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Autism Clinicians' Bias in Detecting Female-Typical RRBI in Young Children

by

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Professor Groscup

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Abstract

With four times as many boys than girls diagnosed with autism, psychologists must investigate whether this is due to an intrinsic difference or gender bias. This proposed study aims to evaluate autism clinicians' bias in detecting restrictive and repetitive behaviors and interests (RRBI) in young children by presenting autism specialists with a vignette depicting one of four children, depicting either the male or female autism phenotype, and a masculine or feminine name. Gender of child and phenotypic presentation is expected to have a significant effect on detection and identification such that feminine names presenting with the Female Autism Phenotype (FAP) and feminine names will be detected and/or identified least, followed by feminine names presenting with the Male Autism Phenotype (MAP), then masculine names presenting with the FAP, and finally, masculine names presenting with the MAP will be identified and/or detected most often. Effects are expected to decrease but remain significant when controlling for education timing.

Autism Clinicians' Bias in Detecting Female-Typical RRBI in Young Children

Autism is a neurodevelopmental condition that varies greatly across those who are diagnosed. However, a cluster of symptoms tend to appear in most patients. According to the DSM-5-TR (American Psychiatric Association [APA], 2022) these symptoms include impaired communication, impaired social skills, and restrictive and repetitive behaviors and interests (RRBI, Haney, 2016). RRBI is a category of symptoms relating to body movements, rigidity, and abnormal response to sensory stimuli. To be diagnosed with autism, a client must present with social communication deficits in social-emotional reciprocity, meaning they struggle to respond appropriately in social situations; nonverbal communicative behaviors, meaning they struggle to perceive and create essential nonverbal cues such as facial expressions; developing, maintaining, and understanding relationships. They must also present with at least two symptoms of RRBI including stereotyped behavior such as hand flapping and rocking back and forth, insistence on sameness, restricted interest, and hyper- or hyporeactivity to sensory input. These symptoms must be clinically significant, meaning they significantly interfere with essential daily functioning, symptoms must not be better explained by other disorders, and have symptoms present in the early developmental period. Severity of autism is broken into three levels with level 1 individuals requiring “support,” level 2 individuals requiring “substantial support,” and level 3 individuals requiring “very substantial support” (APA, 2022, pg 58). With a contested 4:1 ratio of men and boys to women and girls in autism diagnosis (APA, 2022; Baron-Cohen et al., 2011), the field of autistic psychology is forced to wonder: What causes this gender difference?

Accepting and Explaining the Gender Ratio

A wide variety of theories across the biopsychosocial model edit this phrasing attempt to explain the gender ratio. In general, they split into two categories: those that accept and those that reject the ratio being accurate and representative. Biological theories generally accept the ratio as accurate and representative of the population. They argue that fetal hormones and a sex differential genetic liability make women and girls less likely to present with autism. This cluster of theories is referred to as the Female Protected Effect (FPE, Dougherty et al., 2022), which encompasses the decreased genetic and biological risk for autism in women. The Extreme Male Brain (EMB, Baron-Cohen et al., 2011) theory also accepts the ratio as accurate and representative and is closely tied to research on the FPE. However, it is a cognitive explanation of the diagnostic gender ratio asserting that autistic individuals systemize more than they empathize, making cognitive processes more masculine based on normative sex differences in systemizing and empathizing where men systemize more, while women empathize more (Baron-Cohen et al., 2011).

The Extreme Male Brain theory is exemplified by differing scores on the Empathy Quotient (EQ) and the Systemizing Quotient (SQ) across gender in both neurotypical and autistic populations, according to Baron-Cohen et al. (2011). Greenberg et al. (2018) found that neurotypical females tend to score higher on the EQ than neurotypical males, while neurotypical males tend to score higher on the SQ than neurotypical females in a large sample of over half a million people. They also found that people who have received a diagnosis of autism have even higher scores on the SQ and lower scores on the EQ compared to neurotypical males. These scores do not differ significantly by gender within people diagnosed with autism. Even so, it is possible that there may be gender differences, but the under diagnosis of autism in women

prevents the detection of these differences. Based on these scores, Baron-Cohen et al. (2011) suggest that autism seems to be a 'shift' toward a more extreme version of the neurotypical male presentation. Because of this, autistic females who deviate from neurotypical females at the same magnitude as autistic males who deviate from neurotypical males are less likely to be perceived as atypical than their male counterparts, as they may still score similarly to neurotypical males on the EQ and SQ (Baron-Cohen et al., 2011).

To further explain the EMB theory, fetal testosterone levels and 2D:4D digit ratios have been evaluated. The 2D:4D ratio measures the relationship of the length between the second (pointer) and fourth (ring) fingers. According to Hönekopp et al. (2012) digit ratios are a putative marker of fetal testosterone. In their meta-analysis Hönekopp et al. found that 2D:4D digit ratios were significantly smaller (more masculine) in autistic individuals than in neurotypical individuals regardless of gender. However, they did not find an effect of 2D:4D digit ratio on systemizing and empathizing behaviors in neurotypicals. They conclude that while fetal testosterone as assessed by 2D:4D digit ratios appear to be risk factors for autism, they do not seem to contribute to the observed sex differences on empathizing scores and systemizing scores.

Fetal hormones are correlated with autistic traits according to Baron-Cohen et al. (2011), who synthesized a series of studies (Auyeung et al., 2006; Auyeung et al., 2009; Auyeung et al., 2010; Chapman et al., 2006; Knickmeyer et al., 2005; Knickmeyer et al., 2006; Lutchmaya et al., 2002a; Lutchmaya et al., 2002b) indicating that fetal testosterone levels are associated with a decrease of eye contact, quality of social relationships, vocabulary size, and empathy, and in increase in autistic traits, restricted interests, systemizing, and rightward asymmetry in the corpus callosum in typically developing children throughout early development. Baron-Cohen et al. (2011) also cite Schmidtova et al. (2010) whose research showed that lifelong testosterone levels

are elevated in autistic individuals. Thus, it is clear that fetal hormone levels do significantly contribute to autism and may explain why autism is more prevalent in males as most hormones increasing autism likelihood are masculine hormones.

It seems that in general, autistic people are both cognitively and hormonally more masculine than neurotypical people. It may therefore be the case that men are at a higher risk of developing autism as their cognition and hormones need not deviate as much as women from the neurotypical norm. The Female Protective Effect theory (Dougherty et al., 2022) expands on this notion and suggests that females are less deeply affected by genetic risk factors for autism than males. Lawrence, K. et al. (2022) evaluated brain connectivity as a mechanism for the FPE in a balanced sample of typically developing and autistic male and female children. They found that polygenic risk scores influence brain connectivity in male children, but not in female children regardless of autism diagnosis. This finding suggests that polygenic risk scores penetrate less in women than they do in men.

This protective effect was further analyzed by Dougherty et al. (2022) who synthesized research on the FPE using a Liability Threshold Model in an analysis of FPE literature evaluating heritability, recurrence, sex ratio and penetrance correlations, autism population traits, clinical features, and changes in sex ratio with prevalence changes. This analysis creates a conceptual sum of all risk factors for a given condition, referred to as liability. When that liability reaches a certain threshold, the individual would be likely to be affected by the condition being evaluated. As the name suggests, the differing threshold-liability threshold model (DT-LTM), sets different thresholds for men and women to capture the theorized FPE. This theory is violated if both sexes do not follow a normal distribution where the variance is equal across sexes. Dougherty et al. (2022) evaluated multiple modalities including those providing polygenic risk

scores, sibling studies, twin studies, and sing-nucleotide polymorphism (SNP) studies against the DT-LTM model to see if the studies supported the hypothesis that the Female Protective Effect is an accurate explanation for the gender ratio. Results differed across modalities, yet overall, polygenic risk score studies and sibling studies provided the most evidence in support of the FPE liability threshold model (FPELTM), but the studies were not of sufficient quality to significantly support the model and did not have large enough effects to account for the 4:1 ratio. Twin and SNP studies provided evidence against the theory. Dougherty et al. concluded that the FPELTM is not sufficiently supported by existing research and suggest more research be conducted to develop an alternative theory that helps explain the gender ratio.

Rejecting the Gender Ratio: The Female Phenotype

While the FPE and fetal hormones may help to explain the gender ratio, behavioral differences in autism presentation also seem to be present. The overarching theory that rejects the accuracy and representativeness of the gender ratio suggests that there is a Female Autism Phenotype (FAP) with a presentation that is more common in women and girls, and that this presentation is distinct from the male typical presentation, or Male Autism Phenotype (MAP). A distinct phenotype goes beyond a reflection of typical gender differences in autistic people. Instead, the FAP theory requires that autistic women and girls deviate from neurotypical women and girls in a significantly different way from how autistic men and boys deviate from neurotypical men and boys (Hull et al., 2017). It is theorized that the FAP is under researched, and not recognized under current diagnostic criteria. Key features of the FAP are increased camouflaging, social motivation, internalizing symptoms, and decreased or different RRBI (Wood & Wong, 2017).

Camouflaging

Camouflaging is a technique autistic people use to mask their behavior and ‘pretend to be normal’ (Wood & Wong, 2017). For example, autistic people may stop stimming, despite the discomfort this causes, or stare at someone’s nose to emulate eye contact. Cook et al. (2021) conducted a systematic review of existing literature regarding camouflaging, and found that, on self-report measures, autistic adults with more autistic traits also camouflaged more, and those who camouflage more had worse mental health outcomes. They also concluded that autistic women camouflage more, do so more often, for longer periods of time, and across more environments than autistic men. Camouflaging behaviors were further evaluated by Tierney et al. (2016) who conducted semi-structured interviews with 10 adolescent autistic women to provide qualitative self-report data on camouflaging. They concluded through Interpretative Phenomenological Analysis that masking and social imitation, which are mechanisms of camouflaging, increased during adolescence as social demands increased and grew more complex.

To understand an underlying cause of camouflaging sex differences, Lehnhardt et al. (2016) evaluated the cognitive profile of autistic people diagnosed later in life. They found that autistic men had higher verbal abilities than autistic women, while autistic women had higher processing speed and stronger executive functioning than autistic men. They suggest that these cognitive profiles allow autistic women to camouflage their symptoms more, leading to decreased diagnosis. Similarly, Hull et al. (2021) evaluated autistic adolescents on executive functioning and camouflaging. They found that stronger executive functioning skills led to increased camouflaging. Thus, executive functioning could be another cognitive mechanism

employed in camouflaging. It should be noted, however, that executive functioning only accounts for a small amount of variance in camouflaging behaviors.

Camouflaging has been demonstrated to increase anxiety, though it also increases desirable outcomes such as job offers after camouflaging in an interview (Bariegla et al., 2016; Hull et al., 2017). Cage and Troxell-Whitman (2020) further investigated factors that increase camouflaging. They found that disclosure of autistic diagnosis would mediate the relationship between autistic identity and camouflaging such that strong autistic identity would lead to decreased camouflaging through increased disclosure. Interestingly, however, when disclosure was removed from the analysis, a strong autistic identity was associated with increased camouflaging behaviors. Cage and Troxell-Whitman (2020) suggest that this could be due to external factors such as fear of discrimination. They encourage workplaces and other social environments to provide a welcoming and accessible space for autistic community members, so they feel more comfortable disclosing their identity, allowing them to decrease camouflaging behaviors, and have better mental health outcomes.

Social Motivation and Friendships

Social motivation is a key element of the FAP identified by Wood and Wong (2017), though they do conclude that there is insufficient evidence of a significant difference in social motivation between autistic men and women. However, more recent research (Sedgewick et al., 2019) has indicated a significant difference meaning that while autistic women often want friends, they struggle to create and maintain friendships. Sedgewick et al. (2019) evaluated adolescent autistic men and women against each other as well as a neurotypical control on a self-report measure of peer experiences. It is unsurprising that none of the adolescent participants,

regardless of gender and diagnosis, indicated that they were aggressors as the measure was self-reported.

Sedgewick et al. (2019) found that autistic participants experienced more conflict and were more often the victim of bullying than neurotypical participants. Gender had no main effect on conflict, though there was an interaction between gender and diagnosis such that autistic girls experienced more conflict than all other groups. Neurotypical boys and girls did not significantly differ, and neither did autistic boys and neurotypical boys. However, autistic boys did experience more conflict than neurotypical girls, and victimhood followed a similar pattern.

Sedgewick et al. (2019) also conducted semi-structured interviews and compared responses across groups. Girls were most similar to each other across diagnosis, as were boys. The only theme uniquely identified in autistic participants was autistic girls mentioning that friendships are hard work. They conclude that gender seems to have a more significant impact on the kind and frequency of conflict rather than diagnosis. Because of this, Sedgewick et al. (2019) suggest that autistic women may need different kinds of strategies and support than autistic boys to navigate friendships with other girls.

Internalizing vs Externalizing Symptoms and Disorders

As identified by Wood and Wong (2017), internalizing symptoms and/or disorders is also a key element of the FAP. Internalizing symptoms and disorders include anxiety and depression, while externalizing symptoms and disorders include conduct disorder and hyperactivity (Solomon et al., 2012). Solomon et al. (2012) evaluated around 80 children and adolescents, half of whom had autism. Autistic participants were both age and IQ matched to controls. They found that in adolescence, autistic girls demonstrated more internalizing symptoms than both autistic boys and neurotypical girls, that autistic girls demonstrated more depressive symptoms than

neurotypical girls, and that more autistic girls were identified as at risk for depression than any other group.

This difference in presentation has generally led autistic males to receive more support and research as they tend to be more disruptive (Bölte et al., 2023; Hiller et al., 2014). Hiller et al. (2014) notes that teachers are more concerned about their male students than their female students as they externalize their emotions more often, and autistic girls regulate their behavior more effectively. Bölte et al. (2023), however, explains that the evidence for this widespread opinion is inconsistent, and population-based research, unlike clinical research, has failed to detect such a pattern. Similarly, it is widely accepted that autistic females display fewer RRBIs than autistic males (Edwards et al., 2023; Tilmann et al., 2018). However, some challenges have been made to this theory as diagnostic tools may not recognize RRBI in autistic females (Antezana et al., 2019; Hiller et al., 2014; Lai & Szatmari, 2020; McFayden et al., 2019; Nowell et al., 2021; Sutherland et al., 2017; Young et al., 2018). These contrasting theories on a key element of the FAP will be thoroughly discussed in a later section and are the focus of this proposal.

Gender Bias in Diagnosis

Gender bias in both clinicians and non-clinicians can impact young autistic girls' access to care. It seems that clinicians' bias is largely related to the diagnostic tools that they have access to, and the education they. As such, time since becoming an expert in autism will be controlled for.

Barriers to Diagnosis

Haney (2016) evaluated diagnostic bias in autism, focusing on the DSM-5 as compared to the DSM-4, and the Autism Spectrum Screening Questionnaire (ASSQ) and its revised extended

version (ASSQ-REV). The ASSQ was developed using a primarily male sample, and therefore is likely not as generalizable to autistic females. The ASSQ-REV was developed in by Kopp and Gillberg (2011), adding 18 items to the original ASSQ that are particularly sensitive to the FAP. Haney (2016) comments, however, that the ASSQ-REV needs further research to confirm its ability to detect autism in females, and to compare the new items to the DSM-5. He adds that the DSM-5 does include a statement advising clinicians of the prevalence of gender bias in autism diagnosis, which was not present in the DSM-4. Interestingly, using DSM-5 criteria decreased the proportion of children diagnosed with autism as compared to DSM-4-TR criteria (Ferrara et al., 2021).

While bias in the assessment process is clear (Haney, 2016), barriers to reaching this diagnostic process were systematically reviewed by Estrin et al. (2021) conducted a systematic review of barriers to autism diagnosis for females. Clinician bias was listed in multiple studies as a barrier, with Giarelli et al. (2010) concluding that ‘interpreting bias’ was at the root of the problem. Giarelli et al. (2010) supported this claim with evidence of boys and girls with educational and clinical records documenting symptoms of autism, yet only boys being diagnosed with autism. A common theme present across interviews of parents with autistic daughters, was that clinicians were hesitant to diagnose their daughters with autism and instead opted for alternative diagnoses. With one parent even saying, “I remember her [general practitioner] saying that this is usually a boys’ thing” (Navot et al., 2017 pg. 14).

Dworzynski et al. (2012) helped to quantify this barrier by drawing a sample from a United Kingdom-based population study monitoring twins born in the 1990’s. 11,000 families had their children screened for autistic traits at 8 years old using the Childhood Autism Spectrum Test (previously Childhood Asperger’s Spectrum Test, CAST; Scott et al., 2002). This is a

parental report where parents answer yes or no to a series of questions, a score of greater than 14 indicates that the child is at a high risk for autism. They created a 'diagnosed ASD' group (N = 189, 15.3% female) through positive autistic diagnosis results on the Development and Wellbeing Assessment (DAWBA), which is a set of interviews and questionnaires meant to generate a set of psychiatric diagnoses in 2 to 17-year-olds through parent reports, teacher reports, and interviews with affected individuals (11 to 17-year-olds only). The control group (N = 174, 31.6% female) included children with a score greater than 14 on the CAST (high risk for autism) and either a negative for autism DAWBA or a missing DAWBA. Dworzynski et al. (2012) found that girls who had a high CAST received a DAWBA diagnosis 38% of the time, compared to 56% of the time in boys. Similarly, autistic girls identified by DAWBA were 8.4 times more likely to have additional difficulties than high CAST girls, compared to only 1.8 times more likely to have additional difficulties in boys diagnosed by DAWBA than high CAST boys. They conclude that autism is diagnosed less often in girls even when symptom levels are similar and suggest that girls without additional difficulties may cope better with their autistic symptoms.

However, Dworzynski et al. (2012) was conducted before the publication of the DSM-5 (APA, 2013), which attempted to address the gender ratio (Haney, 2016). Even so, findings were replicated by Duvekot et al. (2017), after the publication of the DSM-5. Duvekot et al. (2017) assessed children's social responsiveness to characterize them as either at risk, or not at risk of autism. At risk children were invited to participate in the study and complete a comprehensive autism diagnostic assessment. Children characterized as not at risk were also randomly asked to complete the same measures to form a comparison group. This resulted in three groups of children: at risk of autism, autistic, and neurotypical not at risk of autism.

Duvekot et al. (2017) found that increased RRBI were less predictive of receiving a diagnosis in girls than in boys, while increased emotional and behavioral problems were more predictive of receiving a diagnosis in girls than in boys. No such gender difference was found for overall autistic impairment, sensory struggles, and cognitive functioning. Of the at risk of autism children, 55% of the boys were diagnosed, while only 25% of the girls were, with boys being 2.18 times more likely to be diagnosed than girls. They conclude that misdiagnosis led to these statistics.

Russell et al. (2011), a retrospective analysis, yielded similar results. However, they evaluated effects of additional demographic factors such as maternal age, being a first-time mom, and depression. They controlled for severity of symptoms and found that boys were diagnosed more often than girls, and that younger moms' and first-time moms' children were diagnosed less. Additionally, if the mother experienced depression before and/or around the time the child began to present with symptoms, the children were less likely to be diagnosed. Again, this research was conducted before the publication of the DSM-5, so it may be outdated, but Duvekot et al. (2017) produced similar patterns. Therefore, it can be concluded that girls at similar risk and/or symptoms levels are diagnosed less often than boys.

A final element that demonstrates the barriers to autism diagnosis for young girls, is the timing of their diagnosis. Autistic women tend to receive their diagnosis significantly later in life than men, and significantly longer after the onset of symptoms (Begeer et al., 2013; Nicholas et al., 2008; Shattuck et al., 2009). In a large sample Begeer et al. (2013) found that the time between first signs being noticed and receiving a diagnosis were longer in women. However, there was an interaction of autism subtype (Autism, Asperger's, and Pervasive Developmental Disorder Not Otherwise Specified: PDD-NOS) and gender. Girls under 18 years old experienced

a 1.8-year delay before being diagnosed with Asperger's compared to boys yet did not experience a significant delay in receiving other autism condition diagnoses. However, women over 18 years old experienced a 4.3-year delay in being diagnosed with autism compared to men but experienced no delay in receiving other autism condition diagnoses.

In similar research, Shattuck et al. (2009), found that receiving a diagnosis at a younger age was associated with being male, having intellectual disability (ID) ($IQ < 70$), and having developmental regression. Similarly, Nicholas et al. (2008) found a higher rate of autistic women with ID (72.7%) than autistic men with ID (56.4%) in their sample of 295 children with autism (32.3% female). However, this gender difference in frequency was not apparent in the severely intellectually impaired group ($IQ < 34$).

Non-Clinician's Autism Gender Bias

The bias of non-clinicians also has a significant impact as it impacts who gets referred to the clinicians for testing. Whitlock et al. (2020) even describes educators as the 'gatekeepers' of autism diagnosis. Whitlock et al. (2020) conducted an online survey where a set of four vignettes were presented to primary school teachers (including those who did not have work experience, but were trained, or who were in their training to become a primary school teacher). The vignettes depicted a child, who was either a boy or a girl, displaying the male-typical presentation in one vignette, and the female-typical presentation in the second vignette. Two additional vignettes were included with children displaying Attention Deficit Hyperactivity Disorder (ADHD) or separation anxiety to distract from the aim of the study. The gender of the name of the child was the same across vignettes each participant saw and was randomly assigned with about half viewing vignettes with feminine names. Participants then responded to questions asking how likely they would be to say the child has autism, and how likely they would be to

seek support and/or treatment for the child. They found that both gender of the child and the autism presentation (either male-typical or female-typical) had a significant effect on whether the teachers perceived the child to be autistic, and a significant interaction where female children presenting with female-typical autistic traits were less likely to be detected than male children presenting with female-typical autistic traits.

However, in a similar method, Ward et al. (2021) found no significant effect of gender on primary school teacher's perception of autism. They also distributed a survey to primary school teachers with a vignette describing an autistic child, and asked participants to select possible reasons for the behavior. Importantly, only the gender of the child was manipulated in these vignettes, no behaviors were changed. Having created the vignettes using DSM-5 diagnostic criteria, which is particularly sensitive to the male phenotype, they have not evaluated whether the primary school teachers would detect the typical female presentation of autism, but rather the male presentation of autism in both boys and girls. Thus, Whitlock et al. (2020) demonstrates greater validity as they more accurately represented the typical presentations of autism across gender.

Even so, gender does seem to have an effect on perceptions of autism and symptom severity, as demonstrated by Geelhand et al. (2019). Lay individuals were presented with a vignette depicting a 5-year-old child, with either a masculine or feminine name. Symptom severity was also manipulated in vignettes across participants to evaluate if gender influenced the layperson's perception of the severity of autism symptoms. They found that while there was no difference in symptom severity perception when asked about the child's current presentation, there was a gender difference regarding future predictions. Participants estimated that boys would be perceived as more atypical by their peers at age 15 than girls. Similar to Ward et al.

(2021), the symptom presentation was not manipulated to include both the male and female phenotypes, and yet, gender differences were still found such that girls were expected to grow out of their atypicality and later not be perceived as such.

RRBI and the Female Autism Phenotype

RRBI are a broad category of behaviors that are repetitive, rigid, consistent, and inappropriate to the environmental context. There are four subtypes of RRBI, of which at least 2 must be present in an individual or within their history to meet DSM-5 diagnostic criteria. These four categories include repetitive and stereotyped speech, movement or use of objects, as well as rituals and resistance to change, restricted interests, and sensory experiences (APA, 2022; Gal & Yirmiya, 2021). According to the DSM-5-TR RRBI are specified separately from social communication in the severity levels. Level 1 severity requires “support,” and patients experience significant interference that hampers independence across one or more contexts. Level 2 severity requires “substantial support,” and patients experience interference occurring frequently enough to be “obvious to the casual observer,” and presenting across a variety of contexts. Finally, Level 3 severity requires “very substantial support,” and patients experience extreme difficulty with coping and functioning across all contexts (APA, 2022, pg. 58).

Repetitive and stereotyped speech and movement or use of objects can include hand flapping; rhythmic body rocking, lining up toys, flicking light switches, repeating sounds, words, or phrases; and repeating the same question. Give idea where info from These vocal repetitions may be an attempt to communicate where a response is desired. However, they can also be the child processing verbally rather than mentally, where a response is not always desired. Rituals and resistance to change refer to rigid thinking patterns, difficulty with transitions, and extreme distress at minor changes to a schedule. The rituals can be highly specific, such as refusing to eat

any food other than a specific brand, and if asked to eat a different food, they experience extreme distress. Restricted interests refer to abnormally intense interests in an activity. In early childhood, they may have a restricted interest in a specific toy or stuffed animal, which they will refuse to part with. As they grow older, the interest tends to shift from an object to a subject. These interests often interfere with the person's ability to participate in other activities, and they may also provide profound joy when they are able to fully interact with their restricted interest. Sensory experiences can be either hypo- or hyper-reactivity to sensory input and may include odd or unusual sensory interests. Autistic people may experience indifference to pain and/or temperature; strong negative reactions to specific sounds, textures, or smells; and fascination with sounds, textures, smells, or visuals. They may also experience sensory overload, which occurs when stimuli that are not usually disturbing when experienced in isolation, become distressing when many stimuli are experienced simultaneously (Gal & Yirmiya, 2021).

While RRBI are often simple to observe, and the distress they can cause may be easily detectable if it results in a meltdown with outward symptoms such as crying, there are experiences of RRBI that are best described by autistic people themselves. Goldfarb et al. (2021) conducted 10 interviews with autistic adults ranging in age from 18 to 54 years old and ranging in educational achievement from high school degrees to master's degrees. Some participants lived independently, while others lived with their parents or in supported housing. Participants were asked about their experiences of RRBI, as well as their implications and impacts. Participants reported that engaging in repetitive behaviors allowed them to engage in and stay attentive to other activities. They also reported that RRBI were a way to regulate their sensory experiences. RRBI could block or reduce the intensity of the stimuli or provide additional sensory input if they were experiencing hypo-reactivity. They even described some repetitive

movements as the natural resting state, such as rocking back and forth. They reported that staying still required more attention and mental resources. Similarly, participants reported that RRBI provide emotional regulation when the feelings are difficult to contain. According to participants, RRBI help regulate all emotions, including joy and happiness, and can differ based on the emotion. When experiencing emotional distress, participants report that RRBI can become self-injurious through behaviors such as scratching, self-beating, and self-induced vomiting, which allows them to transform mental pain into physical pain.

Female Autism Phenotype: Women and Girls Display Less RRBI

Research on gender differences in RRBI generally find that autistic females display less RRBI than autistic males (Edwards et al., 2023; Tilmann et al., 2018). Edwards et al. (2023) evaluated this pattern through a systematic review using subcategories: stereotyped behavior, restricted interests, insistence on sameness, and sensory experiences. They found that autistic males demonstrated more stereotyped behaviors and restricted interests, while there was no significant gender difference on sensory experiences or insistence on sameness. Tilmann et al. (2018) evaluated sex and age differences on the ADI-R and the ADOS and found that using the ADI-R, Tilmann et al. (2018) found that autistic females demonstrated less RRBI than autistic males.

Lai and Szatmari (2019) conducted a review that produced similar results to Tilmann et al. (2018) and Edwards et al. (2023) where autistic females were found to display less RRBI than autism males. Lai and Szatmari (2019), however, suggest that this could be due to the reliance on current diagnostic tools, assumptions, and definitions regarding RRBI, and that they may have not detected RRBI in autistic females. Young et al. (2018) reviewed literature regarding sex/gender impact on presentation of autism symptoms. Their review found a theme of autistic

girls engaging in less RRBI, even when IQ was controlled. Similar to Lai and Szatmari (2019), they recognize the hypothesis that RRBI could be present at the same rate in autistic girls, but they are simply different and possibly more difficult to detect. They suggest that while boys may be interested in more abnormal topics such as maps and architecture, girls may focus on animals and dolls, which are more generally accepted as interests for young girls. They advise clinicians to ask about the quality and intensity of the activity through questions like: Does the activity cause academic or social issues? Does the activity stop her from engaging in other activities? How does she react if she is not permitted to do the activity (Young et al., 2018)?

Female Autism Phenotype: Women and Girls Display Different RRBI

In support of the hypothesis that RRBI occur at similar rates across gender, just in different presentations, Antezana et al. (2019) found that girls had more compulsive behaviors, insistence on sameness, restricted behaviors, and self-injurious behaviors. They assessed RRBI in a primarily male sample of autistic children. Similar to Edwards et al. (2023), Antezana et al. (2019) also evaluated sex differences on narrow constructs of RRBI. They, however, broke down RRBI into slightly different subcategories including stereotyped, self-injurious, compulsive, ritualistic and restricted behaviors, as well as insistence on sameness. Interestingly, they found conflicting results. Where Edwards et al. (2023) found no significant gender differences on insistence on sameness and found that autistic males demonstrated more restricted behaviors, Antezana et al. (2019) found that autistic girls displayed more insistence on sameness and restricted behaviors.

In their sample, McFayden et al. (2019) found similar results to Edwards et al. (2023) with autistic boys demonstrating more restricted behaviors than girls. However, overall, they did not find gender differences for the severity of RRBI even when controlling for age and IQ.

McFayden et al. (2019) also found that autistic girls' restricted interests varied less, and primarily included interests with the social environment or other living beings. Interestingly, autistic girls also displayed their interest in a more social manner.

Similarly, Hiller et al. (2014) found that autistic girls more frequently displayed no impairment in willingness to share their interest, with about 50% of the autistic girls staying somewhat engaged in conversation. They defined "somewhat" as engaging in reciprocal conversation, but only if the topic was their special interest, or if social scripts were expected to play a clear role (Hiller et al., 2014). Sutherland et al. (2017) further defined gender differences regarding types of interests. They found no difference in the number of RRBI, but rather, significant differences across categories of RRBI. Autistic boys were more frequently interested in technology, dinosaurs, and transport, while autistic girls were more frequently interested in singing/dancing/music, books/reading, and arts/crafts. Finally, Nowell et al. (2021) found that unusualness of the interest significantly positively correlated with interference in functioning. It is not surprising that RRBI may be missed in autistic girls, leading to them not meeting diagnostic criteria, as their interests are less unusual, less variable, expressed in social manners, less likely interfere with their lives, and they are more willing to talk about their interests (Hiller et al., 2014; McFayden et al., 2019; Nowell et al., 2021; Sutherland et al., 2017).

Study Overview and Aims

If RRBI are present at similar rates in both autistic males and females, but in different ways, clinician's ability to detect the male and female typical presentation of RRBI must be evaluated, which this paper aims to do. Due to limited qualitative research characterizing female typical RRBI, the present proposed study used both previous research and social media to create vignettes, so that the FAP RRBI were more accurately represented. These vignettes portray

MAP and FAP RRBI presentations across genders. These will be presented to autism clinicians to evaluate if they are able to identify and detect autism in both boys and girls, as well as their ability to detect RRBI across the gender typical presentations.

Investigation of differing RRBI presentations is imperative as late diagnosis of autism can lead to significant distress, additional comorbidities, and further difficulty receiving a diagnosis (Bargiela et al., 2016; Huang et al., 2020; Jadav & Bal, 2022). According to Huang et al.'s (2020) scoping review, receiving a diagnosis as an adult was frustrating as most autism clinicians work exclusively with children, or are undereducated on autism in adults. Additionally, formal support systems were inaccessible for autistic adults as the focus of most autism resources is children. They found that women were more likely to be diagnosed later in life, and when coupled with the diagnostic bias and lack of knowledge about the female autism phenotype, autistic women are clearly neglected by current practices. Jadav and Bal (2022) evaluated comorbidities in autistic adults. Participants diagnosed after the age of 21 were more likely to have comorbid psychiatric diagnoses compared to participants diagnosed before they were 21. Additionally, female participants were more likely to have comorbid psychiatric disorders than male participants. Bargiela et al. (2016) found particularly distressing results in their qualitative analysis of 14 autistic women diagnosed in late adolescence or adulthood to investigate the impact of going undiagnosed. In this sample, 9 women experienced sexual abuse, half of which occurred in a relationship. They evaluate the relationship between the women's autism diagnosis and their experience, finding that their decreased understanding of social cues made them more vulnerable to manipulation, and more vulnerable to unknowingly nonverbally communicating attraction when they were not attracted to the person.

This study aims to evaluate the gender bias of autism clinicians. Clinicians will be presented with one of four vignettes with either a girl or a boy, presenting with either a male or female typical autism presentation. They will then evaluate if they identify autism in the child, if they detect non-RRBI autism symptoms, and if they detect RRBI symptoms. It is hypothesized that clinicians will not recognize autism as frequently in children presenting with a female phenotype, and that this effect will be amplified in girls presenting with a female phenotype. It is also hypothesized that clinicians who became an expert in autism diagnosis longer ago and/or treat autistic girls and women less frequently will recognize autism less frequently in all girls and will recognize the female phenotype less frequently in both boys and girls while clinicians who became experts more recently will be more accurate in recognizing autism across gender and presentation.

Proposed Method

Participants

Participants are likely to include middle aged (30-60 years old) highly educated men and women because participation in the study requires expertise in autism, which requires graduate school, whether that be through a master's program, psychology doctorate, or philosophy doctorate in psychology. It is expected that more than half of the participants will be women as they represent 53% of the work force, and 74% of psychologists who are still early in their career (Willyard, 2011). Because this research was conducted in 2011, the psychologists who are still early in their career, are likely now well established, making most psychologists women. Most participants are expected to be White as 83% of psychologists reported that they were white in 2019 (Huff, 2021). Participants will be recruited through the APA Division 12 mailing list and website. This is the Society of Clinical Psychology, and while this targets all clinicians, the

recruitment materials will be clear that participants must be autism experts. Participants will also be recruited through other more specific websites and mailing lists such as the Association for Science in Autism Treatment. Participants will be compensated with 10 dollars for their time.

Whitlock (2020) found a medium effect size of phenotype gender, name, gender, and the interaction of the two on the participant's estimated likelihood that the child in the vignette had autism. Because this is the only study that is similar to the present study, these effect sizes were used to conduct a power analysis. Thus, at least 132 participants will be necessary to have adequate power in the 2x2 factorial analyses of variance (ANOVAs). G* Power (Faul et al., 2007) analysis of the ANCOVA test yielded a required sample size of 237 participants for sufficient power. Hopefully, the target sample size will be 300 participants, which will allow for sufficient power for both the ANOVA and analyses of covariance (ANCOVA) tests even if some participants must be excluded.

Materials

Vignettes

Participants will be presented with a vignette describing a 10-year-old child during a typical day in the classroom. Participants will be told that the behaviors the child presents with are often present at similar levels on most days. They will be instructed to read the vignette, and consider what clinical diagnosis, if any, the child presents with. The gender of the child will be manipulated through pronouns and names (Alexandra she/her for the girl, Alexander he/him for the boy). Race, ethnicity, and sexual orientation of the child will not be presented as these demographic variables may influence perceptions of autism and are not the focus of this proposed study. The child will display sufficient symptoms of autism such that they meet DSM-5-TR (APA, 2022) diagnostic criteria with level 1 severity. Due to limited research characterizing

RRBI in autistic women, and how it differs in quality, rather than quantity, from autistic men, social media was used to create the vignettes. On social media, search terms started with ‘autistic women’ followed by each symptom. Sources that discussed autism in children under 8 or in men and young boys were excluded. Ideally, a qualitative pilot study would be conducted, and autistic participants would be asked to identify their RRBI. Unfortunately, a pilot study is not within the scope of this project.

In the vignette, the children will not initiate any social interaction, and when other children interact with them, they will appear disinterested in the topic, and instead start discussing their special interest. The child will speak without facial expressions, and when the other child makes a joke, the autistic child will not laugh. The child will also be of average intelligence, as seen through classroom success, to ensure the symptoms cannot be better explained by intellectual disability. Aside from the topic of their special interest, these symptoms will be consistent across vignettes. These symptoms are pulled from DSM-5-TR diagnostic criteria for autism.

RRBI symptoms will include repetitive motor movements and restricted interests. These will be demonstrated through the female presentation children playing with their hair and focusing on a specific line of dolls, barbies, while the male presentation children will flap their hands and focus on a line of toy cars, hot wheels. They will discuss the history of the toys, which are owned by the same company, Mattel. To inform this history the articles “Hot Wheels Celebrates 50 Years” (2018) and Lord (2023) were referenced. Special interest topics were chosen based on Nowell et al. (2021) research showing that toys, music, and animals were the most common categories of special interests seen in a pilot study of 1,992 autistic children (79.9% male). Social media supplemented this decision due to the disproportionate

representation of male children in Nowell et al. (2021). Tiktok creator Paige Layle (2021), an autistic woman, posted a video in her playlist ‘autism in girls’ where she explains how special interests differ across gender. She asserts that special interests are often related to things that help them understand how the world works. Her special interest is anatomy, though the video prompted discussion of special interests in the comments. Comments (Layle, 2021) demonstrated a common theme of specific doll lines, whether this be Barbies or American Girl Dolls, rather than dolls in general. This theme is supported by Nowell et al. (2021) who added Barbies, dolls, and animal figurines to the existing examples (collecting action figure models or toy cars). Thus, dolls and toy cars were selected as similar special interests as they are included in the same category by Nowell et al. (2021).

Hand flapping was chosen to represent repetitive movements in the male presentation as it is the example used, alongside finger-flicking, in the DSM-5-TR diagnostic features of autism. Hair twirling was chosen as it was listed in two videos that appeared in the search for repetitive movements on Tiktok. One video was from Teray (Noyes, 2022), an autistic woman, in which she provides examples of ‘stimming,’ a term often used by the autistic community to describe repetitive movements, which she explains in her caption. The second example she lists is playing with hair. The other video was from Dr. Joey (Lawrence, J., 2022), an autism psychologist, in which she discusses autistic psychology and repetitive behaviors or ‘stimming,’ and lists playing with hair as an example of stimming. While she herself does not have autism, the comments under the video include autistic women agreeing with her and describing playing with their hair or biting their hair as a repetitive behavior or ‘stim.’ Hand flapping and playing with hair both entail moving the hand near the level of the shoulder, so they have been selected to be equivalent.

Inflexible adherence to routines and sensory hyper-reactivity will also be present in each child, but the reaction will be manipulated, rather than the presence of the symptom. For example, at the end of the vignette, all children will be asked to change tasks. In response, the male presentation children will start yelling, and will repeatedly punch their leg. The female presentation children, on the other hand, will become nonverbal, and punch their fists against their leg only a couple of times. Similarly, the children will be overstimulated by the bright lights. In response, the female-presentation children will squeeze their eyes shut as they try and stay quiet while they cry and punch their leg a couple of times, while the male-presentation children will start loudly crying and again, punching their leg repeatedly.

These meltdown symptoms were selected based on two videos of autistic women documenting their meltdowns, and an Instagram post explaining autistic meltdowns (Anderson, 2022; Chandler, 2023; Smith, 2023). Both videos and the Instagram post included punching parts of their body multiple times, squeezing their eyes shut, and crying. Lewis and Stevens (2023) report that autistic people often attempt to camouflage their external symptoms of meltdowns by internalizing them. Because it is generally accepted that autistic women internalize their behavior more than autistic men, the children in the female presentation vignettes will present with internalizing meltdown symptoms such as not speaking and shutting eyes, while children in the male presentation vignettes will present with externalizing meltdown symptoms such as unrestricted punching and yelling. The female presentation children do punch as well, though they do so only a couple of times because there is an attempt to internalize symptoms. In both presentations, the child attempts to remove the stressful stimuli through shutting their eyes, attempting to communicate their sensory overload through yelling, or becoming withdrawn and refusing to participate in the next task. Thus, meltdown symptoms are manipulated through

demonstration of externalizing, as compared to attempts to internalize symptoms. The complete texts of the vignettes are included in the appendix.

Autism Identification

The Autism Identified Composite will evaluate whether participants detected autism in the child and were able to identify it. Participants will be asked to rate their agreement on a five point scale (1-*strongly disagree*, 5-*strongly agree*) with the following statement: “The child has a clinical diagnosis.” They will then respond to an open-ended question: “what clinical diagnosis do you think this child has?” This question will be scored as a dichotomous variable with the categories ‘answered autism’ and ‘did not answer autism.’ They will then rate their agreement with the following statements in the same way they did before: “The child has autism,” and “I would assess this child or refer this child to be assessed for autism.” These two Likert scale questions will contribute to the Autism Identified Composite. This composite will average the scores on these two questions with a higher score indicating better detection. This is distinct from the Non-RRBI Symptoms Detected Composite, as it assesses whether the participant has named the cluster of symptoms, rather than simply recognizing each symptom. Psychometric information is unavailable for these questions as they were developed for the present study. Ideally, a pilot study would be run to assess reliability and validity, but this is not within the scope of this project.

Autism Detection

The Non-RRBI Symptoms Detected Composite will evaluate whether the participant noticed the non-RRBI symptoms of the child in the vignette, even if they did not identify this cluster of symptoms as autism. Participants will be prompted to indicate the extent of their agreement from 1 to 5, strongly disagree to strongly agree with a series of phrases: “The child

shows characteristics of autism but does not meet diagnostic criteria” and “this child demonstrates struggles with...” followed by non-RRBI symptoms: social-emotional reciprocity, understanding nonverbal cues, producing nonverbal cues, developing relationships, and maintaining relationships. These symptoms were pulled from the DSM-5-TR diagnostic criteria, excluding RRBI. None of these symptoms were manipulated in the vignettes. This set of questions will be consolidated to a composite by averaging scores, and higher values will indicate better detection of autistic symptoms excluding RRBI. Again, there is no psychometric information available, and conducting a pilot study would be ideal.

RRBI Detection

The RRBI Symptoms Detected Composite will evaluate whether participants identify the manipulated symptoms in the children as RRBI. They will be asked to indicate the extent of their agreement with the statements “This child demonstrates...” followed by RRBI symptoms: insistence on sameness and inflexibility, restricted interests, struggles with sensory stimuli, and significant impairment in social functioning. Scores will be averaged to create the composite, with higher scores indicating better detection of RRBI. Again, these questions were pulled from the RRBI section of the autism diagnostic criteria of the DSM-5-TR, and do not have psychometric information, which conducting a pilot study would provide.

Education Timing Questions

Participants will then complete a series of questions evaluating when they received their education. They will be asked if they received specialized training on autism in graduate school (*yes/no*), the year they graduated from graduate school (open-ended), if they received specialized training in autism outside of graduate school (*yes/no*), and if so, what year (open-ended), and year the participant started working with autistic clients (open-ended). Responses will then be

coded into a number representing the years since their most recent education on autism, whether that be through graduate school, an outside program, or simply working with autistic clients.

Procedure

This two-by-two factorial between groups study will be conducted online through an online survey. Participants will be asked to provide informed consent before starting the survey. If they do not consent, they will be sent to the end of the survey. Participants who consent will be randomly assigned to one of the four vignettes. After reading the vignette, they will be asked questions assessing whether they identified autism in the child, if they detected non-RRBI autism symptoms, and if they detected RRBI autism symptoms. They will be asked the open-ended question ‘what clinical diagnosis do you think the child has?’ a second time to assess if participants identified autism after rating the likelihood that the symptoms are present, even if they did not initially identify autism. Participants will be asked questions about the timing of their education and their demographics such as age and gender. Finally, participants who have completed the survey will be directed to a debriefing page where hypotheses and instructions to receive compensation will be presented.

Ethical Considerations

The proposed study will not only benefit the scholarly knowledge base by investigating diagnostician bias more thoroughly, but it will also likely benefit autistic women as they seek their diagnosis. If clinicians are more aware of their bias, and of the female autism phenotype, they will be able to better support autistic women and more accurately diagnose them. There is not likely going to be a direct benefit to participants aside from the financial compensation. These benefits outweigh the minimal risk to the participants. Participants will not be asked about sensitive information, there will be no deception, and data will be kept anonymous. Anonymity

will be maintained by using an online survey and not collecting any identifying information, including IP addresses. Participants will be autism experts with experience diagnosing and/or treating autistic children. As such, the primary task they will be asked to complete, assessing autism in a hypothetical child, is very similar to a task they would conduct in their daily life: diagnosing a child with autism. Because participants will be experts in the field of psychology, they are not a protected or vulnerable population, and they are more likely to be aware that participation is entirely voluntary. Even so, the informed consent will inform participants of their rights, and remind them that participation is voluntary. Compensation is \$10, which is not excessive or undue influence for this population. Participants will be debriefed and informed of the hypotheses evaluated in this survey.

Anticipated Results

Vignette and Identification/Detection

A factorial analysis of variance (ANOVA) with child gender and presentation gender as independent variables will be conducted to evaluate the effect of the vignette on clinician's ability to both identify and detect autism, as well as detect RRBI. A significant main effect of both name gender and presentation gender are expected, as well as an interaction effect. Feminine names and the FAP are expected to decrease identification and detection compared to masculine names and the MAP. Identification and detection are expected to decrease with feminine names as compared to masculine names. This decrease will be significantly greater in the FAP than in the MAP. These predictions are drawn from the findings of Whitlock et al. (2020), which included a main effect of both gender and autism presentation, as well as an interaction effect of gender and presentation on primary school teacher's estimations of autism in the vignettes. A study with similar research methods has not been conducted with clinicians, yet

these patterns are still expected in clinicians as research (APA, 2013; Duvekot et al., 2017; Estrin et al., 2021; Haney, 2016; Navot et al., 2017) conducted after the publication of the DSM-5 in 2013 suggests that clinicians still demonstrate significant bias in identifying and detecting autism in girls and/or the female phenotype.

Vignette, Identification/Detection and Education Timing

An analysis of covariance (ANCOVA) will then be conducted to evaluate if these effects remain when controlling for time since autism education. Because the understanding of autism, especially in women is particularly recent, older participants who received their education longer ago, may have outdated perspectives. Effects are expected to decrease but remain significant suggesting that when controlling for time since autism education, identification and detection are still decreased by vignettes with the FAP and/or feminine names as compared to the MAP and/or masculine names, though to a lesser degree. A multiple regression will then be conducted to evaluate if the relationship between vignette presented, and identification and detection is dependent upon timing of education. This is expected to be the case, with longer time since autism education decreasing identification and detection in the FAP and/or feminine name as compared to MAP and/or masculine name vignettes. These expectations are rooted in research on gender bias from both before and after the publication of the DSM-5. The FAP is a more recent theory, so participants who were educated on autism before widespread analysis of the theory are likely to be less accurate in identifying and detecting autism and RRBI in girls and in the FAP if they have not refreshed their education. Effects are expected to remain significant, though smaller, as research (Estrin et al., 2021; Duvekot et al., 2017; Haney, 2016; Navot et al., 2017) evaluating gender bias in autism diagnosis conducted after the publication of the DSM-5 still yields significant effects

Scholarly Merit

This study would be the first analysis of clinicians' gender bias using vignettes. While other studies have analyzed bias in clinical settings through rate of diagnosis after recruitment, these were all conducted using time consuming, expensive, and often inaccurate measurements (Duvekot et al., 2017; Dworzynski et al., 2012). There is a push to shift away from such a procedure due to the access barriers they create (Gwynette et al., 2019). Thus, asking clinicians to assess children without these tools may yield results on gender bias if these access barriers are removed.

Similarly, research has been conducted using vignettes, to assess the bias of primary school teachers (Whitlock et al., 2020; Ward et al., 2021). The conflicting results between Whitlock et al. (2020) and Ward et al. (2021) demonstrate the importance of vignette research manipulating phenotypic presentation rather than just the name of the child in the vignette. Even still, lay individuals expected symptom severity to decrease in girls, though not in boys regardless of phenotypic presentation (Geelhand et al., 2019). Similar research should be conducted with clinicians as participants to assess if they also expect that symptom severity will decrease in girls, as this could influence their diagnostic decision. Additionally, research using a similar method to the present study and/or Geelhand et al. (2019) should be conducted with general practitioners as they often refer children for autism assessment (Duvekot et al., 2017). This study could significantly contribute to research on gender bias in the diagnosis of autism in women and girls.

Broader Impacts

If the hypotheses are supported, this research could inform clinicians of their gender bias so they may make more informed decisions when diagnosis a child with autism. Autistic women

have been woefully underrepresented in autism research and face serious repercussions due to late and/or missed diagnosis (Bariégla et al., 2016; Jadav & Bal, 2022). Significant results regarding timing of education could motivate clinicians who have not formally refreshed their autism education to do so, allowing them to learn more about the FAP, and more accurately diagnose their clients. Similarly, additional awareness of female typical RRBI could not only inform autism clinicians, but general practitioners and educators as well. This study could drastically improve the experience of autistic women and girls if clinicians work to better themselves after being exposed to their gender bias through this study.

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Appendix A

Female Autism Phenotype and Feminine Name Vignette

In a 4th grade classroom, students are given the opportunity to stay indoors during recess, which Alexandra, a 10-year-old girl, always chooses over going outside. She sits in the corner carefully dressing her barbie. Today, another child, Sam, comes over to tell her a joke. Sam says “Hey Alexandra, knock knock!” When Alexandra doesn’t respond, Sam prompts “you’re supposed to say whose there?” Alexandra responds, “why? I know you are Sam. I can see you” Sam says, “Yea but it’s part of the joke.” Alexandra looks back at her Barbie and responds to Sam “I don’t like jokes, I like Barbies. Did you know Barbie was modeled after a German Bild Lilli doll in 1959? Moms didn’t like her, but kids did. Ken came out in 1963. They are named after the founder’s kids, Barbara, and Ken. Barbie and Ken date even though they are named after siblings which don’t date.” Sam walks away from Alexandra while she talks, growing uninterested in the conversation.

Later, while the class is watching a movie, Alexandra plays with her hair by twirling it around her finger. Before the movie ends, however, the bell rings and the class has to go to lunch. Alexandra slams her hands over her ears, and when the light turns on, she squeezes her eyes shut. When asked if she is okay, Alexandra does not respond. She starts quietly crying and occasionally punching her leg. The teacher comes over and touches her shoulder to try and soothe Alexandra, and she flinches away from this touch. The teacher brings Alexandra’s lunch to her desk, where she quietly eats by herself while the rest of the class eats in the cafeteria. While she stops crying and punching her leg, she does not talk for the rest of the day.

Female Autism Phenotype and Masculine Name Vignette

In a 4th grade classroom, students are given the opportunity to stay indoors during recess, which Alexander, a ten-year-old boy, always chooses over going outside. He sits in the corner carefully dressing his barbie. Today, another child, Sam, comes over to tell him a joke. Sam says “Hey Alex, knock knock!” when Alexander doesn’t respond, Sam prompts “you’re supposed to say whose there?” Alexander responds, “why? I know you are Sam. I can see you” Sam says, “Yea but it’s part of the joke.” Alexander looks back at his barbie and responds to Sam “I don’t like jokes, I like barbies. Did you know Barbie was modeled after a German Bild Lilli doll in 1959? Moms didn’t like her, but kids did. Ken came out in 1963. They are named after the founder’s kids, Barbara, and Ken. Barbie and Ken date even though they are named after siblings which don’t date.” Sam walks away from Alexander while he talks, growing uninterested in the conversation.

Later, while the class is watching a movie, Alexander plays with his hair by twirling it around his finger. Before the movie ends, however, the bell rings and the class has to go to lunch. Alexander slams his hands over his ears, and when the light turns on, he squeezes his eyes shut. When asked if he is okay, Alexander does not respond. He starts quietly crying and occasionally punching his leg. The teacher comes over and touches his shoulder to try and soothe Alexander, and he flinches away from this touch. The teacher brings Alexander’s lunch to his desk, where he quietly eats by himself while the rest of the class eats in the cafeteria. While he stops crying and punching his leg, he does not talk for the rest of the day.

Male Autism Phenotype and Feminine Name Vignette

In a 4th grade classroom, students are given the opportunity to stay indoors during recess, which Alexandra, a ten-year-old girl, always chooses over going outside. She sits in the corner

spinning the wheel on her hot wheel toy car. Today, another child, Sam, comes over to tell her a joke. Sam says, “Hey Alexandra, knock knock!” when Alexandra doesn’t respond, Sam prompts “you’re supposed to say whose there?” Alexandra responds, “why? I know you are Sam. I can see you” Sam says, “Yea but it’s part of the joke.” Alexandra looks back at her hot wheel and responds to Sam “I don’t like jokes; I like hot wheels. Did you know hot wheels were the first toy car that could go on tracks? The founder was shocked by the wheel’s functions, and yelling out that they were some hot wheels.” Sam walks away from Alexandra while she talks, growing uninterested in the conversation.

Later, while the class is watching a movie, Alexandra flaps her hands repeatedly. Before the movie ends, however, the bell rings and the class has to go to lunch. Alexandra slams her hands over her ears, and when the light turns on, she squeezes her eyes shut. When asked if she is okay, Alexandra starts yelling “no” repeatedly. She starts loudly crying and repeatedly punching her leg. The teacher comes over and touches her shoulder to try and soothe Alexandra, and she flinches away from this touch. She tells the teacher she wants to finish the movie, and the teacher informs her that she has to eat lunch. Alexandra cries out when the teacher tries to bring her to the cafeteria, so the teacher brings Alexandra’s lunch to her desk, where she eats by herself while the rest of the class eats in the cafeteria. Alexandra is on edge for the rest of the day and flaps her hands more often than usual.

Male Autism Phenotype and Masculine Name Vignette

In a 4th grade classroom, students are given the opportunity to stay indoors during recess, which Alexander, a ten-year-old boy, always chooses over going outside. He sits in the corner spinning the wheel on his hot wheel toy car. Today, another child, Sam, comes over to tell him a joke. Sam says, “Hey Alexander, knock knock!” when Alexander doesn’t respond, Sam prompts

“you’re supposed to say whose there?” Alexander responds, “why? I know you are Sam. I can see you” Sam says, “Yea but it’s part of the joke.” Alexander looks back at his hot wheel and responds to Sam “I don’t like jokes; I like hot wheels. Did you know hot wheels were the first toy car that could go on tracks? The founder was shocked by the wheel’s functions, and yelling out that they were some hot wheels.” Sam walks away from Alexander while he talks, growing uninterested in the conversation.

Later, while the class is watching a movie, Alexander flaps his hands repeatedly. Before the movie ends, however, the bell rings and the class has to go to lunch. Alexander slams his hands over his ears, and when the light turns on, he squeezes his eyes shut. When asked if he is okay, Alexander starts yelling “no” repeatedly. He starts loudly crying and repeatedly punching his leg. The teacher comes over and touches his shoulder to try and soothe Alexander, and he flinches away from this touch. He tells the teacher he wants to finish the movie, and the teacher informs him that he has to eat lunch. Alexander cries out when the teacher tries to bring him to the cafeteria, so the teacher brings Alexander’s lunch to his desk, where he eats by himself while the rest of the class eats in the cafeteria. Alexander is on edge for the rest of the day and flaps his hands more often than usual.