost, as well as the time requirement for researchers. Clinical interviews could be conducted either in person, as has been done most frequently in the past, or over an online platform such as Zoom or Google Meet to have a larger range of possible participants available. This brings with itself a whole other set of problems, particularly those surrounding confidentiality and anonymity of the participants, so a secured medical video call platform may be preferred.

The plan to use the DASS-21 for future studies to measure general anxiety and stress, along with the Academic Anxiety Scale, would allow for more information to be gathered regarding heightened levels of anxiety and stress at college for autistic students, which would pose a barrier to the students' academic achievement. In Cassady et al.'s 2019 study in which they created the AAS, they discussed how academic anxiety could be conceptualized as a level between general anxiety and specific subject or test anxieties. It was found in this study that one's score on the AAS did not have a significant relation to one's year in college, suggesting that academic anxiety is not a mutable trait that will decrease as one grows more acclimated to their situation as a student. As discussed above, it is known that anxiety disorders are commonly comorbid with ASD (as per the DSM-5), and the primary hypothesis of this study was that increased amounts of academic anxiety would be associated with participants with high levels of autistic traits. It would not be hard to believe that high levels of academic anxiety would be an impediment to academic success, though more research will be needed to reach any conclusions regarding that. The academic anxiety scale does not only measure one's individual academic anxiety, but rather their perception of themselves in comparison to others, with statements such

as “I am less confident about school than my classmates” and “I’m concerned about what my classmates think about my abilities” (Cassady et al., 2019). These begin to bridge closer to social anxiety, which is also more commonly seen in autistic populations. Social anxiety also poses a barrier to academic achievement as it can cause students to be reticent in asking for help from instructors, tutors, or peers, regarding schoolwork. In this vein, the AAS was a very useful measure to use in this study as it measures both the concepts of academic anxiety and how academic anxiety is impacted by social anxiety.

Conclusions

The study of academic anxiety and its intricate connections to autism spectrum disorder and autistic traits is a new field of research. In this study, it has been found that autistic traits are significantly and positively correlated with academic anxiety in a population of US-based undergraduate students aged 18 to 22. It was also found that the number of autistic traits a participant presents is higher in nonbinary as opposed to binary gender groups, but academic anxiety is not. Furthermore, transgender students showed evidence of higher amounts of autistic traits and academic anxiety as compared to cisgender students. A surprising finding was that academic anxiety was not influenced by the year in school a participant was in, as it was expected at some level that, as one proceeded through college, their level of academic anxiety would decrease as they grew more acclimated to their school environment. Future research will be necessary to further test the results of this study, and to allow these results to be generalizable to a larger population should they be replicated. The number of autistic students attending college will only increase in the future and, as such, institutions, professors, and support staff should be prepared to work with these students in order to guarantee their success in higher education.

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Appendices

Appendix A

Diagnostic Criteria for Childhood Onset Pervasive Developmental Disorder

A. Gross and sustained impairment in social relationships, e.g., lack of appropriate affective responsivity, inappropriate clinging, asociality, lack of empathy.
B. At least three of the following
    (1) sudden excessive anxiety manifested by such symptoms as free-floating anxiety, catastrophic reactions to everyday occurrences, inability to be consoled when upset, unexplained panic attacks
    (2) constricted or inappropriate affect, including lack of appropriate fear reactions, unexplained rage reactions, and extreme mood lability
    (3) resistance to change in the environment (e.g., upset if dinner time is changed), or insistence on doing things in the same manner every time (e.g., putting on clothes always in the same order)
    (4) oddities of motor movement, such as peculiar posturing, peculiar hand or finger movements, or walking on tiptoe
    (5) abnormalities of speech, such as questionlike melody, monotonous voice
    (6) hyper- or hypo-sensitivity to sensory stimuli, e.g., hyperacusis
    (7) self-mutilation, e.g., biting or hitting self, head banging
C. Onset of the full syndrome after 30 months of age and before 12 years of age
D. Absence of delusions, hallucinations, incoherence, or marked loosening of associations (APA, 1980, p. 92)

Diagnostic Criteria for Atypical Pervasive Developmental Disorder

"This category should be used for children with distortions in the development of multiple basic psychological functions that are involved in the development of social skills and language and that cannot be classified as either Infantile Autism or Childhood Onset Pervasive Developmental Disorder" (APA, 1980, p. 92)

Appendix B

Diagnostic Criteria for Asperger's Disorder

A. Qualitative impairment in social interaction, as manifested by at least two of the following:
    (1) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
    (2) failure to develop peer relationships appropriate to developmental
    (3) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people
    (4) lack of social or emotional reciprocity
B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
    (1) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
    (2) apparently inflexible adherence to specific, nonfunctional routines or rituals
    (3) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
    (4) persistent preoccupation with parts of objects
C. The disturbance causes clinically significant impairment in social occupational, or other important areas of functioning
D. There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood
E. Criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia (APA, 2000, p. 84)

Diagnostic Criteria for Pervasive Developmental Disorder Not Otherwise Specified

"This category should be used when there is a severe and pervasive impairment in the development of reciprocal social interaction associated with impairment in either verbal or nonverbal communication skills or with the presence of stereotyped behavior, interests, and activities, but the criteria are not met for a specific Pervasive Developmental Disorder, Schizophrenia, Schizotypal Personality Disorder, or Avoidant Personality Disorder. For example, this category includes "atypical autism"-- presentations that do not meet the criteria for Autistic Disorder because of late age at onset, atypical symptomatology, or subthreshold symptomatology, or all of these." (APA, 2000, p. 84)

Appendix C

The Academic Anxiety Scale / AAS (Cassady et al., 2019)

Each question contains the options ‘1 = Not at all typical of me’ ‘2 = Somewhat typical of me’ ‘3 = Quite typical of me’ and ‘4 = Very typical of me’.

1. I often worry that my best is not as good as expected in school.
2. I tend to put off doing school work because it stresses me.
3. I often worry that I am not doing assignments properly.
4. I am less confident about school than my classmates.
5. I have a sense of dread when I am in my classrooms.
6. I tend to find my instructors intimidating.
7. I spend much of my time at school worrying about what is next.
8. There is something about school that scares me.
9. I’m concerned about what my classmates think about my abilities.
10. I often feel sick when I need to work on a major class assignment.
11. I have a hard time handling school responsibilities.

Scoring (not presented to participants): Each question is scored with the answer as either a 1, 2, 3, or 4, which correspond to a point value of 0, 1, 2, or 3, respectively. No reverse coding is present in this measure. A high score on this test indicates a high level of academic anxiety.

Appendix D

The Brief Autism Spectrum Questionnaire / AQ-10 (Allison et al., 2012)

Each question contains the options ‘Definitely Agree’ ‘Slightly Agree’ ‘Slightly Disagree’ and ‘Definitely Disagree’. Only one option can be chosen per question.

1. I often notice small sounds when others do not.
2. When I’m reading a story, I find it difficult to work out the characters’ intentions.
3. I find it easy to “read between the lines” when someone is talking to me.
4. I usually concentrate more on the whole picture, rather than the small details.
5. I know how to tell if someone listening to me is getting bored.
6. I find it easy to do more than one thing at once.
7. I find it easy to work out what someone is thinking or feeling just by looking at their face.
8. If there is an interruption, I can switch back to what I was doing very quickly.
9. I like to collect information about the categories of things.
10. I find it difficult to work out people’s intentions.

Scoring (not presented to participants): On questions 1, 7, 8, and 10, 1 point is scored for the answers ‘Definitely Agree’ and ‘Slightly Agree’. On questions 2, 3, 4, 5, 6, and 9, 1 point is scored for the answers ‘Definitely Disagree’ and ‘Slightly Disagree’. Add these scores together. If the individual scores 6 or more, they should be considered for a diagnostic assessment for autism. For our purposes, this scale will be treated as a continuous variable of the number of autistic tendencies tested for that are present in the participant.

Appendix E

INFORMED CONSENT AGREEMENT
BARD COLLEGE

Project Title: Academics and Anxiety

Researcher: Keelyn Zepp, Undergraduate Psychology Student, Bard College (kz7120@bard.edu)

Adviser: Justin C. Hulbert, Ph.D., Associate Professor of Psychology, Bard College (jhulbert@bard.edu)

Background: This is a study designed to test the relationship between academic performance and certain types of concerns or anxieties.

Eligibility Requirements and Procedures: To participate in this study, you must be between the ages of 18 and 22, currently be enrolled in an undergraduate college program within the continental US, and be willing to answer questions regarding academic achievement and experiences with anxiety and social activities.

Procedure: Participants will be asked to answer some questions regarding their personal experience as an undergraduate in college, as well as questions surrounding social experiences and anxieties. There will also be questions surrounding your grades during college and your academic standing. Basic demographic questions (such as your age and year in school) will also be asked.

Risks and Benefits: There are no direct benefits associated with participation in this study. There are also no major risks to this study. Participants may experience slight discomfort or distress when confronted with questions surrounding their academic and social experiences; however, reminders about such topics are fairly common in the life of students.

Participant Rights: Participation in this study is entirely voluntary and you may choose to end your participation in the study at any point for any reason (e.g., should you feel uncomfortable). You may choose to click out of the study at any time without any negative repercussions or penalties.

Compensation: Participants will be compensated through Prolific.

Confidentiality: While Prolific knows your identity, no identifying information for any participant will be gathered specifically for the purpose of this study or shared with the researcher. Raw data collected during the course of the study will be kept using Qualtrics, before being stored and analyzed using the researcher's passcode-protected personal computer. Raw data (without identifying information included) will be made available via the Open Science Framework (osf.io) at the conclusion of the project. Study data will be reported only in aggregate for a Senior Project thesis, which will be permanently and publicly available in the Bard College library and online through the Digital Commons.

Contact: If you have any further questions, please reach out to Keelyn Zepp at kz7120@bard.edu. You may also contact Dr. Justin Hulbert, the faculty adviser to this project, at jhulbert@bard.edu. Should you have any concerns surrounding your rights as a participant, you can also reach out to the Bard College Institutional Review Board at irb@bard.edu.

If you wish to consent to this study and proceed with the select the option below which states "I have read the consent form and consent to participating in the study." Without selecting this option, you will not be able to continue with the study.

Appendix F

Debriefing Statement:

Thank you for participating in this study. Individuals vary naturally in their traits, including autistic tendencies. Whether or not students exhibit more or fewer tendencies along the autism spectrum, they are likely to have some concerns regarding their academic abilities. The questions you answered addressed your traits and aspects of your perceived academic performance. This study was designed to determine how natural variations in these traits might be related to particular academic concerns. If you have any questions about the study, please do not hesitate to contact Keelyn Zepp, the lead researcher for this project at kz7120@bard.edu, or Dr. Justin Hulbert, the faculty adviser for this project, at jhulbert@bard.edu. If you have any concerns surrounding your rights as a participant, please feel free to contact the Bard College Institutional Review Board Chair at irb@bard.edu. If you have any concerns surrounding your mental state following the completion of this study, please check out the Substance Abuse and Mental Health State Administration at www.samhsa.gov.

Appendix G

Preregistration:
Academics, Anxiety, and Autistic Traits (#)
Author(s) Keelyn Zepp (Bard College) - kz7120@bard.edu
1) Have any data been collected for this study already?
No, no data have been collected for this study yet.
2) What's the main question being asked or hypothesis being tested in this study?
Research Question:
Does the number of autistic traits an individual presents on a questionnaire (the AQ-10) correlate with the amount of academic anxiety they present on the Academic Anxiety Scale?
Hypothesis:
In populations of current undergraduate students ages 18-22 located within the continental United States, the number of autistic traits that a participant presents using the AQ-10 as a continuous measure will have a positive correlation with the amount of academic anxiety they experience as measured by the AAS, which will also be used as a continuous measure.
3) Describe the key dependent variable(s) specifying how they will be measured.
Academic Anxiety: will be measured using the Academic Anxiety Scale created by J. Cassady et al. in 2019.
4) How many and which conditions will participants be assigned to?
There are no conditions.
5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
We will be conducting a regression analysis to show what type of regression generates the best fit line for the data collected, and possibly a t-test to discern a connection between gender identity / identity as a transgender individual and autistic tendencies.
6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We will exclude participants who do not consent to the study, who indicate that they do not meet the participation requirements for the study, or who indicate at the end of the study that they have not answered questions truthfully and to the best of their ability.
7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
We will have 100 participants, and set Prolific to allow for only 100 participants to complete the study.
8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
We will also be collecting data on the participant's gender identity.
https://doi.org/10.17605/OSF.IO/DM8BK

Appendix H

IRB Application and Approval

IRB New Proposal Form - Template

Note: This form will be completed using the following link https://www.bard.edu/irb/proposal/. However, the online form does not save your progress. I strongly recommend you drafting your responses before putting your responses into the form.

Part 1

1.1 Today's date: *

February 15, 2022

1.2 Name: *

Keelyn Zepp

1.3 Email: *

kz7120@bard.edu

1.4 Your Academic Program/Department/Office: *

Psychology

1.5 Your status (faculty, staff, graduate or undergraduate student): *

Undergraduate

1.6 Adviser or Faculty Sponsor (if applicable):

Sarah Dunphy-Lelii

1.7 If you are a graduate or undergraduate student, has your Adviser or Faculty Sponsor seen and approved your application?

Yes

1.8 Your Adviser's or Faculty Sponsor's email address (if applicable):

sdl@bard.edu

1.9 Please list all individuals (full name and status, i.e. faculty, staff, student) involved in this project that will be working with human subjects. Note: Everyone listed must have completed Human Subject Research Training within the past three years. *

Keelyn Zepp, student

1.10 Do you have external funding for this research? *

No

Part 2

2.1 What is the title of your project? *

Academics, Anxiety, and Autistic Traits

2.2 When do you plan to begin this project? (Start date): *

February 22, 2023

2.3 Describe your research project: *

Research Question: Does an individual's number of autistic tendencies correlate with their perception of success in academics?

Background Information: Studies have shown that increasing numbers of autistic students have been enrolling into higher education over the past decade (Pinder-Amaker et al., 2014). Autistic students are also known to struggle more with the transition to college, as well as with social behaviors and academic or study related behaviors. My hypothesis is that college students with a high number of autistic traits as tested via the Brief Autism Spectrum Quotient questionnaire will report having higher levels of academic stress than individuals with a low number of autistic traits. It has already been found that higher levels of anxiety and social skill deficits have been found in populations of adolescents with autism (Bellini et al., 2004). I wish to test more specifically academic anxiety, using the Academic Anxiety Scale created by Cassady et al. in 2019.

2.4 Describe the population(s) you plan to recruit and how you plan to recruit participants. Please submit all recruitment material, emails and scripts to IRB@bard.edu *

I plan to recruit participants who are ages 18 through 22 and currently enrolled in an undergraduate degree program taking place within the United States. Participants will be recruited using Prolific. No emphasis will be put on recruiting specifically participants diagnosed with autism; in fact, it will not be mentioned in the recruitment materials. Instead, all people who fit the recruitment demographics listed above will be encouraged to participate in the study, regardless of status on the autism spectrum.

2.5 Will your participants include individuals from vulnerable or protected populations (e.g., children, pregnant women, prisoners, or the cognitively impaired)? *

No
2.6 If your participants will include individuals from the above populations, please specify the population(s) and describe any special precautions you will use to recruit and consent. Although we will not be specifically targeting autistic populations when recruiting participants, in all likelihood, we will have participants who can be or have been diagnosed with autism. Due to autism counting under IRB guidelines as a cognitive impairment and the nature of my research question, we have, in an abundance of caution, indicated that this project likely will be working with individuals from vulnerable populations. We will be using the guidelines set out by the Academic Autism Spectrum Partnership in Research and Education (AASPIRE) guidelines on working with adult autistic participants in research (Nicolaidis et al., 2020). Efforts have been made to have the consent materials be accessible in multiple forms (i.e., having both a written version to read from the screen and have the text be available to be read aloud via a screen reader) and a required question at the bottom of the consent form will confirm consent before participants can continue with the study. One other recommendation was to have participants complete surveys and consent forms online as opposed to in-person research, which was already built into this study's design. Most other recommendations for study completion are not applicable for the study design and for the population this study is working with.
2.7 Approximately how many individuals do you expect to participate in your study? *
100 participants.
2.8 Describe the procedures you will be using to conduct your research. Include descriptions of what tasks your participants will be asked to do, and about how much time will be expected of each individual. NOTE: If you have supporting materials (printed surveys, questionnaires, interview questions, etc.), email these documents separately as attachments to IRB@bard.edu. Name your attachments with your last name and a brief description (e.g., "WatsonSurvey.doc").
Participants ages 18 through 22 who self-report as being current undergraduate students in the US will be recruited using Prolific. From there, they will be routed to Qualtrics, where they will first be asked to provide consent and some basic demographic information (age, year in school, gender).
After this, participants will fill out the Academic Anxiety Scale (AAS) (Cassady et al., 2019) and, as a final measure, they will complete the Brief Autism Spectrum Quotient (AQ-10) 10-item scale. High scores on the AQ correspond to a high number of autistic tendencies, while low scores indicate the opposite. The AQ-10 is a 10 question survey intended to assist doctors in screening for autism (Allison et al., 2012). It is likely to pick up a large variation of traits which could be considered to be autistic traits across the entire population, including both the neurodivergent and the neurotypical populations. However, for the purposes of this experiment, the AQ-10 will be used as a continuous measure The AAS is a questionnaire designed to measure the level of anxiety an individual has regarding different areas of academics. Both scales are available in the supplemental materials sent to the IRB. Data will be analyzed using a regression with both the score on the AQ-10 and their score on the AAS being treated as continuous.
2.9 Describe any risks and/or benefits your research may have for your participants. *
Participants who experience high levels of academic anxiety may find their anxiety somewhat triggered by questions about their academic success. Some participants may experience distress when presented with questions concerning their perceived struggle in academic settings. This should not cause additional risk to participants due to a large number of reminders already existing in a student's day to day life. No direct benefits are expected to come from participating in this study. Compensation will be provided to the participants for their time following the Prolific minimum compensation ($8.00/hr), prorated for the duration of the study (which is expected to take 5 to 10 minutes). Each participant will be compensated approximately 75¢ for taking part in the study.
2.10 Describe how you plan to mitigate (if possible) any risks the participants may encounter. *
In addition to numerous reminders that participants are free to discontinue their participation at any point, the debriefing materials will include a link to the Substance Abuse and Mental Health Services Administration (SAMHSA) website. They will be encouraged to seek out mental health care should they feel that they have been negatively impacted by the study.
2.11 Describe the consent process (i.e., how you will explain the consent form and the consent process to your participants): *
The study will be announced on Prolific (prolific.co), allowing their active base of users to find out more about the study by clicking a link that will take them from the Prolific homesite to Qualtrics, where they will be presented with the consent form. The text of the Qualtrics survey will be formatted such that it can be read aloud by a screen reader should the participant require one for full comprehension. Above the consent form, the following text will be present: "Below is the informed consent form for this study. In order to continue with the study you must read the following form and select the option below which states 'I have read the consent form and consent to participating in

this study.' Without selecting this option, you will not be able to continue with the study. Please read the consent form fully before continuing with the study. Note that, while participating in this study is entirely voluntary, you may quit the study at any time should you feel the need to."
2.12 Have you prepared a consent form(s) and emailed it as an attachment to IRB@bard.edu? Note: You must submit all necessary consent forms before your proposal is considered complete. *
Yes.
2.15 What procedures will you use to ensure that the information your participants provide will remain confidential and safeguarded against improper access or dissemination? *
No identifying information about the participants will be collected beyond their Prolific ID number specifically generated for use in this study. Prolific assigns a separate ID number for each participant in each study they participate in to keep track of study completion for the purposes of payment and to provide the researchers with a participant ID to track their data. Raw data will be kept using Qualtrics, before being stored and analyzed using the researcher's passcode-protected personal computer. Raw data (without identifying information) will be made available via the Open Science Framework at the conclusion of the project.
2.16 Will it be necessary to use deception with your participants at any time during this research? Withholding details about the specifics of one's hypothesis does not constitute deception, this is called incomplete disclosure. Deception involves purposefully misleading participants about the nature of the research question or about the nature of the task they will be completing.
No.
2.18 For all projects, please include your debriefing statement. (This is information you provide to the participant at the end of your study to explain your research question more fully than you may have been able to do at the beginning of the study.) All studies must include a debriefing statement. Be sure to give participants the opportunity to ask any additional questions they may have about the study. *
Thank you for participating in this study. Individuals vary naturally in their traits, including autistic tendencies. Whether or not students exhibit more or fewer tendencies along the autism spectrum, they are likely to have some concerns regarding their academic abilities. The questions you answered addressed your traits and aspects of academic anxiety. This study was designed to determine how natural variations in these traits might be related to particular academic concerns. If you have any questions about the study, please do not hesitate to contact Keelyn Zepp, the lead researcher for this project at kz7120@bard.edu, or Dr. Sarah Dunphy-Lelii, the faculty adviser for this project, at sdl@bard.edu. If you have any concerns surrounding your rights as a participant, please feel free to contact the Bard College Institutional Review Board Chair at irb@bard.edu. If you have any questions or concerns surrounding your mental state following the completion of this study, please check out the Substance Abuse and Mental Health State Administration at www.samhsa.gov.

Bard College

Institutional Review Board

Date: 2/28/2023
To: Keelyn Zepp
Cc: Justin Hulbert; Nazir Nazari
From: Ziad M. Abu-Rish, IRB Chair
Re: Academics and Anxiety

DECISION: APPROVAL

Dear Keelyn Zepp

The Bard Institutional Review Board reviewed your revised proposal and has approved it through February 28, 2024. Your case number is 2023FEB28-ZEP.

Please notify the IRB if your methodology changes or unexpected events arise.

We wish you the best of luck with your research.

Sincerely,

Ziad M. Abu-Rish, Ph.D.
IRB Chair
Associate Professor of Human Rights and Middle Eastern Studies
Bard College
zaburish@bard.edu