

IN DEFENSE OF PECULIARITIES: MEASURING PERCEPTIONS OF HIGH-  
FUNCTIONING AUTISM SPECTRUM DISORDER AS A COGNITIVE STYLE

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by

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## ABSTRACT

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The association between high-functioning autism (HFA) and high cognitive granularity has led researchers to make the argument that HFA might be better conceptualized as a cognitive style rather than a cognitive deficit. Additionally, several studies have supported the notion that a brain whose neurology is locally biased emphasizes the integration of information among proximal elements, indicating that individuals with HFA live in a more peculiar, detail-oriented cognitive environment compared to neurotypicals. Unfortunately, communication of these paradigm-shifting findings to the public has been scarce. The current study sought to examine the perceived relationship between HFA and highly-granulated (atypical) style of cognitive processing within a sample of university students. Participants were randomly assigned to a psychoeducation or control condition and measured on their beliefs both before and after the respective presentations. Results showed no significant differences between groups. Implications of this research could be used to fuel the integration of HFA psychoeducation into society and could further encourage the formation of a more cohesive, positive perception of individuals with HFA and their respective cognitive style.

KEY WORDS: High-functioning autism, Autism spectrum disorders, Cognitive granularity, Perception

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## **CHAPTER I**

### **Introduction**

Autism, or autism spectrum disorder (ASD), refers to a vast range of conditions characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication, as well as unique strengths and differences (National Institute of Mental Health, 2018). The conceptualization of ASD and its diagnostic boundaries have been relatively arbitrary since its original portrayal over 70 years ago (Constantino & Charman, 2016). ASD has evolved from a term used to describe schizophrenia to a condition comprised of a range of symptoms such as poor eye contact, lack of social/emotional reciprocity, delay or lack of language, stereotyped/repetitive language, restricted patterns of interest, and specific behavioral preoccupations (Autism Spectrum Disorder Fact Sheet, 2017). Although these symptoms may vary in terms of severity, ASD functionally impacts as many as 1 in 59 people (Center for Disease Control, 2018; Mandal, 2018; Martínez-Pedraza & Carter, 2009).

The diversity and prevalence of ASD is, in part, due to over-identification (Smith et al., 2017). For example, the Pervasive Developmental Disorders (PDDs) category utilized in previous versions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) is now subsumed by the ASD diagnosis (American Psychiatric Association, 2013), which has substantially broadened the spectrum. Additionally, it has been hypothesized that etiology, genetic processes, environmental events, gene/environment (epigenetic) interactions, and developmental factors all contribute to individual differences and variability within the autism spectrum (Wozniak et al., 2017). However, the autism spectrum can be simplified by splitting it into a dichotomy; therefore, the



current study uses the term high-functioning autism (HFA) to describe individuals with average to above-average intelligence, whereas the term low-functioning autism (LFA) is used to describe those located on the remainder of the spectrum.

### **Differences Between LFA and HFA**

Apart from IQ, individuals with HFA display similar symptomology to those with LFA; albeit to lesser severities. Whereas individuals with HFA may be clinically distressed by their symptoms, it is likely because of the way society ostracizes them (Kwok & Yip, 2012). In fact, many individuals with HFA do not experience impairment if they find an environment that is complementary to their functioning (Grandin, 1999). In addition to a generally higher cognitive ability, individuals with HFA frequently have sufficient language skills - they simply use language in non-customary ways (Vicker, 2009). More specifically, speech patterns may be unusual, lack inflection, have a rhythmic nature, or be louder or higher-pitched than that of neurotypicals (Autism Society, 2016; Vicker, 2009). Furthermore, individuals with HFA may not understand irony, humor, sarcasm, or the reciprocal nature of a conversation (Vicker, 2009). Whereas children with LFA are frequently interpreted as aloof and uninterested in others, individuals with the specification of HFA often seek interaction (Autism Society, 2016). Perhaps the most intriguing discrepancy between LFA and HFA is that individuals with HFA can be rather obsessive when it comes to particular topics and abilities (e.g., recalling meaningful dates, memorizing number spans, or reciting characteristics of a specific animal), often displaying above-average intelligence and expertise regarding their area(s) of interest (Pijnacker, Hagoort, Buitelaar, Teunisse, & Geurts, 2009).

## **HFA as a Cognitive Style**

Within the last few decades, researchers have suggested characterizing HFA as a cognitive style (Baron-Cohen, 2000; Frith, 1989). In fact, atypical cognitive perspectives could offer vital insights commonly missed by individuals with classically functioning neural processes, also referred to as neurotypicals (West, 2017). Researchers suggest individuals with local-processing biases and detail-oriented thinking patterns, which are characteristic of HFA, may have the capability to help make discoveries and solve problems in innovative and unexpected ways (West, 2017). Nevertheless, public perceptions of individuals with HFA tend to focus on the shortcomings associated with the diagnosis (e.g., integrating context, navigating social situations, and communicating), and neglect the positive characteristics. This one-sided public perception is exacerbated by the majority of ASD research, which focuses on documenting task failures among individuals with ASD (Gernsbacher, Dawson, & Goldsmith, 2005). Additionally, the scarce amount of research that does characterize HFA as a specialized, highly detail-oriented style of cognition is not effectively communicated to the general public.

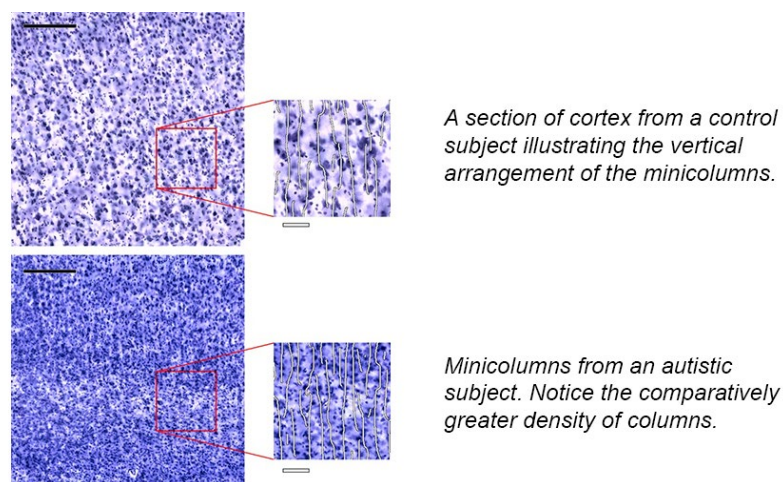
## **Problems with Current Perceptions**

Although labels such as “disorder” and “disability” may be necessary to provide resources, aid, and funding to people who need it, identifying someone with HFA as simply “disabled” could undermine their confidence as well as their abilities. Additionally, past medical terminology such as “feeble-minded, retarded, moronic, idiotic or schizoid” (Fischbach, 2007) has created a social stigma surrounding ASD; therefore, it is not surprising that individuals diagnosed with ASD, regardless of their symptom severity, become socially ostracized and distressed due to their negatively-

implicated label (Kwok & Yip, 2012). Furthermore, several other studies indicate that individuals with HFA may be particularly vulnerable to the effects of ostracism due to significantly higher anxiety symptoms, a lower perceived rate of peer acceptance, and the awareness that they are perceived as being 'different' (Jones, Huws, and Beck, 2013; Kuusikko et al., 2008; Williamson, Craig, & Slinger, 2008). Negative self-perceptions include being 'retarded', having a 'bad brain', and wanting to be made 'normal' (Humphrey & Lewis, 2008). Additionally, doctors and parents often speak on behalf of individuals with HFA, which creates a notion that those with HFA are too disordered and incompetent to advocate for themselves (Blume, 1997), further deprecating their identities. According to Milton (2012), to be labeled as anomalous in society is often accompanied by being perceived as disordered and thus, being socially stigmatized and rejected. However, many qualities of HFA are not pathological; rather, they are neurological (Casanova et al., 2006).

### **Distinctions in Neuronal Architecture and Processing Biases**

Although ASD is likely to be caused by a myriad of factors, neuroanatomical research has reported that most individuals with HFA have a higher density of cortical processing units than neurotypical individuals (Buxhoeveden & Casanova, 2002). A higher density of cortical processing units, or minicolumns, suggests that individuals with HFA have finer cognitive granularity. The term 'granularity' describes the dense gradient of the cortical cells, an example of which is provided in Figure 1.



*Figure 1.* Differences in minicolumn density among individuals with ASD/HFA (Autism Science Foundation, 2015).

Individuals with finer cognitive granularity display a different style of cognitive processing given that the size of the minicolumns, or vertical arrays of neurons, are often smaller and more compact (Buxhoeveden & Casanova, 2002; Casanova et al., 2006). Variation in minicolumn density would also explain the diversity within the spectrum (Buxhoeveden & Casanova, 2002). A decrease in minicolumn size and a simultaneous increase in the total number of minicolumns results in a cortical connectivity that favors local rather than global information processing (Happé, 1999). In other words, this type of neuronal architecture would predispose an individual to prefer parts over wholes - a cognitive preference often observed in those with HFA. In addition to performing superiorly at detail-oriented tasks, individuals with HFA often excel at understanding the inner workings of systems (Baron-Cohen, 2001). This style of understanding is highly beneficial in scientific and mathematic communities. Indeed, neurotypical scientists tend to mimic this type of cognitive style and are more likely to display signs and symptoms of HFA, such as extreme attention to detail and social ineptness (Baron-Cohen, 2001). Essentially, a brain whose neurology is locally biased emphasizes integration of

information among proximal elements, indicating that individuals with HFA selectively amalgamate fine details from their surrounding environment. Therefore, those with HFA likely live in a more peculiar, detail-oriented cognitive environment from that which neurotypicals routinely experience (Casanova et al., 2006; Kozima, 2013).

In addition to discrepancies in cognitive granularity, recent neurological and genetic findings indicate that alleles for HFA overlap with those for high intelligence (Crespi, 2016). This genetic commonality may play a role in the heightened, yet imbalanced, facets of intelligence seen in those with HFA (Crespi, 2016). For example, when a task requires an individual to obtain global meaning from surrounding context, those with HFA tend to be at a disadvantage; in contrast, when asked to extract minor details from mass amounts of information, those with HFA flourish (Happé, 1999). In fact, research suggests that individuals with HFA are superior to neurotypical control groups when a task complements their detail-oriented bias (O’Riordan, Plaisted, Driver, & Baron-Cohen, 2001; Pellicano & Burr, 2012; Remington & Fairnie, 2017; Shah & Frith, 1993; Tillmann & Swettenham, 2017).

### **Effectiveness of Psychoeducation**

Although several researchers have sought to express the positive attributes of HFA and provide a better understanding of their unique strengths, communication of these paradigm-shifting findings to the public has been scarce. A possible solution for the lack of communication is psychoeducation. Psychoeducation can be used to inform clients, families, and the public about psychological conditions and their characteristics (etiology, symptoms, and treatments); to promote understanding; and to help reduce existing stigmas. For instance, Gordon et al. (2015) developed PEGASUS:

PsychoEducational Groups for Autism Spectrum Understanding and Support, a psychoeducational program for individuals ages 9-14 with HFA, exclusively. After completing PEGASUS, HFA participants reported more general knowledge about their condition and showed a greater awareness of their unique strengths and struggles (Gordon et al., 2015). Although Gordon et al.'s (2015) study made huge strides for the HFA/ASD community, the general public still often lacks a sense of awareness and understanding of those with HFA/ASD.

## CHAPTER II

### The Current Study

It was previously established that the general population holds numerous misconceptions, a lack of awareness, and a lack of understanding regarding characteristics of ASD, and, more specifically, HFA (Holt & Christensen, 2013). The current study sought to examine the perceived relationship between HFA and highly granulated (atypical) style of cognitive processing, given that HFA is an extreme case in the spectrum of cognitive style characterized by high cognitive granularity. After random assignment into control and experimental conditions (e.g., a confirmatory study of Freud's psychosexual stages versus HFA psychoeducation), the researchers examined the following hypotheses: (1) The two groups will not significantly differ in terms of their scores on any of the subscales of the Knowledge of HFA Scale (KHFAS) at pretest; (2) Members of both groups will endorse the stereotyped items (represented by the General Perceptions subscale of the KHFAS) more than the other factors (e.g., Behavioral/Sensory, Cognitive Style, Socioemotional, Other) on the pretest; (3) Participants that indicated a relationship between themselves and someone with HFA/ASD will endorse significantly fewer stereotypical items on the first administration/pretest of the KHFAS than those who did not; (4) The control condition will continue to endorse stereotypical beliefs following the control material presented (i.e., historical psychological excerpt); and (5) The group assigned to the HFA psychoeducation condition (including those who indicated an ASD-based relationship) will endorse more items related to a highly-granulated cognitive style and fewer

stereotypical HFA items on the second administration of the KHFA (posttest).

Hypothesized results can be viewed in Figure 2.

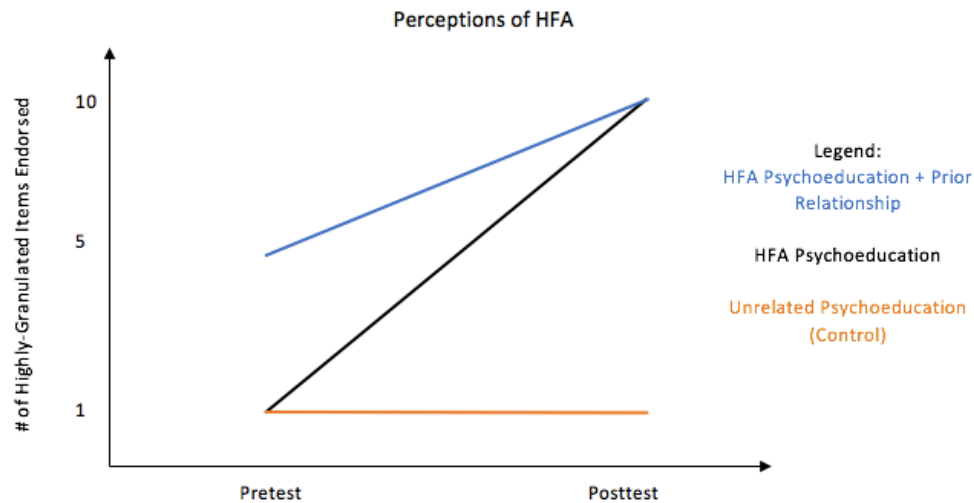


Figure 2: Hypothesized results.

## Method

**Participants.** After attrition, analyses were performed on a final sample of 280 Sam Houston State University students (82.5% female, 17.1% male, 0.4% non-binary). The average age of the sample was 20.71 ( $SD = 3.51$ ), and was 45.0% White, 28.6% Hispanic/Latinx, 22.1% Black/African American, 2.1% Other, 1.4% Asian, and 0.7% American Indian or Alaska Native participants. Students participated in the online study as partial fulfillment of a class research requirement or extra credit opportunity. Students who were on record as being clinically diagnosed (DSM-5 criteria) with ASD were excluded from the data analyses, given that their responses were likely to be biased. Additionally, 31 students were excluded due to incompleteness of the survey, 18 for not meeting the minimum time requirement of 10 minutes, and 15 for failing the validity



measures included to ensure participants were appropriately engaged in the study questionnaires. An initial power analysis was conducted to determine what sample size would be needed to provide a moderate effect size. Results indicated that a sample size of 100 would have allowed a small effect size (Cohen's  $d = .283$ ) to be detected as significant, given a power of 0.80.

**Design.** The study utilized a 2 (Psychoeducation: HFA presentation, historical presentation) x 2 (Test: pretest, posttest) mixed-factor design with psychoeducation manipulated between-subjects, and test (pre vs. post) manipulated within-subjects. The dependent variable was the number of highly granulated cognitive style related items endorsed. Endorsement of items that depicted a highly-granulated style of cognition (e.g., “Individuals with high-functioning autism have different brain structures than most people”; “Scientists, mathematicians, and individuals who have high-functioning autism commonly display the same style of cognitive processing”) indicated that the participants possessed a greater understanding of the cognitive processes displayed by those with HFA.

## **Materials**

**Knowledge of High-Functioning Autism Scale.** Unfortunately, existing scales regarding the general knowledge of ASD have demonstrated low internal consistency. Therefore, the Knowledge of High-Functioning Autism Scale (KHFAS) was developed for the current study to more accurately assess understanding and comprehension regarding the characteristics of high-functioning autism. The KHFAS consists of 52 true/false items that were partially inspired by both the Knowledge of Autism (KOA; Campbell & Barger, 2011) scale and the Autism Awareness Scale (AAS; Gillespie-Lynch

et al., 2015). In a pilot study, an exploratory factor analysis (EFA) revealed several possible factor structures. Using a scree plot, the current researchers determined that the scale should utilize anywhere from five to eleven factors. The researcher's final decision was to utilize a 5-factor model: General Perceptions, Behavioral/Sensory, Cognitive Style, Socioemotional, and Other. A description for each subscale as well as examples can be seen in Appendix C.

Additionally, Cronbach's alphas were calculated for each subscale. More specifically, General Perceptions (19 items) revealed an alpha level of 0.721, Behavioral/Sensory (10 items) was 0.677, Cognitive Style (six items) was 0.629, Socioemotional (eight items) revealed an alpha level of .441, and the nine "Other" items did not fit in any of the factors. No items were deleted so further factor analyses could be conducted. A breakdown of the items, factor structure, and alpha levels can be seen in Appendix E.

**Knowledge of Autism/Asperger's Questionnaire.** Ross and Cuskelly (2006) created a 21-item measure, the Knowledge of Autism/Asperger's Questionnaire, to assess the attitudes and perceptions of those with autism spectrum disorders. For the use of this study, the "autism" version of the assessment was used as a supplemental measure to the KHFA. The Knowledge of Autism Questionnaire can be viewed in Appendix D.

**HFA Psychoeducation.** The medical article, *High-Functioning Autistic Children – From a clinical psychologist's perspective* (Ohkouchi, 2012), was used to create an interactive psychoeducational presentation. The article accurately describes the challenges individuals with HFA face (particularly at school), their cognitive characteristics (including those resulting from having a high cognitive-granularity),

underlying learning difficulties, sensory peculiarities, secondary disorders, and interventions. Participants were asked very basic questions throughout the presentation to ensure that they were appropriately engaged.

**Control Psychoeducation.** An unrelated article, *Confirmation of the Freudian Psychosexual Stages Utilizing Sexual Symbolism* (Cameron, 1967), was used to create a historical interactive presentation that served as the control condition. Similar to the experimental condition (psychoeducation about HFA), participants were asked basic questions throughout the presentation to ensure appropriate engagement.

### **Procedure**

Prior to the study, participants completed information regarding their demographics; more specifically, they identified their age, race, ethnicity, gender, and whether they have a familial or otherwise close relationship with an individual who has a diagnosis of ASD. Upon accessing the study via Qualtrics, participants indicated consent and were assigned to either the experimental (i.e., given a brief psychoeducational presentation about HFA after the pre-test assessment) or control condition (i.e., presented with a historical psychological presentation after completing the pre-test). All participants, regardless of group membership, were directed to a pre-test assessment; namely, the KHFAS. The KHFAS served as a baseline assessment for general knowledge of ASD/HFA. Participants were instructed to mark each item on the KHFAS as either ‘definitely true’, ‘slightly true’, ‘slightly false’, or ‘definitely false’. Following completion, participants were directed to either information regarding HFA or information regarding an unrelated historical concept (Freud’s theory of psychosexual development). The participants were prompted to answer a few basic questions about

their respective psychoeducation to ensure they were partaking in the study. The participants then re-rated the items on the KHFAS as well as the Knowledge of Autism Questionnaire. Following completion, all participants indicated via electronic signature that they read the debriefing statement. Those who were assigned to the control condition were given the information provided by the experimental condition to ensure that all participants received equal psychoeducational opportunities.

## CHAPTER III

### Findings

#### Results

Descriptive statistics were run to characterize the sample and to examine the means in each group (experimental and control), whereas main analyses consisted of several independent and paired-sample (dependent) *t*-tests.

First, the researchers ran a *t*-test on all subscale pretests with grouping variable set as condition to determine whether there were any significant differences on the pretest between the two groups (HFA vs. historical psychoeducation group). In line with hypothesis 1, results showed that the groups did not significantly differ in terms of their scores on any of the subscales at pretest, with the exception of the leftover items that were compiled into the “Other” subscale (General Perceptions  $t = .212, p = 0.783$ ; Behavioral/Sensory  $t = -.548, p = 0.494$ ; Cognitive Style  $t = -.957, p = 0.760$ ; Socioemotional  $t = 1.200, p = 0.661$ ; Other  $t = -.284, p = 0.030$ ). See Table 1.

Table 1

*Results for hypotheses 1 and 2.*

	<i>F</i>	Sig.	<i>t</i>	<i>df</i>	Mean Difference	95% CI (Lower)	95% CI (Upper)
GenPer_Pre	.076	.783	.212	278	.00441	-.03653	.04535
BehSen_Pre	.469	.494	-.548	278	-.01446	-.06638	.03746
CogSty_Pre	.093	.760	-.957	278	-.03030	-.09263	.03204
SocEmo_Pre	.192	.661	1.200	278	.02589	-.01657	.06835
Other_Pre	4.761	.030	-.284	278	-.00581	-.04615	.03453

Note that “GenPer\_Pre” denotes the General Perceptions pretest; “BehSen\_Pre” denotes the Behavior Sensory pretest; “CogSty\_Pre” denotes the Cognitive Style pretest; “SocEmo\_Pre” denotes the Socioemotional pretest; “Other\_Pre” denotes the Other pretest; and “TotalScore\_Pre” denotes the total pretest score across all subscales.

Second, to determine if members of both groups endorsed the stereotyped items more than the other items on the pretest of the KHFAS, the researchers examined the results from hypothesis one, looking specifically at the General Perceptions subscale and its corresponding means. Although many participants in both groups endorsed the stereotyped items (as represented by the General Perceptions subscale of the KHFAS; Control  $M = .7438$ , Control  $SD = .17471$ , Experimental  $M = .7394$ , Experimental  $SD = .17320$ ), the Behavioral/Sensory items were more heavily endorsed (Control  $M = .7647$ , Experimental  $M = .7792$ ). This was in contrast to hypothesis two. The second most endorsed group of items was Cognitive Style (Control  $M = .6422$ , Experimental  $M = .6725$ ), then Socioemotional (Control  $M = .6535$ , Experimental  $M = .6276$ ), and then the ‘Other’ (Control  $M = .6038$ , Experimental  $M = .6096$ ) items that did not fit the factor analyses. See Table 1 above.

Third, to examine whether participants that indicated a relationship between themselves and someone with ASD endorsed significantly fewer ‘common misconception’ items on the first administration (pretest) than those who did not, the researchers ran a paired-samples *t*-test. Results showed that although 106 participants reported having a relationship with someone with HFA/ASD, no significant differences ( $p = 0.350$ ) were observed in terms of endorsement of stereotypical items on the pretest. This was in contrast to hypothesis three. See Tables 2 and 3.

Table 2

*Group statistics for hypothesis 3.*

	Close Relationship?	<i>N</i>	Mean	<i>SD</i>	Std. Error Mean
GenPer_Pre	Yes	106	14.4340	3.20719	.31151
	No	174	13.8793	3.34566	.25363
BehSen_Pre	Yes	106	7.8019	2.13104	.20698
	No	174	7.6724	2.25066	.17062
CogSty_Pre	Yes	106	4.0755	1.58984	.15442
	No	174	3.8678	1.58745	.12034
SocEmo_Pre	Yes	106	5.1226	1.45865	.14168
	No	174	5.1207	1.43946	.10913
Other_Pre	Yes	106	5.4906	1.47516	.14328
	No	174	5.4425	1.58192	.11992
TotalScore_Pre	Yes	106	2.9815	.66109	.06421
	No	174	2.9034	.64381	.04881

Note that “GenPer\_Pre” denotes the General Perceptions pretest; “BehSen\_Pre” denotes the Behavior Sensory pretest; “CogSty\_Pre” denotes the Cognitive Style pretest; “SocEmo\_Pre” denotes the Socioemotional pretest; “Other\_Pre” denotes the Other pretest; and “TotalScore\_Pre” denotes the total pretest score across all subscales.

Table 3

*Endorsement of stereotypical items for those that indicated an ASD-based relationship.*

	<i>F</i>	Sig.	<i>t</i>	<i>df</i>	Mean Difference
GenPer_Pre	.877	.350	1.367	278	.55465
BehSen_Pre	.419	.518	.476	278	.12947
CogSty_Pre	.037	.847	1.061	278	.20766
SocEmo_Pre	.259	.611	.011	278	.00195
Other_Pre	.677	.411	.253	278	.04804
TotalScore_Pre	.002	.962	.974	278	.07806

Note that “GenPer\_Pre” denotes the General Perceptions pretest; “BehSen\_Pre” denotes the Behavior Sensory pretest; “CogSty\_Pre” denotes the Cognitive Style pretest; “SocEmo\_Pre” denotes the Socioemotional pretest; “Other\_Pre” denotes the Other pretest; and “TotalScore\_Pre” denotes the total pretest score across all subscales.

Fourth, to determine if the control condition continued to endorse the ‘common misconception’ items following the historical psychological excerpt, the researchers ran a paired-samples *t*-test within the control condition and found that the control condition continued to endorse the same stereotypical beliefs following the historical psychological excerpt ( $p = 0.675$ ). This supports hypothesis 4. See Table 4.



Table 4

*Control condition's endorsement of stereotypical items after historical excerpt.*

	Mean	SD	<i>t</i>	<i>df</i>	Sig.	95% CI (Lower)	95% CI (Upper)
CogStyPreCON	.05147	1.42631	.421	135	.675	-.19041	.29335
CogStyPosCON							

Note that “CogStyPreCON” is the control condition’s pretest score on the Cognitive Style subscale; “CogStyPosCON” is the control condition’s posttest score on the Cognitive Style subscale.

Lastly, to determine whether the group assigned to the HFA psychoeducation condition endorsed more items related to a highly granulated cognitive style and fewer stereotypical HFA items on the second administration (posttest), the researchers ran another paired samples *t*-test within the experimental condition. No significant differences ( $p = 0.953$ ) were observed regarding endorsement of highly granulated cognitive style items, meaning that HFA psychoeducation was not effective in changing the participants perceptions. This was in contrast to hypothesis five. See Table 5.

Table 5

*Experimental condition's endorsement of stereotypical items after HFA psychoeducation.*

	Mean	SD	<i>t</i>	<i>df</i>	Sig.	95% CI (Lower)	96% CI (Upper)
CogStyPreEXP	.0094	1.40676	.059	143	.953	-.22478	.23867
CogStyPostEXP							

Note that “CogStyPreEXP” is the experimental condition’s pretest score on the Cognitive Style subscale; “CogStyPostEXP” is the experimental condition’s posttest score on the Cognitive Style subscale.

Although there were not any significant differences regarding endorsement of items regarding highly granulated styles of cognition within the experimental condition (after the HFA psychoeducational presentation), there were notable differences between the pre-and posttest. As seen in Tables 4 and 5, the T-statistic for the control condition was 0.421 ( $p = 0.675$ ), while the experimental condition was 0.059 ( $p = 0.953$ ), meaning that the experimental condition was closer to the null hypothesis than the control condition. In other words, contrary to what the researchers expected to find, the experimental condition was less effective than the control condition in changing people's perceptions about aspects of HFA. This finding was also supported by comparing the means of the two conditions (0.05147 and 0.00694, respectively)

Post hoc analysis were run on the total scores of the KHFAS to determine if the experimental condition demonstrated any changes between the pretest and the posttest. Analyses revealed a  $p$ -value of 0.443, indicating no significant difference. Additional analyses were run to determine if there were differences on the total scores of the KHFAS for those that indicated a relationship with someone with ASD. Results showed a  $p$ -value of 0.136, indicating that prior experience with someone with ASD does not necessarily serve as a protective factor as the researchers originally thought. See Tables 6 and 7.

Table 6

*Paired samples t-test for experimental condition's total KHFAS score.*

	Mean	SD	<i>t</i>	<i>df</i>	Sig.
Exp_Pre	.02976	.46406	.769	143	.443
Exp_Post					

Note that "Exp\_Pre" denotes the experimental condition's total pretest score and "Exp\_Post" denotes their total posttest score.

Table 7

*Paired samples t-test for ASD relationship's pre- and posttest score on KHFAS.*

	Mean	SD	<i>t</i>	<i>df</i>	Sig.
ASDRel_Pre	.0610	.42277	1.502	105	.136
ASDRel_Post					

Note that "ASDRel\_Pre" denotes those that endorsed relationships' pretest score and "ASDRel\_Post" denotes their posttest score.

## Discussion

The current study investigated the perceived relationship between HFA and highly granulated style of cognitive processing, given that HFA is an extreme case in the spectrum of cognitive style characterized by high cognitive granularity. Not all of the researcher's hypothesis were correct; nonetheless, the results contained several interesting findings.

Although it was not surprising that both groups did not significantly differ in terms of their scores on any of the subscales at pretest, it was unexpected that participants who reported having a relationship with someone with HFA/ASD did not significantly differ than those who did not report such a relationship in terms of endorsement of stereotypical items on the pretest, nor did they differ as far as overall performance.

Originally, the researchers believed that having this type of relationship would act as a protective barrier from inaccurate stereotypes. Given the findings, the researchers can conclude that knowing or having a relationship with someone on the spectrum does not inoculate them from the biased stereotypes and beliefs held and/or endorsed by society.

Furthermore, it was unforeseen that participants would endorse the Behavioral/Sensory factor more than any other factor. However, given the media portrayal of behavioral components of ASD versus their cognitive counterparts, this result makes sense. For instance, consider television shows and movies such as *Atypical*, *Rainman*, and *The Good Doctor* - these shows all display individuals with ASD. However, while they are mostly accurate in depicting the behavioral components and sensory issues related to ASD (e.g., noise sensitivity, repetitive behaviors, self-stimulatory behaviors), they fail to address the full cognitive spectrum; therefore, skewing the cognitive perceptions of those with ASD.

Perhaps most surprisingly, the experimental condition did not show any significant differences in endorsement of highly granulated cognitive style between the pretest and posttest. In fact, the experimental condition was more representative of the null hypothesis than the control condition after intervention. Normally, the lack of significance regarding the experimental condition is primarily due to participant engagement. However, the current study controlled for engagement by presenting the psychoeducation in an interactive manner, frequently requiring a response from the participant. Additionally, the experimental psychoeducation utilized material from a peer-reviewed journal article, ensuring that the material would be valid. Therefore, findings of

the current study provide supplementary evidence for the obstinacy of the stereotypes held about those with ASD; more specifically, HFA.

Stereotypes and harmful messages about those with ASD are ever-present in today's society. Take, for instance, the anti-vaccination (anti-vax) movement. Based largely on a faulty study linking the measles, mumps, and rubella (MMR) vaccine to ASD (Wakefield et al., 1998), members of the anti-vax movement often treat ASD as a calamity far worse than a debilitating disease or death. In fact, as a result of fear-mongering and blatant endorsements of ableism, there have been several outbreaks of measles, a previously eradicated disease, in the United States over the last few years (Sabbe & Vandermeulen, 2016).

Unfortunately, ableism has much deeper roots. Autism Speaks, one of the nation's largest advocacy groups, is guilty as well. The organization aired a commercial in 2009, "I am Autism", that showed several images of children with autism, accompanied by an ominous voice-over: "I am Autism ... I know where you live ... I live there too ... I work faster than pediatric AIDS, cancer and diabetes combined ... And if you are happily married, I will make sure that your marriage fails" (Wallis, 2009). Although the commercial received a significant amount of backlash from self-advocacy groups, Autism Speaks remains a prominent figure in the ASD community.

Unfortunately for the current study, it is likely that the article utilized for the brief HFA presentation was not enough to override years of societal stereotypes. More engaging materials and resources (e.g., testimonies, videos, excerpts) might have strengthened the study, allowing the researchers to determine significance. In addition to

the weakness of the intervention, the current researchers should have physically administered the intervention to ensure participant engagement/compliance.

Implications of this research could fuel the integration of ASD/HFA psychoeducation and awareness activities into the general population. Furthermore, this project has the potential to provoke deeper thought regarding the basic neurological foundations of HFA and will hopefully impact the general population to form a more cohesive, positive, and accurate perception of individuals with HFA and their respective cognitive style. Future studies should consider replicating the current study with members of the community instead of students, who likely have low intrinsic motivation. Additionally, future studies could present the psychoeducation in different formats to ensure compliance.

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## APPENDIX A

### Demographics Questionnaire

#### Demographics Survey

**Construct Measured:** Demographic information on participants

**Citation:** Developed by the current researchers

**Instructions:** Please respond to the following questions. Take your time and select your response by circling the appropriate answer or filling in the blank.

1. What is your gender?  
 0 = Male  
 1 = Female  
 3 = Non-binary
2. What is your date of birth?  
 \_\_\_\_/\_\_\_\_/\_\_\_\_
3. Which of the following best describes your race? You may choose more than one answer if you are bi-racial or multi-racial.
  - a. Race: American Indian or Alaska Native
  - b. Race: Asian
  - c. Race: Native Hawaiian or Other Pacific Islander
  - d. Race: Black or African American
  - e. Race: White
  - f. Race: Other
4. If you answered "other", how would you describe your race or ethnicity? Please write in your answer.
5. Do you have any children?  
 0 = No  
 1 = Yes
6. Have you ever been clinically diagnosed with autism spectrum disorder (ASD)?  
 0 = No  
 1 = Yes
7. Have you ever had a close relationship (e.g., family member, friend, child) with someone who was diagnosed with autism spectrum disorder (ASD)?  
 0 = No  
 1 = Yes

## APPENDIX B

### KHFAS

#### Knowledge of High-Functioning Autism Scale

Read the following items carefully. Note that although they do not depict all cases of autism spectrum disorder or high-functioning autism, they can all be categorized as generally 'true' or 'false'. Please mark your response with an 'x' in the designated column.

Item	Definitely True	Slightly True	Slightly False	Definitely False
1. High-functioning autism only lasts for about a month. <sup>2</sup> (F; common misconception)				
2. Those with autism often display repetitive behaviors, such as flapping their hands. (T; behavioral)				
3. Vaccines cause autism. (F; common misconception)				
4. People with high-functioning autism often have a hard time making eye contact with others. <sup>2</sup> (T; socioemotional)				
5. High-functioning autism does not impact the function of someone's brain. <sup>2</sup> (F; cognitive processing)				
6. Individuals with autism are good with abstract concepts. (F; cognitive processing/perceptual)				
7. People with high-functioning autism do not have an intellectual disability. (T; common misconception)				
8. People with high-functioning autism sometimes display echolalia, or repeat what is said to them. <sup>2</sup> (T; socioemotional)				
9. Individuals with autism have excellent motor coordination. (F; behavioral)				
10. People with high-functioning autism do not have problems changing activities and can easily move from one activity to another. <sup>2</sup> (F; behavioral)				
11. Individuals with high-functioning autism have different brain structures than most people. (T; cognitive processing)				
12. Autism can be diagnosed as early as 15 months of age. <sup>1</sup> (T; undecided)				
13. People with autism may have trouble expressing their emotions. <sup>2</sup> (T; socioemotional)				
14. Autism is contagious and you can catch it by spending time with someone who has it, similar to a cold. <sup>2</sup> (F; common misconception)				
15. Individuals with high-functioning autism prefer to focus on wholes rather than parts. (F; cognitive processing)				
16. People with high-functioning autism are capable of showing affection. <sup>1</sup> (T; socioemotional)				

17. Most people who are diagnosed with high-functioning autism are unintelligent. <sup>1</sup> (F; common misconception)				
18. Individuals with high-functioning autism may display unique speech patterns. (T; behavioral/perceptual)				
19. Gluten-free diets can treat autism. (F; common misconception)				
20. People with high-functioning autism tend to be aggressive and violent. <sup>1</sup> (F; behavioral)				
21. Genes for high-functioning autism overlap with those for high intelligence. (T; cognitive processing)				
22. People with high-functioning autism often have extreme fascinations with specific topics or objects. (T; cognitive processing/behavioral)				
23. Scientists, mathematicians, and individuals who have high-functioning autism commonly display the same style of cognitive processing. (T; cognitive processing)				
24. People with high-functioning autism do not have empathy. <sup>1</sup> (F; common misconception/socioemotional)				
25. Those with autism may often try to cover their ears and be upset by loud noises. (T; perceptual)				
26. Individuals with high-functioning autism often excel at understanding the inner workings of systems. (T; cognitive processing)				
27. Individuals with high-functioning autism are good at using context to navigate social situations. (F; socioemotional)				
28. A child with autism will often outgrow it. <sup>1</sup> (F; common misconception)				
29. People with high-functioning autism may notice small sounds when others do not. (T; perceptual)				
30. When asked to extract minor details from mass amounts of information, individuals with high-functioning autism are often superior than their normal counterparts. (T; cognitive processing/perceptual)				
31. High-functioning autism is more frequently diagnosed in females than males. <sup>1</sup> (F; common misconception)				
32. Individuals with high-functioning autism are skilled at perceiving fine details. (T; cognitive processing/perceptual)				
33. Variations in neural cell density explains the variability within the spectrum. (T; cognitive processing)				
34. Those with high-functioning autism have a larger brain than most people. (T; cognitive processing)				
35. High-functioning autism can be cured. (F; common misconception)				

36. Individuals with high-functioning autism are disinterested in making friends. <sup>1</sup> (F; socioemotional)				
37. High-functioning autism makes it difficult to understand nonverbal cues. (T; socioemotional)				
38. People with high-functioning autism are highly reactive to sensory stimuli, including sights, sounds, smells and textures. (T; behavioral/perceptual)				
39. Autism has a tendency to run in families. (T; undecided)				
40. Individuals with high-functioning autism are deliberately uncooperative and difficult. <sup>1</sup> (F; common misconception)				
41. Individuals with high-functioning autism are likely to stick to a rigid schedule. (T; behavioral)				
42. Avoiding foods with artificial coloring can help prevent autism. (F; common misconception)				
43. There is one specific intervention that works for all individuals with autism. <sup>1</sup> (F; undecided)				
44. Individuals with autism prefer to do things with others rather than on their own. (F; socioemotional)				
45. Those with high-functioning autism may often appear 'odd'. (T; behavioral)				
46. People with high-functioning autism do not show any relational attachments. <sup>1</sup> (F; socioemotional)				
47. Those with high-functioning autism often appear to be socially awkward. (T; behavioral/socioemotional)				
48. Individuals with high-functioning autism are often fascinated by numbers or patterns. (T; cognitive processing/behavioral)				
49. If someone displays uncontrollable repetitive movements, or 'tics', then they have autism. (F; common misconception)				
50. Individuals with autism are likely to enjoy loud, busy places such as amusement parks. (F; perceptual)				
51. All people with high-functioning autism have a photographic memory. (F; common misconceptions)				
52. Chelation therapy, which involves taking medicines to remove the heavy metal mercury from the body, treats autism. (F; common misconceptions)				

<sup>1</sup>Adapted from the Autism Awareness Scale (AAS; Gillespie-Lynch et al., 2015)

<sup>2</sup>Adapted from the Knowledge of Autism (KOA; Campbell & Barger, 2011) survey.

How to score: For items marked with a 'T', score 1 point for a response of either 'Definitely true' or 'Slightly true'. For items marked with a 'F', score 1 point for a response of either 'Definitely false' or 'Slightly false'. A total score of 31 is considered passing.



## APPENDIX C

### Description of KHFA Subscales

Subscale	Description	Examples
General Perceptions	This factor assesses common misconceptions and stereotypes of HFA.	<p>Item 1: High-functioning autism only lasts for about a month.<sup>2</sup> (F)</p> <p>Item 3: Vaccines cause autism. (F)</p> <p>Item 35: High-functioning autism can be cured. (F)</p>
Behavioral/Sensory	This factor assesses common movements and sensory issues linked with ASD/HFA.	<p>Item 8: People with high-functioning autism sometimes display echolalia, or repeat what is said to them.<sup>2</sup> (T)</p> <p>Item 25: Those with autism may often try to cover their ears and be upset by loud noises. (T)</p> <p>Item 38: People with high-functioning autism are highly reactive to sensory stimuli, including sights, sounds, smells and textures. (T)</p>
Cognitive Style	This factor assesses the highly-granulated style of cognition often displayed by those with HFA.	<p>Item 23: Scientists, mathematicians, and individuals who have high-functioning autism commonly display the same style of cognitive processing. (T)</p> <p>Item 30: When asked to extract minor details from mass amounts of information, individuals with high-functioning autism are often superior to their normal counterparts. (T)</p> <p>Item 48: Individuals with high-functioning autism are often fascinated by numbers or patterns. (T)</p>
Socioemotional	This factor assesses the social and emotional aspects of HFA.	<p>Item 13: People with autism may have trouble expressing their emotions.<sup>2</sup> (T)</p> <p>Item 27: Individuals with high-functioning autism are good at using context to navigate social situations. (F)</p> <p>Item 46: People with high-functioning autism do not show any relational attachments.<sup>1</sup> (F)</p>
Other	Items that did not fit neatly into any factor.	<p>Item 4: 4. People with high-functioning autism often have a hard time making eye contact with others.<sup>2</sup> (T)</p> <p>Item 24: 24. People with high-functioning autism do not have empathy.<sup>1</sup> (F)</p> <p>Item 34: Those with high-functioning autism have a larger brain than most people. (T)</p>

## APPENDIX D

### Knowledge of Autism Questionnaire

1. More girls have autism than boys	T	F
2. Many children with autism get upset if there are changes to routines at home or school (e.g. usually on Tuesday's they go swimming, but one day they can't)	I	F
3. All children with autism deliberately hurt themselves	T	F
4. All children with autism will become adults who have a job and live on their own (i.e. be independent)	T	F
5. Autism is more common in families who have a history of the disorder (e.g. more likely to have autism if grandparents are autistic)	I	F
6. Not many people have autism in the world – it is quite rare	I	F
7. Most children with autism do very well at school	T	F
8. Children with autism don't seem to know how other people are feeling (e.g. they can't tell when you are feeling angry or sad)	I	F
9. You can "catch" autism from children who have it - it's a disease like chickenpox	T	F
10. Many children with autism have problems looking at you in the eye when you are talking to them	I	F
11. All children with autism will eventually "grow out" of the disorder and no longer be autistic as adults	T	F
12. Some children with autism sometimes get upset by different noises or when they are touched by people	I	F
13. All children with autism can talk well	T	F
14. Most children with autism prefer to play on their own	I	F
15. Some children with autism move their body in unusual ways – e.g. flap their hands	I	F
16. Many children with autism spend lots and lots of time on specific activities or things that interest them (e.g. Tom spends hours and hours playing with his train set)	I	F
17. Many children with autism don't make friends	I	F
18. Some children with autism repeat words or phrases that they have heard over and over again	I	F

19. Children with autism usually enjoy playing games with other children	T	E
20. All children with autism are good at making friends	T	E
21. All children with autism generally like to share their interests or enjoyment in activities with other people	T	E

## APPENDIX E

### KHFAS Exploratory Factor Analyses (EFA)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor	General	Behavioral/	Cognitive	Socioemotional	Other
Name	Perceptions	Sensory	Style		
Items	1, 2, 3, 7, 12, 14, 17, 19, 20, 28, 31, 35, 39, 40, 42, 43, 49, 51, 52	8, 9, 18, 25, 29, 37, 38, 41, 45, 50	21, 22, 23, 26, 30, 48	6, 13, 16, 27, 36, 44, 46, 47	4, 5, 10, 11, 15, 24, 32, 33, 34
Cronbach's Alpha	0.721(0.734)	.677(0.705)	0.629(0.617)	0.441(0.434)	-

## **VITA**

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### **EDUCATION**

Master of Arts student in Clinical Psychology at Sam Houston State University, August 2017 – present. Thesis title: “In Defense of Peculiarities: Measuring Perceptions of High-Functioning Autism Spectrum Disorder as a Cognitive Style.”

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