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Development and Validation of a Survey of Knowledge of Autism Spectrum Disorder

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DEVELOPMENT AND VALIDATION OF A SURVEY OF KNOWLEDGE OF AUTISM SPECTRUM DISORDER

by

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ABSTRACT

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As autism spectrum disorder (ASD) is more commonly diagnosed, having knowledge of the disorder becomes increasingly important for educators, parents, and the general public. Previous research regarding knowledge of ASD, focused mainly on knowledge possessed by those in the educational field, has found that individuals may perceive themselves as possessing average knowledge regarding ASD but have low actual knowledge (as defined by the researchers) regarding specific aspects of the disorder (Williams et al., 2011). Studies support the notion that there is a general lack of knowledge of different aspects of ASD among teachers; however, there has been little research regarding the level of awareness concerning ASD possessed by individuals outside of the educational sphere. The primary goal of this study was to create a standard measure to evaluate perceived versus actual knowledge of ASD. A sample of undergraduate students was administered A Survey of Knowledge of Autism Spectrum Disorder (ASK-ASD), as well as a measure of knowledge of ADHD and a measure of knowledge of HIV/AIDS. The ASK-ASD demonstrated test-retest reliability, adequate internal consistency, and fair validity coefficients. An exploratory factor analysis of the ASK-ASD revealed a two-factor structure of knowledge of ASD. Additionally, exploratory analyses revealed several interesting correlations between ASD knowledge, demographic characteristics, and source of ASD knowledge.

DEDICATION

I would like to dedicate this document to my family, especially my parents, who have supported me throughout my academic career and without whom I would never have made it this far. I would also like to thank the members of my cohort, who have been sources encouragement and reassurance throughout my graduate school experience.

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LIST OF ABBREVIATIONS

ASD	Autism Spectrum Disorder
ASK-ASD	A Survey of Knowledge of Autism Spectrum Disorder
CDC	Centers for Disease Control
CFI	Comparative Fit Index
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th Ed.
EFA	Exploratory Factor Analysis
HIC	Homogenous Item Composite
IRB	Institutional Review Board
IRT	Item Response Theory
M	Mean
SD	Standard Deviation
WLSMV	Weighted least squares means and variance

CHAPTER I

INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder marked by the existence of impairment in social communication and restricted, repetitive behaviors, which manifests within the early developmental period (American Psychiatric Association, 2013). According to a report by the Centers for Disease Control and Prevention (CDC, 2014), ASD occurs in approximately 1 in 68 children. Boys are five times more likely than girls to have ASD, and the disorder is more likely to be diagnosed in White children, compared to Black or Hispanic children (CDC, 2014). ASD is a complex diagnosis, with a variety of symptom manifestations and a multifaceted etiology (Klinger, Dawson, Barnes, & Crisler, 2014).

Outside of academia, there is extensive evidence that most people are prepared to accept both plausible and implausible claims, particularly those presented through the Internet (Bain, Brown, & Jordan, 2009). Information about ASD is conveyed not only through scientific journals, but also through television, films, blogs, advocacy websites, newspapers, and word-of-mouth (Bain et al., 2009). This may dilute the information, causing parents or educators to pursure interventions which have not been scientifically evaluated. Additionally, many websites providing information about ASD contain advertisements for treatments and interventions that are not evidence-based, making it more difficult for individuals seeking information about ASD to separate scientifically valid treatments from those not supported by research. However, despite this trend, relatively little research in the psychological field has addressed the subject of misperceptions and inaccurate knowledge among the lay public regarding ASD (Bain et al., 2009).

Although information about ASD is more readily available to the lay public, it is not clear that it consistently translates to application of that information. For example, even though children as young as two-years-old can be diagnosed with ASD, on average children are not diagnosed until after age 4 years (CDC, 2014), suggesting that despite the public awareness regarding autism, many individuals continue to be uninformed about warning signs regarding the disorder or ignore these early warning signs before taking action. Given the efficacy of early interventions (Klinger et al., 2014), it is important that caregivers of children with early warning signs are able to recognize the symptoms as well as know the steps to have their children assessed.

Perceived versus Actual Knowledge

A review of literature revealed that previous studies found discrepancies between actual knowledge of self-assessment of knowledge in a variety of processing tasks (Park, Gardner, & Thukral, 1988). Actual and perceived knowledge levels most often coincide when the individual has little knowledge (e.g., at the beginning of the semester) of a subject, or when the individual has a high level of knowledge or expertise. Conversely, the discrepancy between perceived and actual knoweldge is often largest when a minimal level of knowledge has been obtained, but remains inadequate for a given subject (Park et al., 1988).

The discrepancy between perceived and actual knowledge has been examined for ASD in the educational field (Williams, Schroeder, Carvalho, & Cervantes, 2011); however, it appears to not have been well addressed across other contexts or psychological disorders. In the medical realm, the discrepancy between perceived and actual knowledge has been examined for a limited number of diseases in specific populations. For example, one study evaluated correlations between perceived and actual

knowledge of prostate cancer among African-American men (Agho & Lewis, 2001). Researchers found that actual and perceived knowledge of prostate cancer were moderately correlated, and both were also correlated with having health insurance coverage. Another study examined nurses' perceived and actual knowledge regarding diabetes mellitus (Baxley, Brown, Pokorny, & Swanson, 1997). In this study, actual and perceived knowledge of diabetes mellitus were not significantly correlated among nurses, suggesting that perceived knowledge and actual knowledge about medical disorders are often moderately related at best—among the general population or even among professionals with more access to relevant knowledge. These results suggest that at most, there may be a moderate correlation between an individual's perceived knowledge and actual knowledge of ASD.

Knowledge of ASD

As the prevalence of ASD increases, it is increasingly important for caregivers, educators, and the general public to understand different aspects of ASD, such as the symptoms, causes, and treatment options. Research in this area has focused primarily on knowledge possessed by those in the educational field, given that ASD often has significant consequences within academic settings (Williams et al., 2011). For example, a 2009 study by Bain and colleagues evaluated teacher candidates' knowledge about the validity of different types of intervention for a variety of disorders, including ASD, as they progressed through their teaching internships. Participants were given lists of interventions, each of which fell in one of three categories: evidence-based, controversal, or anecdotal interventions. Overall, teacher candidates were about as likely to endorse controversial treatments as they were to endorse evidence-based treatments. For ASD, the only evidence-based treatment presented to the subjects was picture exchange. Whereas

most of the students (89%) endorsed this intervention, less than half had heard of it prior to the study. Anecdotal interventions were supported by a surprisngly high percentage of students: 54% endorsed chelation therapy, whereas 32% endorsed avoiding the measles/mumps/rubella (MMR) vaccine. Findings also showed that participants were most likely to endorse interventions that were "scientific-sounding," seemed logical, or had overgeneralized findings (e.g., gluten-free diets), even if those interventions were not appropriate to the disorder in question.

Another study explored the perceived versus actual knowledge of ASD possessed by teachers, counselors, and paraprofessionals (Williams et al., 2011). The participants were all school employees, enrolled in graduate level courses in education, who were currently working with students with ASD. They were given two surveys: a perceptions survey and a knowledge survey, both of which were created by the researchers specifically for this study. The perceptions survey consisted of 12 Likert-scale items, in which participants rated how strongly they agreed or disagreed with statements about perceived knowledge of various aspects of ASD. The Knowledge Survey was an open-ended measure, in which researchers asked general questions about ASD (e.g., "What is autism?"). The researchers found that these individuals perceived themselves as possessing average knowledge regarding ASD, but they had low actual knowledge (as defined by the researchers) regarding both diagnostic methods and treatment. These results were concerning, given that nearly 40% of the participants had participated in at least one autism training, and all of the participants were working with children with ASD at the time of the study.

The aforementioned studies support the notion that there is a general lack of knowledge of different aspects of ASD among teachers and other school personnel; however, there has been little research regarding the level of awareness concerning ASD among individuals outside of the sphere of eductation.

Knowledge of Other Disorders and Diseases

Although few studies have investigated knowledge of ASD, there is an abundance of research on actual knowledge of other diseases and disorders. For example, a recent study examined individuals' knowledge of attention-deficit hyperactivity disorder (ADHD), a neurodevelopmental disorder in the same category as ASD (APA, 2013). Similarly to ASD, awareness of ADHD is increasing, as is the concern that incomplete or erroneous knowledge of ADHD may contribute to mistakes in identification of the disorder in children (Sciutto & Feldhamer, 2005). The Knowledge of Attention Deficit Disorders Scale (KADDS) was designed to evaluate knowledge of ADHD in three domains: associated features, symptoms and diagnosis, and treatment. Additionally, the KADDS was designed to identify genuine lack of knowledge versus incorrect beliefs about ADHD. A variety of factors correlated with higher scores of knowledge on the KADDS, including exposure to children with ADHD as well as ADHD training. In fact, as amount of exposure to individuals with ADHD (e.g., teachers who had experience with a higher number of students with ADHD) increased, knowledge scores on the KADDS also increased. No known research has linked knowledge of ASD to knowledge of other psychological disorders; however, conceptually it makes sense that people who have high ASD knowledge would also be highly knowledgable about ADHD. Both are neurodevelopmental disorders (APA, 2013), and there is a fairly high rate of comorbidity between the two disorders (33-78%; Klinger et al., 2014).

In addition to psychological disorders, a number of studies have explored knowledge of medical diseases. One recent study (Sutton et al., 2011) used an online survey consisting of a mix of *True* or *False* and multiple choice questions to investigate knowledge and perceived risk of human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) on historically Black college and university campuses. Whereas the majority of students (82%) had average or high scores on the HIV/AIDS knowledge scale, they often perceived themselves as being at low risk of contracting the disease, despite engaging in practices that increased their risk (e.g., inconsistent condom use, multiple sexual partners). This study stressed the importance of translating general knowledge into a practical application to identify risk factors. Again, no known previous literature has examined the relation between ASD and knowledge of medical diseases. Theoretically, general knowledge of psychiatric and medical disorders should be fairly consistent for a given individual. It follows that it could be expected that individuals who have moderate or high knowledge of ASD will also be more knowledgable about HIV/AIDS.

Self-efficacy

Another factor that may impact perceived knowledge of ASD is self-efficacy. Self-effiacy is the confidence one possesses regarding the ability to control their behavior and social environment (Bandura, 1990). Research has shown that self-efficacy is related to a wide variety of people's beliefs and actions, including how much effort they put forth, what they choose to do in a given situation, and how much stress and depression they experience in demanding situations (Bandura, 1990). Low self-efficacy leads to a decreased ability to respond appropriately to situations, even when an individual possesses the necessary skills. In a recent study, researchers examined the relation

between self-efficacy and ADHD knowledge in a sample of teachers. Self-efficacy was negatively correlated with actual knowledge of ADHD, indicating that teachers with average or high knowledge levels reported feeling less confident in their knowledge of ADHD (Graeper, 2011).

Research has shown that having higher perceived self-efficacy influences a variety of factors, including how much effort and persistence an individual puts forth when challenged (Zimmerman, Bandura, & Martinez-Pons, 1992). One study found that students with higher self-efficacy and perceived capacity to self-regulate were more confident in their abilities to master academic topics and achieve higher academic goals (Zimmerman, Bandura, & Martinez-Pons, 1992), suggesting that self-efficacy may play a role in individual's perceived performance in academic domains. Theoretically, individuals with low or average actual knowledge but high self-efficacy should have higher levels of perceived knowledge.

Current Study

As evidenced by the studies outlined above, studies regarding knowledge of ASD have primarily focused on knowledge among those in the educational field, given that knowledge of ASD can have strong implications in academic settings (Williams et al., 2011). The current study consists of two studies: Study 1 (Pilot Study) and Study 2 (ASK-ASD Measure Development). The primary purpose of Study 1 was to evaluate perceived knowledge of ASD, actual knowledge of ASD, and the relation between the two types of knowledge in an undergraduate population. Study 1 also examined the correlations between levels of perceived and actual knowledge and demographic characteristics such as gender, ethnicity, and whether or not the participant had children.

Additionally, Study 1 also investigated whether having a relationship with an individual with ASD or participating in ASD training would relate to perceived or actual knowledge of ASD.

The goals of Study 2 were to develop and assess the reliability and validity of a new measure, *A Survey of Knowledge of Autism Spectrum Disorder (ASK-ASD)*, to evaluate both the perceived and the actual knowledge among individuals regarding autism spectrum disorder (ASD). This measure was designed to be useful in a variety of contexts, including academic, clinical, and community settings. In addition, the Study 2 investigated how various factors may relate to one's knowledge of ASD, including a personal relationship with an individual with ASD and participation in training in ASD. Measures of knowledge of both another psychological disorder (i.e., ADHD) as well as a medical disease (i.e., HIV/AIDS) were administered to participants to evaluate how knowledge in these other areas may correlate with knowledge of ASD. Finally, participants' self-efficacy was evaluated to determine if level of self-efficacy moderates the relation between perceived and actual knowledge of ASD.

Hypotheses for Study 2

It was hypothesized that an individual's score on the ASK-ASD would be a reliable, valid way to evaluate that individual's perceived and actual knowledge of ASD. Specifically, it was expected that five distinct factors (based on the five homogenous item composites used to generate the pool of test questions) would emerge in a factor analysis indicating knowledge in diagnosis, etiology, epidemiology, prognosis/treatment, and symptomology (Hypothesis 1). It was also expected that each of the subscales as well as a total knowledge scale would be internally consistent (Hypothesis 2a) and demonstrate test-retest reliability (Hypothesis 2b). As evidence of construct validity, it was expected

that individuals who had received training on ASD (Hypothesis 3a), as well as individuals who had experience with an individual with ASD (Hypothesis 3b), would have higher levels of both perceived and actual knowledge of ASD.

As evidence of convergent validity, it was predicted that the ASK-ASD total scale would be moderately positively correlated with an established measure of knowledge regarding another psychological disorder, specifically ADHD (Hypothesis 4). Likewise, the ASK-ASD was hypothesized to be moderately positively correlated with a measure of knowledge of a medical disease, specifically HIV/AIDS (Hypothesis 5). However, it was predicted that the magnitude of the correlation between the ASK-ASD and the measure of ADHD knowledge would be stronger than the magnitude of the correlation between the ASK-ASD and the HIV/AIDS knowledge survey, because both ADHD and ASD are neurodevelopmental disorders that develop during childhood (Hypothesis 6). It was also predicted that perceived knowledge on the ASK-ASD would be positively correlated with actual knowledge on the ASK-ASD (Hypothesis 7). Furthermore, an exploratory curve estimation regression analysis was conducted to determine if the relation between perceived and actual knowledge was linear or curvilinear.

Additionally, it was hypothesized that self-efficacy would moderate the relation between perceived knowledge of ASD and actual knowledge of ASD (Hypothesis 8). Specifically, it was expected that higher self-efficacy would attenuate that relation. Finally, exploratory analyses examined whether perceived knowledge or actual knowledge varied based on demographic factors (e.g., age, gender, whether individuals have children; Research Question 1).

CHAPTER II

METHOD

Study 1: Pilot Study

Participants

The pilot study sample was comprised of 57 undergraduate students attending a university in southern Mississippi. Participants ranged in age from 18 to 58 years (M = 23.98, SD = 9.31). A total of 86% of the participants were female. Additional descriptive characteristics are presented in Table 1. Participants were recruited through SONA, an online system used to recruit students for research studies, and received 0.5 SONA credit for their time.

Table 1

Sample Statistics for Study 1

Participant characteristics	N = 57
Age	M (SD) 23.98 (1.23)
	N (%)
Gender	
Female	49 (86%)
Male	7 (14%)
Ethnicity	
White	34 (59.6%)
African-American	20 (35.1%)
Latino	2 (3.5%)
Other	1 (1.8%)
Psychology Majors	22 (38.6%)
Participants with children	9 (15.8%)
Participants with ASD experience	15 (26.3%)
Participants with ASD training	4 (7%)

Measures

Demographic form (Appendix A). Participants completed a demographic form to gather information such as age, gender, race, whether or not they have children, etc. It also contained questions regarding the individual's experience with ASD (i.e., whether or not they have participated in ASD training or have experience interacting with an individual with ASD).

ASD perceptions scale (Appendix B). The ASD perceptions scale contained 10 Likert-scale items, with responses ranging from *1-Strongly Disagree* to *5-Strongly Agree*. Two items were general, psychology related statements (e.g., "I hope to have a career in psychology). The other eight statements were written to capture perceived knowledge of specific areas of ASD. For example, "I am knowledgeable about what causes ASD," was used to determine the participant's perceived knowledge of etiology of ASD. In the pilot study, the alpha coefficient for the ASD perceptions scale was .93.

ASD knowledge scale (Appendix C). The ASD Knowledge scale was developed for the pilot study. It contained 25 statements to which participants responded *True*, *False*, or *Don't Know*. Statements were chosen through a thorough literature review. To ensure that the items chosen captured a range of ASD knowledge, an equal number of items fell within each of five homogenous item composites (HICs): prognosis/treatment, epidemiology, diagnosis, symptoms, and etiology. In the pilot study, the ASD knowledge scale alpha coefficient was .61.

Procedure

After obtaining Institutional Review Board (IRB) approval, participants were recruited through SONA to participate in the study. Following informed consent, each participant was administered the demographic form, the ASD perceptions scale, and then

the ASD knowledge scale, which took approximately 15-20 minutes total. All measures were completed online using Qualtrics, a web-based survey creation platform.

Results of Study 1

For perceived knowledge, all calculations were conducted using the eight ASD-specific items from the ASD perceptions scale. Descriptive statistics are presented in Table 2. Overall, participants perceived themselves to be averagely knowledgable (M = 2.90, SD = .94, N = 57). The ASD perceptions scale was highly internally consistent, α = .93. Participants were moderately (64%) accurate on average across the ASD knowledge scale when they believed they were knowledgeable enough to answer. The alpha coefficient for the ASD knowledge scale was .61; however, because of the *Don't Know* responses, this value was calculated with N = 15. Participants responded *Don't Know* an average of 27% of the time, with a range of 9% to 43% across all 57 participants. Across all 25 items, *Don't Know* was the response 15% of the time. When the *Don't Know* response on the ASD knowledge scale was recoded as incorrect, participants were accurate 45% of the time.

Table 2

Scale and Subscale Descriptive Statistics (Study 1)

Scale	Scale *N*	*M*	*SD*	Cronbach's Alpha
Perceived Knowledge Total	57	2.90	.94	.93
Actual Knowledge Total	52	.64	.15	.61
ASD Knowledge-Epidemiology	43	.70	.31	--
ASD Knowledge-Diagnosis	50	.68	.30	--

Table 2 (continued).

Scale	Scale *N*	*M*	*SD*	Cronbach's Alpha
ASD Knowledge-Etiology	51	.62	.24	--
ASD Knowledge-Symptoms	52	.65	.18	--
ASD Knowledge-Prognosis/treatment	49	.63	.28	--

Note: ASD = autism spectrum disorder. The "Don't Know" option led to a large number of missing values, thus the alpha coefficients were not given for subscales of actual knowledge.

Exploratory analyses revealed several interesting correlations between perceived knowledge, actual knowledge, and several demographic characteristics (Table 3). Notably, actual knowledge was not significantly correlated with perceived knowledge, $r = -.11$, $p = .45$. Ethnicity was positively correlated with knowledge of prognosis/treatment, $r = .40$, $p = .003$, and symptoms, $r = .40$ $p = .01$, indicating White individuals scored significantly higher than non-White individuals on these item composites. Participants who had training or experience had significantly higher perceived knowledge, $r = .29$, $p = .03$; $r = .28$, $p = .04$, but did not score higher on the the actual knowledge scale.

Table 3

Correlations between ASD Knowledge and Demographic Information (Study 1)

	Gender	Children	Ethnicity	Training	Experience
ASD Perceptions Total Scale	-.80	.21	.14	.29*	.27*
ASD Knowledge Total Scale	-.13	.21	-.36**	.33*	.07
ASD Knowledge-Epidemiology	-.11	.13	.07	-.03	.02
ASD Knowledge Diagnosis	-.07	.28*	-.02	.19	.20

Table 3 (continued).

	Gender	Children	Ethnicity	Training	Experience
ASD Knowledge-Etiology	-.06	.01	-.12	.17	-.10
ASD Knowledge-Symptoms	.002	.09	-.60***	.27†	.13
ASD Knowledge-Prognosis/treatment	-.18	.18	-.34*	.18	-.06

Notes. ASD = autism spectrum disorder. Gender was recoded as female = 1, male = 0; Children was recoded as having children = 1, not having chin = 0; Ethnicity was recoded as nonwhite = 1, white = 0; training was recoded as having participated in training = 1, not having participated in training = 0; experience was recoded as having experience with an individual with ASD = 1, not having

†trend, $p < .10$. * $p < .05$. ** $p < .01$.*** $p < .001$.

A curve estimation regression analysis was used to determine if the relation between perceived and actual knowledge was curvlinear, given the findings by Park et al. (1988); however, the amount of variance in actual knowledge attributable to perceived knowledge was not significant for either the linear model (as also shown in the correlation above), $R^2 = .002$, $F(1, 47) = .09$, $p = .76$, or the quadratic model, $R^2 = .004$, $F(2, 46) = .10$, $p = .91$. Therefore, there was no evidence of a curvlinear relation.

Discussion of Study 1

The primary objective of study 1 was to examine the level of perceived versus actual knowledge possessed by undergraduate students regarding ASD. Researchers also assessed how other factors, such as having children or having undergone ASD training, may relate to knowledge of ASD. In general, students were moderately knowledgable about ASD, and rated themselves to be at the mean of the scale of perceived knowledge. However, actual knowledge and perceived knowledge were not significantly correlated, indicating that participants were not able to accurately evaluate their actual levels of ASD knowledge.

When examining the impact of other factors on knowledge, there were several interesting correlations. For example, participants with children had higher levels of knowledge of diagnosis, compared to those without children, indicating that parents may be more likely to seek out information about ASD. Additionally, participants who had received ASD training were significantly more knowledgable overall compared to individuals who had not undergone training. The results of study 1 underscore the need for a consistent measure to evaluate actual knowledge, as well as perceived knowledge, of ASD (including determing variables that may predict knowledge of ASD).

In conclusion, participants were moderately knowledgeable regarding ASD. However, the measure design of study 1 excluded assessment of actual knowledge when participants did not think they knew the answer and, thus, selected the *Don't Know* option. Similar to the findings by Baxley and colleagues (1997) regarding nurses' knowledge of diabetes mellitus, actual knowledge was not significantly correlated with perceived knowledge. These findings underscore that training may relate to knowledge, although further research is needed to determine whether training is associated with actual knowledge. Likewise, the findings suggest further examination of the relation between ethnicity, as well as other potential demographic variables, and indicate that both perceived and actual knowledge should be considered. Because participants selected *Don't Know* at a relatively high rate (average of 27% across items), it appears that eliminating such an option would allow a measure to better capture actual knowledge. Finally, the lack of relation between perceived and actual knowledge may have been due to the way pereived knowledge was operationalized for the pilot study. That is, the more global assessment of perceived knowledge may not have been sufficiently sensitive, and it could have been that an assessment of perception of knowledge for specific content

items about ASD would more closely relate to actual knowledge about those content items. The ASK-ASD was designed with these modifications in place based on the pilot study findings.

Study 2: ASK-ASD Measure Development

Participants

The ASK-ASD was administered to a large sample ($N = 487$) of undergraduate students at The University of Southern Mississippi. Demographic characteristics are presented in Table 4. Participants were recruited through SONA, an online system used to enlist USM students for research studies. The study was conducted in two phases: the first pool of participants took the full test battery (discussed below). These participants received 0.5 SONA credits, which could be used for required course credit or extra credit for undergraduate psychology courses (depending on the courses in which students are enrolled). A subsample of participants ($N = 64$) who indicated they were willing to do so took only the ASK-ASD again two weeks later and received an additional 0.5 SONA credits.

Table 4

Sample Statistics for Study 2

	M (*SD*)
Age	23.98 (1.23)
	N (%)
Gender	
Female	49 (86%)
Male	7 (14%)
Ethnicity	
White	34 (59.6%)
African-American	20 (35.1%)
Latino	2 (3.5%)
Asian	--
Other	1 (1.8%)

Table 4 (continued).

	N (%)
Psychology Majors	22 (38.6%)
Participants with children	9 (15.8%)
Participants with ASD experience	15 (26.3%)
Participants with ASD training	4 (7%)

Measures

Demographic form (Appendix D). Participants were administered a demographic form to gather information such as age, gender, race, whether or not they have children, etc. It also contained questions regarding the individual's experience with ASD (i.e., whether or not they have received training on ASD or have had a personal relationship with an individual with ASD). Finally, it assessed each participant's primary sources of information regarding ASD (e.g., first-hand experience, popular media).

A Survey of Knowledge of Autism Spectrum Disorder (ASK-ASD; Appendix E*).* This measure was developed for the current study. Whereas the ASD knowledge scale from study 1 informed the creation of the item pool, items on the ASK-ASD were generated in a separate, distinct process. The initial item pool contained 51 true or false questions, each of which fell into one of five homogenous item composites: etiology, epidemiology, symptoms, diagnosis, and prognosis/treatment. These areas were chosen to ensure that the item pool adequately defined all aspects of ASD, and were chosen after conducting an extensive literature review.

Six experts with advanced degrees from a variety of areas, including clinical child psychology, school psychology, occupational therapy, and physical therapy, assessed the item pool for precision of language, relevance, and comprehensiveness. The final version

of the ASK-ASD was modified (in terms of item inclusion and content) based on the expert reviewer feedback. In particular, experts recommended that wording be changed on several items to make them more clear and concise, as well as to lower the overall reading level of the measure. Experts also suggested additional items to ensure the measure adequately captured knowledge of ASD. Two items were added to the item pool, and two were eliminated based on expert feedback (resulting in a net of 51 items); additionally, the wording on nearly all of the items was changed to improve the readability and consistency of the measure.

For each participant, the questions on the ASK-ASD were randomly presented via a random presentation setting in Qualtrics. After indicating whether each statement was *True* or *False*, participants rated their confidence in each answer on a Likert scale, with answers: 1-*Not At All Confident*, 2-*Confident*, and 3-*Very Confident*. This format allowed the researcher to capture the actual knowledge and perceived knowledge of each participant at the item level. The readability of the final item pool of the ASK-ASD was assessed on the Flesch-Kincaid readability index (Microsoft Word 2010). The reading ease score was 48.1 out of 100, and the grade level was rated at 9.8, indicating that the ASK-ASD may be administered to a general audience of adults.

As noted earlier, several modifications based on the pilot study were applied to the ASK-ASD, allowing the latter measure to collect the full range of knowledge based on all items. Participants were not allowed to skip items, and the only response choices were *True* or *False* (*Don't Know* was elimintaed). Furthermore, the format of assessing perceived knowledge at a more global level, which was used in the pilot study, may have precluded the ability to find a significant correlation between perceived and actual knowledge about ASD.

The combination of perceived and actual knowledge into a single measure, with participants responding to each item as *True* or *False* (i.e., to measure actual knowledge), then estimating their confidence in each individual rating on a Likert scale (i.e., to measure perceived knowledge), increased the precision with which perceived and actual knowledge could be evaluated.

The Knowledge of Attention Deficit Disorders Scale (KADDS). The KADDS (Sciutto & Feldhamer, 2005) is a 39-item rating scale developed for an adult, non-ADHD population, which is analogous to the target population of the ASK-ASD. Each item is a statement, which can be designated as *True*, *False*, or *Do not know*. The KADDS is comprised of three subscales of ADHD: symptoms/diagnosis, treatment/medication, and associated features. The KADDS total scale can also be calculated and was used for all statistical analyses in the current study. Administration of this measure allowed for evaluation of the validity of the ASK-ASD when compared to another measure of knowledge about a psychiatric, neurodevelopmental disorder. The KADDS has demonstrated reliability and validity, with a reported coefficient alpha of .81 (ranging from .80 to .90 across five studies; Sciutto & Feldhamer, 2005). In the measure development study, the three subscales were found to be moderately consistent, with alpha scores ranging from .52 to .75. Test-retest correlation scores for the total scale and subscales were moderate to high, ranging from $.59 < r < .76$ (Sciutto & Feldhamer, 2005). When evaluated for readability as part of the current study, the KADDS was assessed as 40.8 out of 100 on the Flesch-Kincaid readability index (Microsoft Word 2010). The grade level was rated as 11.5. In the current study, the alpha coefficient for the KADDS was .86.

HIV/AIDS Knowledge scale. The HIV/AIDS knowledge scale (Sutton et al., 2011) measured the level of knowledge possessed by undergraduate students regarding HIV/AIDS. It is a unidimensional scale consisting of 15 items: 12 *True* or *False* questions, and 3 multiple-choice questions. In the original study, HIV/AIDS knowledge scale was found to be reliable, with Cronbach's alpha greater than .70 for all subscales and the total scale. Content validity was established by examining other HIV/AIDS knowledge scales, specifically those created to target college students. In the original study, the measure contained two subscales: (1) general HIV knowledge and (2) applied knowledge (e.g., safe sex practices, beliefs). For the current study, the total scale score was used for all statistical analyses. Additionally, as part of the current study, the HIV/AIDS Knowledge scale was assessed as 62.5 out of 100 on the Flesch-Kincaid readability index (Microsoft Word 2010), and the grade level was evaluated as 6.8. The alpha coefficient for the current sample was .39.

The General Self-Efficacy Scale (GSE). The GSE (Schwarzer & Jerusalem, 1995) was created to evaluate perceived self-efficacy, particular coping with daily tasks and stressors. The scale was designed for use with a general adult population. It is a unidimensional scale consisting of 10 items, each of which can be rated on a 4-point Likert scale from 1-*Not at all true* to 4-*Exactly true*. The GSE is highly reliable, with Cronbach's alphas from a 23-nation sample ranging from .76 to .90. Numerous studies (e.g., Schwarzer & Jerusalem, 1995) have found that this scale has strong criterion-related validity, with significant positive correlations with extraversion, action orientation, and hope for success, as well as significant negative correlations with neuroticism and fear of failure. In the current sample, the GSE had an alpha coefficient of .86, indicating high reliability.

Procedure

After obtaining IRB approval (see Appendix I), a large heterogeneous sample (*N* = 530) was recruited through SONA to be used for the factor analysis as well as the validity and reliability analyses. In phase one, each participant was administered five measures: the demographic form, the ASK-ASD, the KADDS, the HIV/AIDS knowledge scale, and the GSE. Participants were credited 0.5 points in SONA for completion of phase one. Participants who consented to be notified to take the second phase were given a link to the survey two weeks after completion of phase I, and were given one week to complete the survey. Participants who completed phase II received an additional SONA credit (0.5 points) for participation. All participants completed the measures online using Qualtrics, a web-based survey creation platform, for both phases. For quality assurance, bogus items (e.g., "Please answer this question as *True* and *1-Not at all confident*") and time limits were used to ensure students read each item carefully and discourage careless responding. Participants who failed to answer bogus questions correctly or took less than 60 seconds to complete a measure did not receive credit for participating (Dahlen, 2015).

CHAPTER III

RESULTS

Preliminary Analyses

Prior to beginning analysis, all participants with missing values ($N = 43$) were deleted. This included participants who failed to complete the ASK-ASD, as it was required for participants to complete the ASK-ASD before responding to the other measures. After cleaning the data and determining there were no outliers or impossible values, *True*/*False* items on the ASK-ASD, the KADDS, and the HIV/AIDS knowledge scale were recoded as 1 = *correct* and 0 = *incorrect*. On the KADDS, *Don't Know* was also recoded as incorrect, per the recoding procedures described in the KADDS manual (Sciutto and Feldhamer, 2005). Missing values were recoded as -99. Before beginning the Exploratory Factor Analysis (EFA) described below, recoded items on the ASK-ASD were analyzed using an item analysis. The statistics for the initial item pool, including corrected item-total correlations, are presented in Appendix F. Eight items with negative corrected item-total correlations were deleted, leaving an item pool of 43. Descriptive statistics for all measures, including the finalized ASK-ASD, are included in Table 5.

Exploratory Factor Analysis

A factor analysis was conducted with the remaining 43 items to determine the factor structure of the ASK-ASD. Prior to beginning the factor analysis, data were analyzed using a scree plot, parallel analysis, and minimum partial analysis (MAP) to determine how many factors to extract for the solution. The factors from the parallel analysis were generated using principle component analysis. The scree plot provided no clear recommended factor number. The parallel analysis generated a six-factor structure based on principle component analysis. The MAP analysis recommended a two-factor

Table 5

Descriptive Statistics and Reliability of measures used in Phase I (Study 2)

	Scale	Number of Items per Scale	*M*	*SD*	Potential Range	Actual Range	Skewness	Kurtosis	Cronbach's Alpha
ASK-ASD Actual Knowledge	Total Scale	28	.72	.13	0-1	.32-1.0	-.26	-.20	.61
	PRFS	12	.66	.23	0-1	0-1	-.49	-.19	.57
	GFS	16	.73	.18	0-1	0-1	-.67	.63	.61
ASK-ASD Perceived Knowledge	Total Scale	28	1.78	.35	1-3	1-3	-.04	.02	.91
	PRFS	12	1.76	.38	1-3	1-3	.08	-.17	.80
	GFS	16	1.89	.39	1-3	1-3	-.09	-.19	.86
Other Measures	KADDS Total Scale	39	.39	.18	0-1	0-.82	-.32	-.30	.86
	HIV/AIDS Total Scale	15	.77	.08	0-1	.34-.97	-.80	1.78	.39
	Self-Efficacy Total Scale	10	3.08	.46	1-4	1-4	-.47	1.25	.86

Note. ASK-ASD = A Survey of Knowledge of Autism Spectrum Disorder; PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale.; KADDS = The Knowledge of Attention Deficit Disorders Scale; HIV = human immunodeficiency virus; AIDS = acquired immunodeficiency syndrome. Gender was coded as female = 1, male = 0; Ethnicity was coded as nonwhite = 1, white = 0; children was coded as having children = 1, not having children = 0; experience was coded as having experience with an individual with ASD = 1, not having experience = 0; training was coded as having participated in training = 1, not having participated in training = 0; for correlations involving actual or perceived knowledge, $N = 487$; KADDS, $N = 483$; HIV/AIDS knowledge, $N = 481$; self-efficacy, $N = 480$.

structure. After examining 2, 3, 4, 5, and 6 factor structures, the two-factor structure was retained as it attained simple structure with the fewest item deletions. All analyses were conducted using the software program M-Plus (Muthén & Muthén, 1998-2011), using an oblique geomin rotation and the weighted least squares means and variance adjusted (WLSMV) estimator. Because data were dichotomous but assumed a continuous, underlying latent variable, tetrachoric correlations were used for all analyses (Muthén & Hofacker, 1988). Factors with eigenvalues lower than 1 were not retained, and items with factor loadings lower than .3 were eliminated. Additionally, effect of deletion upon alpha and low item-total correlations were examined when determining which items to delete. In all, 28 items remained in the final solution (23 items were deleted).

Although it was hypothesized that the EFA would reveal a five-factor structure (based on the five HICs in the original item pool), two factors emerged as part of the EFA. Factor 1 contained 12 total items related to ASD prognosis, as well as risk factors for ASD. This factor was named Prognosis/Risk Factors Subscale (PRFS), and had an alpha coefficient of .58. Factor 2, named General Features Subscale (GFS), contained 16 items, each related to general characteristics of diagnosis, prognosis, treatment, etiology, and epidemiology of ASD. The alpha coefficient for the GFS was .62.The two factors were not inter-correlated, $r(487) = -.04$, $p = .41$, and were therefore considered to capture distinct aspects of the construct, ASD knowledge.

To summarize, a total of 28 items remained on the ASK-ASD. From these items, two factors emerged: Prognosis/Risk Factors and General Features. The final version of the scale had a Flesch-Kincaid reading level of 10.0 and a Flesch Reading ease score of 45.9. The finalized factor structure of the ASK-ASD is presented in Table 6. Item statistics for the finalized measure are in Appendix G.

Table 6

Factor Structure of ASK-ASD

Question Number	Factor 1 Loading	Factor 2 Loading	Question Text
2	**0.42**	0.13	Because of their lower social awareness, children with ASD/autism rarely have anxiety disorders.
5	0.08	**0.49**	One common treatment for ASD/autism is Applied Behavior Analysis.
6	**0.39**	-0.04	If a teacher believes a student has ASD/autism, he or she can give an initial diagnosis.
7	-0.07	**0.40**	About 75% of individuals with ASD/autism also meet criteria for obsessive-compulsive disorder.
9	-0.17	**0.36**	Many scientists believe that ASD/autism is a product of uneven brain development.
10	**0.30**	-0.04	There is a specific gene that can be used to identify ASD/autism.
13	-0.02	**0.38**	Studies estimate the prevalence of ASD/autism in children has risen about 30% since 2008.
18	-0.26	**0.42**	Problems at birth (e.g., fetal distress, breech presentation) have been linked to ASD/autism.
19	**0.34**	0.2	All individuals with ASD/autism have lower than average IQs.
20	**0.63**	0	Large-scale studies support a link between season of birth and ASD/autism.
21	**0.78**	0.08	ASD/autism is contagious.

Table 6 (continued).

Question Number	Factor 1 Loading	Factor 2 Loading	Question Text
23	**0.52**	-0.04	Children with diets higher in sugars and processed foods show an increased risk of developing ASD/autism.
24	0.01	0.61	Individuals with ASD/autism often engage in restrictive, repetitive behaviors (e.g., lining up cars, strictly adhering to schedules).
25	0.09	**0.39**	At one time, scientists believed ASD/autism was caused by lack of parental interest and motherly warmth.
27	-0.12	**0.59**	An ASD/autism diagnosis is often based on parental interviews and observations of behavior.
29	**0.38**	0.27	With support, therapy, and medication, ASD/autism can be cured.
30	0.02	**0.33**	Early intervention can alleviate symptoms of ASD/autism and lead to improvements in IQ, language, and social behaviors.
32	**0.49**	-0.03	There is strong evidence for low income as a risk factor for ASD/autism.
33	-0.08	**0.40**	ASD/autism is nearly five times as likely to occur in boys as girls.
34	0.09	**0.50**	A common initial concern of ASD/autism is failure to develop language.
36	-0.21	**0.35**	Children with older parents have a higher risk of developing ASD/autism.
39	**0.48**	0.05	Adults can never be diagnosed with ASD/autism.

Table 6 (continued).

Question Number	Factor 1 Loading	Factor 2 Loading	Question Text
40	-0.03	**0.44**	An individual can be diagnosed with both ASD/autism and intellectual disability (previously known as mental retardation).
42	**0.47**	0.15	ASD/autism can be fatal over time.
43	-0.08	**0.37**	About 25% of individuals with ASD/autism remain nonverbal throughout their lives.
45	**0.47**	-0.1	Most evidence suggests ASD/autism can be caused by vaccines.
48	0.03	**0.66**	An early symptom of ASD/autism is a failure to attend to facial expressions, gestures, and speech.
49	0.27	**0.53**	Individuals with ASD/autism have difficulty interacting socially.

Note. Bold face and underscore indicates primary component loadings. for each item.

Internal Consistency

To test Hypothesis 2, reliability was assessed two ways: internal consistency and temporal stability. Internal consistency for the total actual knowledge scale, total perceived knowledge scale, and the two subscales within both actual knowledge and perceived knowledge was evaluated using Cronbach's alpha. For actual knowledge, alpha scores ranged from .57 to .61 for the total scale and subscales. Although lower than anticipated, these alpha coefficient values fall within the acceptable range for early stages of research of a construct (Nunnally, 1978). Additionally, intra-class correlation coefficients (ICCs) were calculated between each of the subscales and the total scale to further examine internal consistency (Table 7). Average measures ICCs between the

actual knowledge total scale and subscales were moderately reliable, ranging from .68 to .77 ($p < .001$). While the ICC between actual knowledge factor 1 (PRFS) and factor 2 (GFS) was significant, it was extremely small, $r(486) = .17$, $p = .02$, offering further support for the distinct nature of these two factors of actual knowledge. For perceived knowledge, ICCs between total scale and subscales, as well as between subscales, ranged from .85 to .96 ($p < .001$), indicating these scales were highly reliable.

Table 7

Intraclass Correlation Coefficients for Actual Knowledge and Perceived Knowledge (Study 2)

		Actual Knowledge			Perceived Knowledge		
		ASK-ASD Total Scale	ASK-ASD PRFS	ASK-ASD GFS	ASK-ASD Total Scale	ASK-ASD PFRS	ASK-ASD GFS
Actual Knowledge	ASK-ASD Total Scale	--	.77***	.68***	.24**	.22†	.27***
	ASK-ASD PRFS		--	.17**	.13†	.26**	.08
	ASK-ASD GFS			--	.28***	.11	.37***
Perceived Knowledge	ASK-ASD Total Scale				--	.94***	.96***
	ASK-ASD PRFS					--	.85***
	ASK-ASD GFS						--

Note. ASK-ASD = A Survey of Knowledge of Autism Spectrum Disorders; PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. All analyses were conducted with $N = 487$.

†trend, $p < .10$. * $p < .05$. ** $p < .01$.*** $p < .001$.

Temporal Stability

Descriptive statistics for the retest administration of the ASK-ASD are presented in Table 8. To evaluate temporal stability, bivariate correlations (Table 9) were calculated between the first and second administrations, providing a test-retest coefficient for both

Table 8

Descriptive Statistics and Reliability of ASK-ASD, Phase II (Study 2)

	Scale	*M*	*SD*	Potential Range	Actual Range	Skewness	Kurtosis	Cronbach's Alpha
Actual Knowledge	Total Scale	.65	.10	0-1	.37-.86	-.37	-.74	.65
	PRFS	.80	.14	0-1	.31-1.00	-.71	.64	.58
	GFS	.74	.20	0-1	0-1.00	-1.30	2.11	.67
Perceived Knowledge	Total Scale	1.80	.41	1-2.98	1-3	.44	.43	.94
	PRFS	1.78	.45	1-3	1-3	.45	.51	.86
	GFS	1.92	.45	1-3	1-3	.45	.09	.80

Note. PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. All analyses were conducted with $N = 64$.

Table 9

Bivariate Correlations for Actual and Perceived Knowledge Test-Retest Analysis

		Time 2					
		Total Actual Knowledge	Actual Knowledge PRFS	Actual Knowledge GFS	Total Perceived Knowledge	Perceived Knowledge PRFS	Perceived Knowledge GFS
Time 1	Total Actual Knowledge	.63***	.36**	.59***	.25*	.23†	.24†
	Actual Knowledge PRFS	.58***	.48***	.39**	.15	.19	.10
	Actual Knowledge GFS	.47***	.13	.58***	.26*	.18	.30*
	Total Perceived Knowledge	.34**	.14	.37**	.69***	.67***	.65***
	Perceived Knowledge PRFS	.29*	.17	.26*	.66***	.72***	.55***
	Perceived Knowledge GFS	.33**	.10	.40**	.64***	.55***	.64***

Note. PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. All analyses were conducted with $N = 64$.

†trend, $p < .10$. * $p < .05$. ** $p < .01$.*** $p < .001$.

the individual subscales and the total scale. For both actual and perceived knowledge, all bivariate correlations between total scales at time 1 and time 2 were significant, $r(64) = .63$, $p < .001$; $r(64) = .69$, $p < .001$, respectively. Test-retest correlations at the item level for actual knowledge are presented in Appendix H.

Additionally, the change score between time 1 and time 2 was correlated with the amount of time elapsed between time 1 and time 2 to determine if time elapsed should be included in the model as a covariate. The change score and time elapsed were not significantly correlated $r(64) = .021$, $p = .86$, indicating time elapsed does not relate to the change in score between time 1 and time 2.

A paired-samples *t*-test also examined the difference between the first and second administration of the ASK-ASD. Both actual and perceived knowledge total scales and subscales were compared at time 1 and time 2. Total actual knowledge was significantly different from time 1 to time 2, $t(63) = -2.6$, $p = .01$. Additionally, actual knowledge factor 2 (GFS) was significantly different from time 1 to time 2, $t(63) = -4.31$, $p < .001$. The other 4 pairs were non-significant, indicating there was no significant change between the first and second administration for these scales and subscales (Table 10).

Table 10

Paired Sample t-tests, Administrations 1 and 2 (Study 2)

	Time 1	Time 2	*t*-value
	M (*SD*)	*M* (*SD*)	*t* (63)
Total Actual Knowledge	.74	.78	-2.60**
Actual Knowledge PRFS	.76	.74	.49
Actual Knowledge GFS	.73	.80	-4.31***

Table 10 (continued).

	Time 1	Time 2	*t*-value
	M (*SD*)	*M* (*SD*)	*t* (63)
Total Perceived Knowledge	1.88	1.83	1.02
Perceived Knowledge PRFS	1.97	1.92	1.07
Perceived Knowledge GFS	1.81	1.78	.85

Note. PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. All analyses were conducted with $N = 64$.

** $p < .01$.*** $p < .001$.

Finally, as further evidence of the reliability of the measure, internal consistencies were reexamined by calculating the alpha coefficients for the subscales and the total scale from the second administration as another estimate of internal consistency of the measure (see Table 8). Alpha coefficients for total scale and subscales of actual knowledge for the second administration ranged from .58 to .67, indicating adequate reliability for this stage of measure development (Nunnally, 1978). For the second administration perceived knowledge total scale and subscales, alpha coefficients ranged from acceptable to excellent (.80 to .94). These alpha coefficients were consistent with the coefficients found in phase I of the study.

Validity

Construct Validity

To test Hypotheses 3a and 3b, construct validity was assessed by examining the factorial validity (discussed above). Construct validity was further investigated by correlating ASK-ASD total actual and perceived knowledge with a) participation in training in ASD and b) whether the participant had a personal relationship with an individual with ASD.

Actual knowledge (both total scale and subscales) was not significantly correlated with participation in ASD training. Perceived knowledge total scale was positively correlated with training, $r(487) = .10$, $p = .03$; however, the perceived knowledge subscales were not significantly correlated with training. The ASK-ASD actual and perceived knowledge total scale and subscales were all positively correlated with experience with an individual with ASD (see Table 11).

Table 11

Bivariate Correlations Between Actual Knowledge, Perceived Knowledge, Experience with ASD and ASD Training (Study 2)

	Experience	Training
Actual Knowledge Total Scale	.12**	-.04
Actual Knowledge PRFS	.10*	-.07
Actual Knowledge GFS	.09*	.03
Perceived Knowledge Total Scale	.22***	.10*
Perceived Knowledge PRFS	.17**	.07
Perceived Knowledge GFS	.24***	.09†

Note. PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. All analyses conducted with N = 487.

†trend, p <.10. * p < .05. ** p < .01.*** p < .001.

Convergent Validity

To assess hypotheses 4 and 5, convergent validity of the ASK-ASD was evaluated by examining the correlations between the ASK-ASD Total Actual Knowledge scale and the KADDS total scale; and the ASK-ASD Total Actual Knowledge scale and the

HIV/AIDS knowledge total scale. All correlations are found in Table 12. Both the HIV/AIDS knowledge total scale and the KADDS total scale were significantly correlated with the ASK-ASD total actual knowledge scale, $r(481) = .33$, $p < .001$; $r(487) = .31$, $p < .001$. However, contrary to Hypothesis 6, the correlation between the KADDS total scale and the ASK-ASD total actual knowledge scale was not higher than the correlation between the HIV/AIDS knowledge total scale and the ASK-ASD total actual knowledge scale. In fact, the HIV/AIDS knowledge scale had a slightly higher correlation with ASK-ASD total actual knowledge scale.

Table 12

Bivariate Correlations Among Total Scales on Different Measures: Test of Hypotheses 4, 5, and 7

	1	2	3	4	5	6	7	8	9
1. ASK-ASD Total Actual Knowledge Scale		.67***	.60***	.21***	.21***	.27***	.31***	.33***	.16***
2. ASK-ASD Actual Knowledge PRFS		--	-.04	.08†	.20***	.06	.18***	.22***	.14***
3. ASK-ASD Actual Knowledge GFS			--	.18***	.07	.26***	.21***	.24***	.06
4. ASK-ASD Perceived Knowledge Scale				--	.89***	.93***	.41***	.10*	.17***
5. ASK-ASD Perceived Knowledge PRFS					--	.74***	.38***	.11*	.19**
6. ASK-ASD Perceived Knowledge GFS						--	.41**	.11*	.13**
7. KADDS Total Scale							--	.15**	.07
8. HIV/AIDS Knowledge Total Scale								--	.19***
9. Self-Efficacy Total Scale									--

Note. ASK-ASD = A Survey of Knowledge of Autism Spectrum Disorders; PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. KADDS = The Knowledge of Attention Deficit Disorders Scale; HIV = human immunodeficiency virus; AIDS = acquired immunodeficiency syndrome. All analyses were conducted with N = 487.

†trend p <.10. * p < .05. ** p < .01.*** p < .001.

To further test Hypothesis 6, Steiger's (1980) method for comparing two dependent correlations (i.e., those sharing one common variable—total actual knowledge score on the ASK-ASD) was used to determine whether the magnitude of the correlation between the ASK-ASD and KADDS was greater than the magnitude of the correlation between the ASK-ASD and HIV/AIDS knowledge scale. The difference between the magnitudes of the correlations was not significant, $t(484) = .33$, $p = .74$, indicating the correlation between the HIV/AIDS Knowledge scale and the ASK-ASD total scale is not significantly higher than the correlation between the KADDS and the ASK-ASD total scale.

Perceived vs. Actual Knowledge

A bivariate correlation between perceived knowledge of ASD and actual knowledge of ASD for each subscale as well as the total scale was conducted to test Hypothesis 7 (Table 11). The ASK-ASD total actual knowledge score was positively correlated with the total perceived knowledge score, $r(487) = .21$, $p < .001$, as well as the perceived knowledge factor 1 (PRFS), $r(487) = .21$, $p < .001$, and perceived knowledge factor 2 (GFS), $r(487) = .27$, $p < .001$. Actual knowledge factor 1 (PRFS) was positive correlated with perceived knowledge factor 1 (PRFS), $r(487) = .20$, $p < .001$. Moreover, actual knowledge factor 2 (GFS) was positively correlated with perceived knowledge factor 2 (GFS), $r(487) = .26$, $p < .001$.

Given the hypothesized linear relations were significant, a curve estimation regression analysis was conducted to further examine the relation between total perceived and total actual knowledge. The amount of variance in actual knowledge attributable to perceived knowledge was significant for both the linear model (as also shown in the correlation in Table 11), $R^2 = .07$, $F(1, 485) = .34.57$, $p < .001$, and the quadratic model, $R^2 = .07$, $F(2, 484) = 19.11$, $p < .001$. The nature of the curve indicated that as perceived knowledge was higher, the trajectory of actual knowledge increased non-linearly (Figure 1).

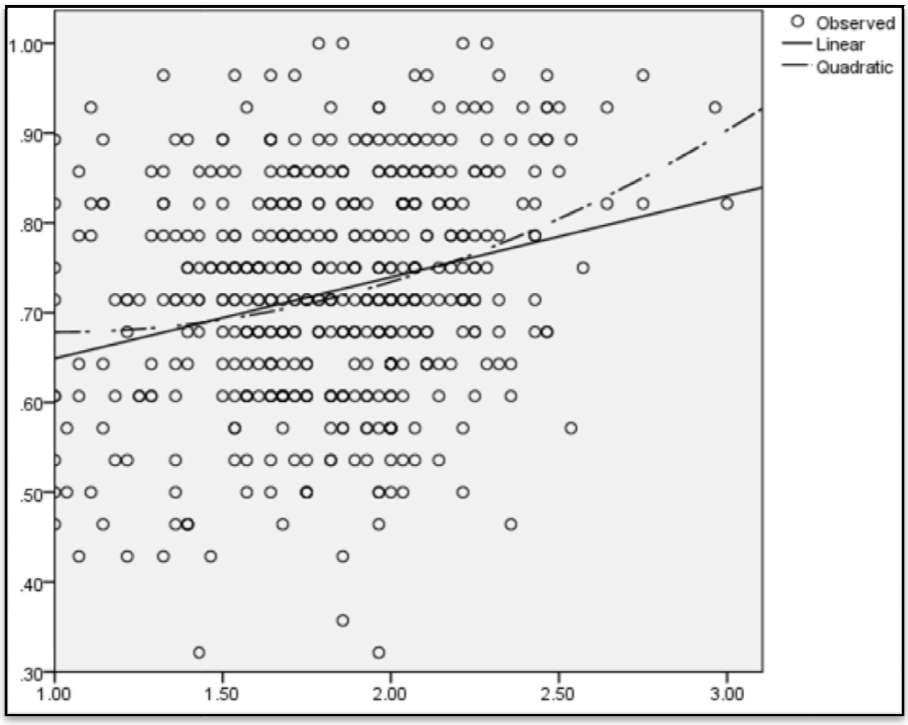

Figure 1. Curve estimation regression analysis of relation between perceived and actual knowledge.

Moderation

To examine self-efficacy as a moderator in the relation between perceived knowledge of ASD and actual knowledge of ASD (Hypothesis 8), data were analyzed using the computational tool PROCESS (Hayes, 2013), in SPSS. This tool automatically

centered continuous variables and created interaction terms. The outcome variable was actual knowledge, the independent variable was perceived knowledge, and the moderator was self-efficacy. The overall model was significant, $R^2 = .34$, F (1, 23) = 11.62, p = .002. Both self-efficacy, $B = .03$, $SE = .01$, $p = .005$, and total perceived knowledge, B = .07, $SE = .02$, $p < .001$, were indicated as significant predictors of total actual knowledge. However, the interaction model was not significant, indicating the interaction term did not add unique variance, $B = .06$, $SE = .03$, $p = .07$, $R^2 = .006$, F (1, 476) = 3.28.

Exploratory Analyses

Bivariate correlations were conducted between demographic variables (gender, race, age, having children) and total actual knowledge scale and subscales, as well as the total perceived knowledge scales and subscales. These correlations are presented in Table 13. Psychology majors scored significantly higher on the actual and perceived knowledge total scales than non-psychology majors, $r(487) = .15$, $p = .001$; $r(487) = .12$, $p = .01$, respectively. Consistent with the results of Study 1, ethnicity was negatively correlated with knowledge in that participants coded as “nonwhite” (i.e. participants who indicated an ethnicity other than White) scored lower than “White” participants. To further investigate this finding, the relation between ethnicity and experience with ASD was investigated; this was also negatively correlated, $r(520) = .14$ $p = .002$, indicating non-White participants have significantly less experience with individuals with ASD. Finally, gender was positively correlated with total actual knowledge scale and subscales, in that female participants scored significantly higher than male participants.

Table 13

Correlations between ASD Knowledge and Demographic Characteristics (Study 2)

	Gender	Ethnicity	Children
Actual Knowledge Total Scale	.15**	-.20***	-.03
Actual Knowledge PRFS	.09*	-.16***	.03
Actual Knowledge GFS	.12**	-.06	-.05
Perceived Knowledge Total Scale	-.08	-.08	-.03
Perceived Knowledge PRFS	-.11	-.07	-.05
Perceived Knowledge GFS	-.03*	-.13**	-.01

Notes. PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. Gender was recoded as female = 1, male = 0; Ethnicity was recoded as nonwhite = 1, white = 0; children was recoded as having children = 1, not having children = 0; experience was recoded as having experience with an individual with ASD = 1, not having experience = 0; training was recoded as having participated in training = 1, not having participated in training = 0; for correlations involving actual or perceived knowledge, N = 487.

* $p < .05$. ** $p < .01$.*** $p < .001$.

Additionally, total actual and perceived knowledge total scales and subscales were correlated with source of ASD information. These correlations are presented in Table 14. Total actual knowledge was positively correlated with firsthand knowledge, acquaintances, popular media, professional/scientific sources, and other sources, with correlations ranging from .10 to .23. Moreover, total perceived knowledge was positively with firsthand knowledge, acquaintances, and professional/scientific sources, with correlations ranging from .13 to .27. Conversely, participants who said "no source" scored significantly lower across total scale and subscales for both actual knowledge, r = -.20, $p < .001$, and perceived knowledge, r = -.16, $p < .001$).

Table 14

Exploratory Bivariate Correlations Between Total Scales, Subscales, and Different Sources of Knowledge (*Study 2)*

	Firsthand Knowledge	Acquaintance	Popular Media	Professional/ Scientific Sources	No source	Other source
Actual Knowledge Total Scale	.10*	.16***	.10*	.23***	-.20***	.11*
Actual Knowledge PRFS	.06	.17**	.05	.17***	-.14**	.11*
Actual Knowledge GFS	.07	.02	.07	.12***	-.10*	.02*
Perceived Knowledge Total Scale	.27**	.13**	-.01	.20***	-.16***	.05
Perceived Knowledge PRFS	.20***	.11*	-.02	.18***	-.11*	.05
Perceived Knowledge GFS	.27***	.15*	.03	.23***	-.21***	.08

Note. PRFS = Prognosis/Risk Factors Subscale; GFS = General Features Subscale. All sources of knowledge were coded as 1 = source of knowledge was used for information, 0 = source of knowledge not used for information. All analyses conducted with $N = 487$.

* $p < .05$. ** $p < .01$.*** $p < .001$.

CHAPTER IV

DISCUSSION

Goals and Hypotheses

The primary purpose of the current study was to design a valid, reliable measure (the ASK-ASD) to evaluate perceived knowledge and actual knowledge of ASD. Additionally, the relation between knowledge of ASD and knowledge of other diseases and disorders was investigated. The relation between self-efficacy, perceived knowledge, and actual knowledge was also evaluated. Finally, the correlation between knowledge of ASD, demographic characteristics, and source of knowledge was explored.

The ASK-ASD was expected to be supported as a valid, reliable measure to evaluate perceived and actual knowledge of ASD. Specifically, Hypothesis 1 was that five factors would emerge as part of an EFA, since the item pool was created using five HICs. However, the EFA revealed a two-factor structure to the ASK-ASD, with all items comprising two subscales. Although not hypothesized, the two-factor structure appears to adequately capture distinct but cohesive aspects of total ASD knowledge.

Hypothesis 2 was that the ASK-ASD would be supported as a reliable measure by demonstrating internal consistency and test-retest reliability. This hypothesis was largely supported through the test-retest reliability analyses, which revealed that the total scale and subscales of both perceived and actual knowledge on the ASK-ASD were significantly correlated between the first and second administrations of the measure. Internal consistency estimates were lower than expected, but are considered adequate for the beginning stages of test development (Nunnally, 1978). Generally, estimates supported the ASK-ASD as a reliable measure to capture both perceived and actual ASD knowledge.

Hypotheses 3a and 3b were that the ASK-ASD would demonstrate construct validity by correlating actual knowledge and perceived knowledge with participation in ASD training and experience with an individual with ASD. Hypothesis 3a, that participation in ASD training would increase perceived and actual knowledge was largely not supported. Actual knowledge total scale and subscales were not significantly correlated with ASD training, and only the perceived knowledge total scale was significantly correlated with ASD training. This may indicate that training in ASD does not necessarily increase an individual's actual knowledge of ASD. However, it is very likely that the lack of a significant relation between training in ASD and increased actual knowledge is due to the low percentage of individuals who had participated in ASD training (3.9%), leading to very little variability in the ASD training variable.

Hypothesis 3b, that experience with an individual with ASD would increase perceived and actual knowledge, was supported. Actual knowledge total scale and subscales were correlated with experience with ASD, as were perceived knowledge total scales and subscales. These results indicate that having a personal relationship with a person with ASD is associated with improved understanding of many aspects of the disorder. This correlation between experience with ASD and actual knowledge of ASD provides evidence for the construct validity of the ASK-ASD.

Hypotheses 4, 5, and 6 concerned the correlation between actual knowledge of ASD and other measures of knowledge; specifically, a measure of ADHD knowledge (KADDS) and a measure of knowledge of HIV/AIDS (HIV/AIDS knowledge scale). The ASK-ASD total actual knowledge scale was significantly correlated with both measures of knowledge, supporting hypotheses 4 and 5 and providing evidence of convergent validity. Additionally, these findings indicate that the broad concept of knowledge may

be captured by the ASK-ASD. However, Hypothesis 6, that the ASK-ASD would be significantly more correlated with the KADDS than the HIV/AIDS knowledge scale, was not supported, indicating that knowledge of ADHD and knowledge of ASD may not be specifically related. This may be because levels of HIV/AIDS knowledge were much higher within the sample than levels of knowledge of ADHD, indicating that participants knew more about HIV/AIDS overall. Additionally, the KADDS includes a *Don't Know* option, which was recoded as incorrect (as per the measure manual) and may have decreased the total knowledge of ADHD as captured by the KADDS.

Hypothesis 7, that perceived knowledge and actual knowledge would be correlated, was supported. Overall, participants perceived themselves as highly knowledgeable about ASD, and scores on the actual knowledge scale supported this perception. The total scale and subscales for actual knowledge were significantly correlated with perceived knowledge, indicating that participants were able to adequately gauge their level of knowledge. While this correlation between perceived and actual knowledge was inconsistent with findings in the pilot study, these findings suggest collecting information about perceived and actual knowledge at the item level (i.e. having participants rate their perceived level of knowledge in each individual item) increased the precision with which information about perceived knowledge could be collected.

Hypothesis 8 was that self-efficacy would moderate the relation between perceived and actual knowledge in that participants with higher self-efficacy would have high perceived knowledge but low actual knowledge. While both perceived knowledge and self-efficacy significantly predicted actual knowledge, the interaction between the two was not significant, indicating that higher self-efficacy does not necessarily lead to individuals perceiving themselves as more knowledgeable than they actually are.

It is possible that this lack of interaction was due to the broadness of the self-efficacy scale used in this study; there were no questions on the self-efficacy scale that addressed knowledge in general or knowledge of ASD specifically.

Exploratory analyses revealed two notable relations between ASD perceived knowledge, actual knowledge, and demographic characteristics: ethnicity and gender. Ethnicity was negatively correlated with actual knowledge, indicating that non-White participants have lower total ASD knowledge than White participants. However, non-White ethnicity was also correlated with having less experience with individuals with ASD, which may explain why overall levels of knowledge among non-White participants were lower. Additionally, female participants were more knowledgeable about ASD than male participants, though this may be accounted for by the high percentage of female participants comprising the sample. Finally, all significant correlations were modest; thus, these relations should be further examined in a larger, more varied sample.

In addition, exploratory analyses were conducted to determine if source of knowledge had an impact on actual knowledge of perceived knowledge of ASD. Of the potential sources of knowledge, professional or scientific sources had the highest correlation with actual knowledge of ASD; however, all sources of knowledge, including *other*, were positively correlated with actual knowledge. Unsurprisingly, *No Source* was negatively correlated with both actual and perceived ASD knowledge, indicating that participants who had little or no exposure to ASD had less actual knowledge of the disorder and recognized that their knowledge was limited.

Limitations and Directions for Future Studies

Limitations of the study were mainly related to sampling. First, all data was collected from a population of undergraduate students at a university in southern

Mississippi, potentially limiting the generalizability of the ASK-ASD. Future research should involve a community sample so researchers can better evaluate levels of perceived and actual knowledge of ASD in the general population. Furthermore, collecting data for measure development in a variety of locations (rather than a small city in the southeastern region of the United States) would increase the generalizability of the ASK-ASD. In general, future studies should attempt to replicate and expand on this study's findings in a more representative, diverse sample. This would also allow researchers to investigate more varied exploratory analyses, such as examining the relation between socioeconomic status and ASD knowledge.

Another limitation of the sample was the method of data collection: a web-based, self-report survey. The self-report format, particularly because data were collected online, may have given participants the opportunity to search for answers to the actual knowledge portion of the ASK-ASD. Future studies may benefit from using a more monitored form of data collection (e.g., having participants come to a lab to complete all measures) to ensure all data collected are an accurate representation of participant knowledge.

Given that the reliability coefficients were adequate only for test development, further measure development should involve improving internal reliability estimates. For example, the wording and scope of the items on the ASK-ASD could be further evaluated by a greater number of experts within the field to ensure the items are both easily understandable and capture the full range of ASD knowledge. Additionally, given that the hypothesized moderation was not significant, future studies may benefit from the use of a measure of self-efficacy that includes items related to actual knowledge and perceived knowledge, both in general and specifically regarding ASD.

This may allow researchers to more adequately capture a participant's actual confidence in their general knowledge, as well as their knowledge of ASD.

Finally, to further examine the items themselves, future data analysis should involve an item response theory (IRT) analysis. This will give researchers the opportunity to examine the range of knowledge captured by the measure, as well as more easily differentiate between individuals with low, moderate, or high levels of knowledge. Additionally, invariance testing may be used to examine the differences across groups (e.g., gender- or ethnicity-based groups) to determine if there are true differences between the groups or if the measure itself is biased.

Conclusions

As the prevalence of ASD continues to rise, a measure to evaluate both perceived and actual knowledge of ASD will useful in clinical, academic, and research settings. The current study attempted to improve upon the limited number of previous studies of perceived and actual knowledge of ASD specifically and psychological disorders in general by creating a reliable, valid measure (the ASK-ASD) that adequately captured both perceived and actual ASD knowledge. An EFA revealed that the ASK-ASD was comprised of two independent subscales: factor 1, pertaining to prognosis and ASD risk factors; and factor 2, pertaining to general features of ASD. Reliability of the ASK-ASD (total scale and subscales) was examined through internal consistency and temporal stability, both of which supported the reliability of the ASK-ASD. To support the validity of the ASK-ASD, total actual knowledge was correlated with other measures of knowledge of a medical disease (HIV/AIDS), as well as a psychological disorder. Correlations between experience with an individual with ASD and the ASK-ASD provided further evidence of validity. In addition to the central goal of developing the

ASK-ASD, self-efficacy was examined as a moderator between perceived knowledge of ASD and actual knowledge of ASD; however, the current study found no significant interaction between self-efficacy, perceived knowledge of ASD, and actual knowledge of ASD. Future research should continue to develop and improve the measure created by the current study by conducting this study in a community sample of individuals, thus improving the generalizability of the ASK-ASD.

APPENDIX A

PILOT STUDY DEMOGRAPHIC FORM

1. Please enter your first and last name.

2. Please enter your age.

3. Please select your gender.
- Male
- Female

4. Please indicate your highest level of education.
- Less than High School
- High School Diploma/GED
- Some college, but no degree
- Associate's Degree
- Bachelor's Degree
- Some Master's degree coursework
- Master's Degree
- Doctorate or Higher

5. Please choose your race.
- White/Caucasian
- African-American
- Latino
- Asian
- Other (please type below) _____

6. Do you have any children?
- Yes
- No

6B. Please indicate your children's ages (select all that apply).
- No children
- 5 years old and below
- 6 years old to 10 years old
- 10 years old to 15 years old
- 16 years old and up

7. Are you a psychology major?
- Yes
- No
- Undecided

8. Do you have experience with individuals with Autism Spectrum Disorder (ASD)?
- Yes
- No
- I don't know

8B. Please indicate the closest approximation of your relationship.
- No experience
- Immediate Family
- Extended Family
- Friend or acquaintance
- Other (please type below) _____

9. Have you undergone training for interacting with individuals with ASD?
- Yes
- No

9B. Please describe your training.

APPENDIX B

ASD PERCEPTIONS SCALE

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I enjoy learning about psychology.	1	2	3	4	5
I hope to have a career in psychology.	1	2	3	4	5
I am knowledgeable about Autism Spectrum Disorder (ASD).	1	2	3	4	5
I understand how ASD is diagnosed.	1	2	3	4	5
I know what kind of symptoms individuals with ASD have.	1	2	3	4	5
I know what happens to people with ASD as they age.	1	2	3	4	5
I am knowledgeable about what causes ASD.	1	2	3	4	5
I am aware of treatment options for children with ASD.	1	2	3	4	5
I understand how common ASD is in the general population.	1	2	3	4	5
I believe I would know if I met a person with ASD.	1	2	3	4	5

APPENDIX C

ASD KNOWLEDGE SCALE

Question	True	False	Don't Know
1. About half of all people with ASD will remain mute throughout their lives.	T	F	DK
2. After being diagnosed, symptoms of ASD remain stable throughout the individual's life.	T	F	DK
3. All individuals with ASD have low IQs.	T	F	DK
4. ASD affects 1% of all children.	T	F	DK
5. ASD can be caused by vaccines.	T	F	DK
6. ASD can be diagnosed with certainty using neural imaging.	T	F	DK
7. ASD can be treated with therapy, medication, or a combination thereof.	T	F	DK
8. ASD can only be diagnosed after a child has entered preschool.	T	F	DK
9. ASD is nearly five times as likely to occur in boys as in girls.	T	F	DK
10. ASD only affects children.	T	F	DK
11. At one time, scientists believed ASD was caused by a lack of parental interest and motherly warmth.	T	F	DK
12. ASD can be fatal over time.	T	F	DK
13. Children with ASD have patterns of play that are similar to their typical peers.	T	F	DK
14. Children with siblings who have ASD are at a higher risk of developing the disorder.	T	F	DK
15. Conditions during pregnancy have little or no affect on whether or not a child has ASD.	T	F	DK
16. Conditions during pregnancy have little or no affect on whether or not a child has ASD.	T	F	DK
17. Diagnosis of ASD is primarily based on behavioral observations and parental interviews.	T	F	DK
18. If a teacher believes a student has ASD, he or she can give a preliminary diagnosis.	T	F	DK
19. Individuals with ASD engage in restricted, repetitive behaviors (e.g. lining up cars, strictly adhering to schedules).	T	F	DK

20. Individuals with ASD have difficulty with social interaction.	T	F	DK
21. Individuals with ASD rarely form meaningful relationships, even with their parents.	T	F	DK
22. Many individuals with ASD are clumsy and uncoordinated.	T	F	DK
23. Many scientists believe that ASD is a product of uneven brain development.	T	F	DK
24. There are no beneficial treatments available for individuals with ASD.	T	F	DK
25. There is no specific genetic marker that can be used to diagnose ASD.	T	F	DK

APPENDIX D

STUDY 2 DEMOGRAPHIC QUESTIONNAIRE

1) Please enter your first and last name: _____

2) Please enter your age: _____

3) Please select your gender.
- ❍ Male
- ❍ Female

4) Please choose your race.
- ❍ White/Caucasian
- ❍ African-American
- ❍ Latino
- ❍ Asian
- ❍ Other (please type below) _____

5) Do you have any children?
- ❍ Yes
- ❍ No

5b) Please indicate your children's ages (select all that apply).
- ❍ No children
- ❍ 5 years old and below
- ❍ 6 years old to 10 years old
- ❍ 10 years old to 15 years old
- ❍ 16 years old and up

6) Are you a psychology major?
- ❍ Yes
- ❍ No
- ❍ Undecided

7) Do you have experience with individuals with Autism Spectrum Disorder?
- ❍ Yes
- ❍ No
- ❍ I don't know

7b) Please indicate the closest approximation of your relationship with an individual with ASD/autism.

- ❍ No experience
- ❍ Immediate Family
- ❍ Extended Family
- ❍ Friend or acquaintance
- ❍ Other (please type below) _____

8) Which of the following sources have you used for information about Autism Spectrum Disorder? Please select all that apply

- ❑ First-hand experience
- ❑ Acquaintances
- ❑ Popular media
- ❑ Professional/scientific sources
- ❑ Training/Workshops (please describe) _____
- ❑ Other (please describe) _____
- ❑ None

APPENDIX E

ASK-ASD

Please designate the following statements regarding Autism Spectrum Disorder as True or False. For each answer, please indicate how certain you are of the accuracy of your response.

	Please designate these statements as true or false.		Please rate your confidence in your answer.		
	True	False	Not at all confident	Confident	Very Confident
1. About 70% of children with ASD/autism have some other psychiatric condition in addition to autism.	❍	❍	❍	❍	❍
2. Adults can never be diagnosed with ASD/autism.	❍	❍	❍	❍	❍
3. ASD/autism can only be diagnosed after a child has entered preschool.	❍	❍	❍	❍	❍
4. ASD/autism cannot be diagnosed using biological markers (e.g., blood tests).	❍	❍	❍	❍	❍
5. An ASD/autism diagnosis is often based on parental interviews and observations of behavior.	❍	❍	❍	❍	❍
6. If a teacher believes a student has ASD/autism, he or she can give an initial diagnosis.	❍	❍	❍	❍	❍
7. An individual can be diagnosed with both ASD/autism and intellectual disability (previously known as mental retardation).	❍	❍	❍	❍	❍
8. Only medical doctors can diagnose ASD/autism in children.	❍	❍	❍	❍	❍
9. A common initial concern of ASD/autism is failure to	❍	❍	❍	❍	❍

develop language.					
10. There is a specific gene that can be used to identify ASD/autism.	❍	❍	❍	❍	❍
11. About a quarter of children with ASD/autism lose skills they once had, such as babbling and use of words.	❍	❍	❍	❍	❍
12. ASD/autism affects about 1 in 150 children.	❍	❍	❍	❍	❍
13. ASD/autism is nearly five times as likely to occur in boys as girls.	❍	❍	❍	❍	❍
14. By adolescence, the rate of ASD/autism between males and females is equal.	❍	❍	❍	❍	❍
15. White children are more likely than Black or Hispanic children to be diagnosed with ASD/autism.	❍	❍	❍	❍	❍
16. Girls with ASD/autism are more likely to have severe behavioral issues and intellectual disability.	❍	❍	❍	❍	❍
17. Prevalence rates of ASD/autism are about the same from state to state.	❍	❍	❍	❍	❍
18. Studies estimate the prevalence of ASD/autism in children has risen about 30% since 2008.	❍	❍	❍	❍	❍
19. There is strong evidence for low income as a risk factor for ASD/autism.	❍	❍	❍	❍	❍
20. ASD/autism is contagious.	❍	❍	❍	❍	❍
21. Children with diets higher in sugars and processed foods show an increased risk of developing ASD/autism.	❍	❍	❍	❍	❍
22. Living near an interstate during pregnancy increases the risk of having a child with	❍	❍	❍	❍	❍

ASD/autism.					
23. Most evidence suggests ASD/autism can be caused by vaccines.	❍	❍	❍	❍	❍
24. At one time, scientists believed ASD/autism was caused by lack of parental interest and motherly warmth.	❍	❍	❍	❍	❍
25. Children with older parents have a higher risk of developing ASD/autism.	❍	❍	❍	❍	❍
26. Children with siblings who have ASD/autism have a higher risk of developing the disorder.	❍	❍	❍	❍	❍
27. Problems at birth (e.g., fetal distress, breech presentation) have been linked to ASD/autism.	❍	❍	❍	❍	❍
28. Conditions during pregnancy do not impact the development of ASD/autism among children.	❍	❍	❍	❍	❍
29. Large-scale studies support a link between season of birth and ASD/autism.	❍	❍	❍	❍	❍
30. Many scientists believe that ASD/autism is a product of uneven brain development.	❍	❍	❍	❍	❍
31. There is no clear link between ASD/autism and genes.	❍	❍	❍	❍	❍
32. ASD/autism can be fatal over time.	❍	❍	❍	❍	❍
33. Early intervention can alleviate symptoms of ASD/autism and lead to improvements in IQ, language, and social behaviors.	❍	❍	❍	❍	❍
34. About 75% of individuals with ASD/autism also	❍	❍	❍	❍	❍

meet criteria for obsessive-compulsive disorder.					
35. Nearly 2/3 of children with ASD/autism have been prescribed one or more psychiatric medications.	❍	❍	❍	❍	❍
36. One common treatment for ASD/autism is Applied Behavior Analysis.	❍	❍	❍	❍	❍
37. There are very few beneficial treatments available for individuals with ASD/autism.	❍	❍	❍	❍	❍
38. There is no strong evidence that a gluten-free or casein-free diet reduces the symptoms of ASD/autism.	❍	❍	❍	❍	❍
39. With support, therapy, and medication, ASD/autism can be cured.	❍	❍	❍	❍	❍
40. About 25% of individuals with ASD/autism remain nonverbal throughout their lives.	❍	❍	❍	❍	❍
41. After being diagnosed, ASD/autism symptoms remain stable throughout the individual's life.	❍	❍	❍	❍	❍
42. All individuals with ASD/autism have lower than average IQs.	❍	❍	❍	❍	❍
43. An early symptom of ASD/autism is a failure to attend to facial expressions, gestures, and speech.	❍	❍	❍	❍	❍
44. Because of their lower social awareness, children with ASD/autism rarely have anxiety disorders.	❍	❍	❍	❍	❍
45. Children with ASD/autism have patterns of play that are similar to their typically-developing peers.	❍	❍	❍	❍	❍

46. Children with ASD/autism often require fewer hours of sleep than typically-developing children.	❍	❍	❍	❍	❍
47. Individuals with ASD/autism often engage in restrictive, repetitive behaviors (e.g., lining up cars, strictly adhering to schedules).	❍	❍	❍	❍	❍
48. Individuals with ASD/autism have difficulty interacting socially.	❍	❍	❍	❍	❍
49. Individuals with ASD/autism rarely form intimate relationships, even with their parents.	❍	❍	❍	❍	❍
50. Children with ASD/autism often fidget and squirm in their seats.	❍	❍	❍	❍	❍
51. Individuals with ASD/autism are often touchy and easily annoyed.	❍	❍	❍	❍	❍

APPENDIX F

INITIAL ITEM POOL DESCRIPTIVE STATISTICS—ASK-ASD (STUDY 2)

Question Number	Item	Mean	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	About 70% of children with ASD/autism have some other psychiatric condition in addition to autism.	.54	.50	.11	.55
2	There is a specific gene that can be used to identify ASD/autism.	.86	.35	.18	.54
3	About a quarter of children with ASD/autism lose skills they once had, such as babbling and use of words.	.72	.45	.06	.55
4	ASD/autism is nearly five times as likely to occur in boys as girls.	.51	.50	.08	.55
5	By adolescence, the rate of ASD/autism between males and females is equal.	.63	.48	.24	.53
6	White children are more likely than Black or Hispanic children to be diagnosed with ASD/autism.	.81	.39	.05	.55
7	Studies estimate the prevalence of ASD/autism in children has risen about 30% since 2008.	.82	.39	.15	.54

8	There is strong evidence for low income as a risk factor for ASD/autism.	.45	.50	.07	.55
9	Adults can never be diagnosed with ASD/autism.	.83	.37	.26	.54
10	ASD/autism is contagious.	.39	.49	.05	.55
11	Children with diets higher in sugars and processed foods show an increased risk of developing ASD/autism.	.56	.50	.06	.55
12	Most evidence suggests ASD/autism can be caused by vaccines.	.26	.44	-.12	.57
13	At one time, scientists believed ASD/autism was caused by lack of parental interest and motherly warmth.	.64	.48	.23	.54
14	Children with older parents have a higher risk of developing ASD/autism.	.66	.48	.24	.53
15	Children with siblings who have ASD/autism have a higher risk of developing the disorder.	.46	.50	.12	.55
16	Problems at birth (e.g., fetal distress, breech presentation) have been linked to ASD/autism.	.44	.50	-.01	.56
17	Conditions during pregnancy do not	.54	.50	-.08	.57

	impact the development of ASD/autism among children.				
18	Large-scale studies support a link between season of birth and ASD/autism.	.80	.40	.15	.54
19	ASD/autism can only be diagnosed after a child has entered preschool.	.76	.43	.09	.55
20	Many scientists believe that ASD/autism is a product of uneven brain development.	.95	.21	.23	.54
21	There is no clear link between ASD/autism and genes.	.75	.43	.05	.55
22	ASD/autism can be fatal over time.	.11	.32	-.19	.57
23	Early intervention can alleviate symptoms of ASD/autism and lead to improvements in IQ, language, and social behaviors.	.75	.43	.09	.55
24	About 75% of individuals with ASD/autism also meet criteria for obsessive-compulsive disorder.	.68	.47	.29	.53
25	One common treatment for ASD/autism is Applied Behavior Analysis.	.65	.48	.06	.55
26	There are very few beneficial	.36	.48	.04	.55

	treatments available for individuals with ASD/autism.				
27	There is no strong evidence that a gluten-free or casein-free diet reduces the symptoms of ASD/autism.	.69	.46	.13	.54
28	With support, therapy, and medication, ASD/autism can be cured.	.75	.43	.09	.55
29	ASD/autism cannot be diagnosed using biological markers (e.g., blood tests).	.69	.46	.21	.54
30	About 25% of individuals with ASD/autism remain nonverbal throughout their lives.	.76	.43	.12	.55
31	After being diagnosed, ASD/autism symptoms remain stable throughout the individual's life.	.68	.47	.08	.55
32	All individuals with ASD/autism have lower than average IQs.	.63	.48	.24	.53
33	An early symptom of ASD/autism is a failure to attend to facial expressions, gestures, and speech.	.79	.40	.14	.54

34	Because of their lower social awareness, children with ASD/autism rarely have anxiety disorders.	.68	.47	.17	.54
35	Children with ASD/autism have patterns of play that are similar to their typically-developing peers.	.74	.44	.00	.56
36	Children with ASD/autism often require fewer hours of sleep than typically-developing children.	.84	.37	.26	.54
37	Individuals with ASD/autism often engage in restrictive, repetitive behaviors (e.g., lining up cars, strictly adhering to schedules).	.58	.49	.11	.55
38	Individuals with ASD/autism have difficulty interacting socially.	.69	.46	.12	.55
39	Individuals with ASD/autism rarely form intimate relationships, even with their parents.	.84	.37	.23	.54
40	An ASD/autism diagnosis is often based on parental interviews and observations of behavior.	.58	.49	.20	.54
41	If a teacher believes a student has ASD/autism, he or she can give an initial diagnosis.	.53	.50	.07	.55

42	An individual can be diagnosed with both ASD/autism and intellectual disability (previously known as mental retardation).	.77	.42	.18	.54
43	Only medical doctors can diagnose ASD/autism in children.	.85	.36	.33	.53
44	A common initial concern of ASD/autism is failure to develop language.	.74	.44	.20	.54
45	Children with ASD/autism have patterns of play that are similar to their typically-developing peers.	.53	.50	.21	.54
46	About 70% of children with ASD/autism have some other psychiatric condition in addition to autism.	.71	.45	.04	.55
47	There is a specific gene that can be used to identify ASD/autism.	.83	.37	.26	.54
48	About a quarter of children with ASD/autism lose skills they once had, such as babbling and use of words.	.89	.32	.29	.54
49	ASD/autism is nearly five times as likely to occur in boys as girls.	.39	.49	.16	.54

50	By adolescence, the rate of ASD/autism between males and females is equal.	.20	.40	-.13	.57
51	White children are more likely than Black or Hispanic children to be diagnosed with ASD/autism.	.22	.41	-.14	.57

APPENDIX G

FINAL ITEM POOL DESCRIPTIVE STATISTICS—ASK-ASD (STUDY 2)

Question Number	Item	Mean	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2	Adults can never be diagnosed with ASD/autism.	.86	.35	.17	.61
5	An ASD/autism diagnosis is often based on parental interviews and observations of behavior.	.63	.48	.27	.59
6	If a teacher believes a student has ASD/autism, he or she can give an initial diagnosis.	.81	.39	.08	.62
7	An individual can be diagnosed with both ASD/autism and intellectual disability (previously known as mental retardation).	.82	.39	.14	.61
9	A common initial concern of ASD/autism is failure to develop language.	.83	.37	.28	.60
10	There is a specific gene that can be used to identify ASD/autism.	.39	.49	.09	.62

13	ASD/autism is nearly five times as likely to occur in boys as girls.	.64	.48	.19	.60
18	Studies estimate the prevalence of ASD/autism in children has risen about 30% since 2008.	.80	.40	.13	.61
19	There is strong evidence for low income as a risk factor for ASD/autism.	.76	.43	.14	.61
20	ASD/autism is contagious.	.95	.21	.24	.61
21	Children with diets higher in sugars and processed foods show an increased risk of developing ASD/autism.	.75	.43	.10	.61
23	Most evidence suggests ASD/autism can be caused by vaccines.	.75	.43	.09	.62
24	At one time, scientists believed ASD/autism was caused by lack of parental interest and motherly warmth.	.68	.47	.29	.59
25	Children with older parents have a higher risk of developing ASD/autism.	.65	.48	.06	.62

27	Problems at birth (e.g., fetal distress, breech presentation) have been linked to ASD/autism.	.69	.46	.11	.61
29	Large-scale studies support a link between season of birth and ASD/autism.	.69	.46	.22	.60
30	Many scientists believe that ASD/autism is a product of uneven brain development.	.76	.43	.15	.61
32	ASD/autism can be fatal over time.	.63	.48	.27	.60
33	Early intervention can alleviate symptoms of ASD/autism and lead to improvements in IQ, language, and social behaviors.	.79	.40	.16	.61
34	About 75% of individuals with ASD/autism also meet criteria for obsessive-compulsive disorder.	.68	.47	.17	.61
36	One common treatment for ASD/autism is Applied Behavior Analysis.	.84	.37	.26	.60
39	With support, therapy, and medication, ASD/autism can	.84	.37	.22	.60

	be cured.				
40	About 25% of individuals with ASD/autism remain nonverbal throughout their lives.	.58	.49	.18	.61
42	All individuals with ASD/autism have lower than average IQs.	.77	.42	.20	.60
43	An early symptom of ASD/autism is a failure to attend to facial expressions, gestures, and speech.	.85	.36	.33	.59
45	Children with ASD/autism have patterns of play that are similar to their typically-developing peers.	.53	.50	.22	.60
48	Individuals with ASD/autism have difficulty interacting socially.	.89	.32	.32	.60
49	Individuals with ASD/autism rarely form intimate relationships, even with their parents.	.39	.49	.17	.61

APPENDIX H

TEST-RETEST CORRELATIONS, ACTUAL KNOWLEDGE (STUDY 2)

		TIME 2													
	Item Number	2	5	6	7	9	10	13	18	19	20	21	23	24	25
TIME 1	2	.04	.22	-.09	-.18	.20	.18	.11	.03	.24	.02	.05	-.07	.14	.42**
	5	.02	.42***	.14	-.23	.11	.18	.27*	.05	-.06	.10	.31*	.17	.02	.09
	6	.20	-.13	.37***	.22	-.02	.02	-.10	.07	-.01	.22	.02	.18	-.01	-.19
	7	.22	-.06	.00	.31*	.01	-.07	.07	.17	.13	.11	.03	-.06	.22	-.17
	9	.14	.12	.10	-.18	.33**	.01	-.07	.03	-.06	.02	.05	.02	.04	-.22
	10	.17	-.09	-.13	-.02	-.06	.40***	.02	.11	.25*	.01	.10	.20	.10	-.16
	13	.12	.32*	-.16	.17	.01	.05	.28*	.13	-.03	-.10	-.08	.02	.35***	-.11
	18	-.08	.09	.07	.15	.30*	.21	.07	.23	-.17	.16	-.15	.19	.21	-.03
	19	.00	-.29*	-.13	.13	-.19	.09	.13	.21	.18	.14	.16	.16	-.10	-.04
	20	-.12	-.13	-.13	.12	.14	.06	.15	-.10	-.12	.49***	.01	.04	.05	.08
	21	-.05	-.06	.00	-.01	.01	.00	-.01	-.04	.13	-.02	.26*	.02	-.05	.02
	23	-.12	.18	-.08	-.07	-.04	.13	.25*	-.09	.04	-.06	.30*	.26*	.21	-.05
	24	-.02	.12	-.14	.247*	.08	.17	.28*	.21	-.10	-.05	-.12	.04	.23	-.03
	25	-.10	.04	.02	-.05	-.03	-.04	.06	.02	.15	.08	.10	-.28*	.15	.50***

Note. Numbers in the first column and top row represent item numbers.

* $p < .05$. ** $p < .01$.*** $p < .001$.

		TIME 2													
	Item Number	27	29	30	32	33	34	36	39	40	42	43	45	48	49
TIME 1	27	.23	-.08	.12	.03	-.03	-.08	-.24	.03	.02	.18	.276*	.15	-.08	-.02
	29	.03	.59***	-.04	.13	-.20	.09	.14	.30*	.24	.46***	.09	.23	.09	.18
	30	.03	-.06	-.02	-.18	.20	.02	-.12	-.04	.13	.01	-.07	.16	.05	.14
	32	.13	.20	-.06	.30*	.271*	-.01	.49***	.18	.12	.16	.14	.04	.03	.40***
	33	.06	.03	-.02	-.01	.16	.11	.04	.04	.06	-.02	-.03	.06	.10	.03
	34	.08	.01	.13	.03	-.06	.27*	-.16	.39***	.32**	.03	.23	-.08	.46***	-.04
	36	.10	.25*	-.13	.21	.12	-.11	.12	.13	-.03	.17	.02	.15	.18	.08
	39	.10	-.05	.29*	.02	-.15	.00	-.15	.02	.24	.17	.49***	-.08	.02	-.10
	40	.03	-.01	-.24	-.07	.32***	-.03	.13	-.15	.50***	-.17	.14	-.04	.03	.15
	42	.29*	.05	-.03	.21	.26*	.00	.12	.13	.06	.292*	.02	.15	.02	.08
	43	.16	.02	-.05	.08	-.03	-.12	-.16	.00	.36***	.03	.31*	.01	.31*	.07
	45	.23	-.08	.13	.00	.04	.13	-.06	.09	.19	.17	.35***	.05	.14	.28*
	48	.00	-.14	.21	.33***	.14	.06	.14	-.11	.08	.10	.18	.27*	-.07	.55***
	49	-.08	-.07	-.04	-.03	.13	-.01	.03	-.12	.05	.01	.20	.21	-.04	.16

Note. Numbers in the first column and top row represent item numbers.

* $p < .05$. ** $p < .01$.*** $p < .001$.

APPENDIX I

INSTITUTIONAL REVIEW BOARD NOTICE OF COMMITTEE ACTION

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 15022702
PROJECT TITLE: Development and Validation of a Survey of Knowledge of Autism Spectrum Disorder
PROJECT TYPE: New Project
RESEARCHER(S): Laura Hansen
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Psychology
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 03/04/2015 to 03/03/2016
Lawrence A. Hosman, Ph.D.
Institutional Review Board

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