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Engendering Autism: Gender and Sensory Processing in Autism Spectrum Disorders

Naomi Hazlett*

Autism Spectrum Disorders (ASD) are characterized by a gender ratio skewed heavily towards males. To effectively address this discrepancy, the nature of sex and gender differences in ASD is examined. Sex and gender differences are distinguished with multidisciplinary references. A theoretical and definitional groundwork takes into consideration the dynamic and multi-levelled nature of developmental influences. Establishing distinctions between sex and gender while recognizing their interrelatedness aids in clarifying the specific nature of these influences; genetics and the environment are similarly conceptualized. Through this lens, Extreme Male Brain Theory (Baron-Cohen, 2009), is critically examined. Baron-Cohen's theory, while containing some merit, requires further revision keeping in mind the many influences upon development as well as distinctions between gender and sex. New directions are proposed for research into gender and sex differences in ASD, with the identification of sensory processing as a promising avenue.

Introduction

Autism Spectrum Disorder (ASD) is a group of developmental disorders that manifest in a variety of outcomes including social difficulties (Lord et al., 2000), sensory processing abnormalities (Stevenson et al., 2014), and repetitive behaviours (Leekham, Uljarvic & Prior, 2011). One of the most prominent characteristics of ASD is a skewed ratio in diagnosis. Males are diagnosed five times as often as females (Centers for Disease Control and Prevention, 2014), and an adequate explanation for this phenomenon remains elusive. Based on emerging findings, it is likely that the current rate of diagnosis is misaligned with actual prevalence. Females with ASD may possess protective behavioural effects or other factors which prevents a more equitable diagnosis rate. Before addressing these issues, it is vital to revisit current definitions and diagnoses as it is likely that the theoretical framework of ASD itself plays a role in perpetuating the lack of understanding of ASD in females.

In re-framing ASD to account for gender differences, a number of steps must be taken.

First, I will address the debate originating in feminist psychology between sex and gender differences as well as its underlying roots; that is, the roles of genetics and the environment in development. While terminology varies throughout the literature, for the purposes of this paper, sex will refer to the biological characteristics which differentiate males and females while gender denotes identity and behaviour outcomes which can be attributed to environmental factors. Stricter definitional boundaries are essential to maintain important theoretical distinctions at a number of levels of analysis. Once a sturdy definitional groundwork has been laid it will then be possible to move towards a critical evaluation of gender issues in ASD, in particular addressing methodological concerns which may reinforce the gender disparity. I will then survey the multiple causal contexts within which ASD manifests. Lastly, I will summarize the role of gender in ASD in order to provide a more accurate account of the condition in relation to sex and gender, as well as propose future directions in research.

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ENGENDERING AUTISM

Sex and Gender: Theoretical Approaches

The distinction between sex and gender has had a turbulent history. The first publication differentiating between the two terms appeared in the late 1950s (Money, Hampson & Hampson, 1955, in Muehlenhard & Peterson, 2011). This terminological shift has been fraught with heated debate from multiple sources, and as a result, there has yet to be a robust consensus on what is sex and what is gender (Muehlenhard & Peterson, 2011). This is due not only to the politically charged nature of the debate, but also to the fact that interactions between genetics and the social environment make the task of separation problematic. As will be explicated, sex differences can be conceptualized for the purposes of this work as biologically-driven behaviours, while gender differences refer to socially or cognitively-driven behaviours.

Before discussing the difficulties of extricating the various influences of gender and sex on behaviour, it is necessary to link this discussion to the greater context of the longstanding nature versus nurture debate. Both are based in the attempt to determine the extent to which biology (nature, sex) or the environment, including socialization (nurture, gender), play a role in observable behaviours.

Over time, the theoretical pendulum has swung back and forth within the field of psychology, favouring either innate or environmental influences (Sameroff, 2010). More recently, a general consensus has developed that genes and the environment are always involved to some degree in a given phenomenon (Lux, 2014). Eagly and Wood observe that despite this, psychological research is often framed within one or the other type of cause, to the exclusion of the other, or treat them as competing explanations (2013). If these influences are seemingly impossible to isolate and yet still play different roles in development and research, how is it possible to gather meaningful, informative data?

Nature, Nurture, and Dynamical Systems

One approach to determining the influences of genetics and the environment are their mutual effects on cognition. A study by Fildes et al. (2014) used twin analyses to determine genetic influences on children's food preferences. Twin studies are widespread in psychological literature, including in ASD (Ronald & Hoekstra, 2011). Given the opinions voiced by Eagly and Wood (2013) and others, this approach also appears to be more strongly favoured by those who emphasize biological explanations for behaviour.

It is important to recognize that the social environment, among other factors, feeds into the long-term sexual selection that underlies permanent genetic changes. If this is the case, biology ought to make permanent and genetically replicable the effects of only the most stable selection pressures. The influences of sexual selection therefore differ from contemporary sociocultural influences. Geary's thesis rests on the idea that the largest sex differences are based on different needs in child-rearing and mating opportunities. These explanations, although illuminative, do not scale easily into higher cognitive processes due to the increasing presence of other environmental influences, as well as other influences on sexual selection.

A second option is taking an integrative, dynamic approach. Overton (2004) holds that, as embodied beings, "any human act is...100% genetically determined, and it is also 100% environmentally determined, and...100% determined by the intentionality of the psychological subject" (p. 204). Overton hopes to move the discussion from quantitatively determining the extent of various influences, which he terms *split metatheory*, towards how these influences work together in tandem. Overton proposes a metatheoretical approach which defines systems in terms of dichotomous

ENGENDERING AUTISM

elements, which he terms *relational theory*. Relational systems are regarded as changing relationships between parts and wholes, framing gene-environmental relations within the context of a dynamical system.

Dynamical systems theory, while originating in mathematics as a framework for describing complex systems, has been adopted for application in biology (Jaegar, 2012; Regan & Aird, 2012), cognitive science (Vervaeke et al., 2012), developmental psychology (Smith & Thelen 2003, Diamond 2012) and neuroscience (Izhikevich, 2006). While the degree to which the mathematical foundations are employed differs, the conceptual application is as follows. Dynamical systems are complex and self-organizing (Vervaeke et al., 2012), containing sets of variables describing the system's state as well as laws describing the evolution of states (Izhikevich, 2006). One of the features of a dynamical system is self-organizing criticality; an oscillation between periods of stability and change-provoking instability, or of synchronicity and asynchronicity (Vervaeke & Ferraro, 2013). The implications for development are that genes and environmental factors are variables governed by a set of laws which promote a self-organized system which is the development of an organism over time.

Twin studies and other methodologies which strongly differentiate between the influences of genetic and environmental factors can be incorporated into the integrative framework of relational metatheory. Rend, in defending behavioural genetics, argues that there is a place for artificial distinctions; he makes the distinction between whether a paradigm relies on artificial distinctions or if those distinctions serve to further understanding of a phenomenon (2004). Bearing this in mind, it is ideal to integrate both the approaches of behavioural genetics and relational metatheory for the purpose of using artificial distinctions as a tool

for furthering research, as will be done moving forward.

Studies placing a strong statistical emphasis on genetic and environmental influences serve as a marker of causational directionality within a dynamical system comprised of multiple factors, rather than an assignment of responsibility on separate influences. A discussion of the current status of the sex and gender debate follows in order to provide an illustration of how dynamical systems operate within human development.

The Sex Versus Gender Debate

Approaches to determining the roles of genetics and the environment in behaviour and phenotypic expression become even more complex once an additional layer of politically and socially-charged discourse is added. The distinction between sex and gender has historical roots in biological determinism, a movement that is problematic both for ignoring the role of the environment and also for incorrectly ascribing behaviours to mere genetic expression. One of the challenges moving forward will be using the previously established theoretical framework, relational metatheory, to avoid making the same missteps while addressing current theoretical shortcomings.

The movement towards understanding gender as a social construct is in part, according to Eagly and Wood (2013), a backlash against characterizing perceived shortcomings or weaknesses of females as biologically innate. The aforementioned authors explain that the original sentiment behind making the sex/gender distinction was to distinguish the social elements of gender from the biological nature of sex (Crawford, 2006, in Muehlenhard & Peterson, 2011). Despite the importance of focusing on social influences on gender-specific behavioural trends, it is impossible to ignore, as Overton puts it, the "embodied" nature of cognition (2004). The reluctance to assign responsibility for

ENGENDERING AUTISM

behaviour on sex may be obfuscating the very distinction that feminist psychologists originally set out to make. Even the American Psychological Association suggests that sex is an ambiguous term (Muehlenhard & Peterson, 2011). Muehlenhard and Peterson found that articles using both the terms sex and gender often used them interchangeably; furthermore, the term sex is often reserved for sex characteristics rather than sex-derived behaviours.

The movement towards making a distinction between gender and sex thus suffers from a lack of clarity, especially in regards to what phenomena ought to be attributed to sex. Perhaps the right decision is indeed to place little focus on sex effects, given the mixed evidence that behavioural sex differences exist. In 2007, Hyde conducted an extensive analysis on reported sex differences from 46 previously conducted meta-analyses. While the author used the term gender differences, the term sex difference is used here in reference to the biological nature in which differences were conceptualized. Through meta-meta analysis, the author determined that there were large sex effects in throwing velocity and attitudes about casual sex, moderate to large effects in physical aggression and mental rotation, and small to moderate effects in smiling, verbal aggression, and self-esteem. The overall findings of the analysis were also that within-sex variability was more often larger than between-sex variability. While some authors argue vehemently to attribute all differences between males and females to sociocultural effects (Eagly & Wood, 1999, in Hyde, 2007), it is worthwhile to take a closer look at the instances in which there are sex differences of some significance in order to attempt to clarify the source of the discrepancy, especially given the alleged existence of biologically-based behavioural differences in ASD.

While the task of artificially separating the mutual influences of biology and socialization in gender and sex differences requires a more careful approach, it is by no means impossible, and furthermore, is likely to become easier over time. One approach, taken by Craig et al. (2011), was to investigate behaviour differences in females with Turner syndrome. Turner syndrome, in which part or a whole of one of two X chromosomes is missing in females, provided a means by which to study differences based on the phenotypic expression of one, rather than two, X chromosomes in females. Females with who retained the maternal X had greater difficulties in socialization than those who retained the paternal X, leading Craig (2011) to speculate that boy's difficulties in socialization may stem from exclusively inheriting their mother's X chromosome. This example not only provides an illustration of the work of contemporary behavioural genetics, but also has implications for ASD, as difficulties in socialization comprise part of the core symptomatology. Another study by Kendler et al. (2001) attempted to rule out environmental influences on gender differences in depression. The study recruited both monozygotic and dizygotic twins, like the study conducted by Fildes et al. (2014). However, the study distinguished only between same-sex and opposite-sex, and merely reported levels of monozygosity (Kendler et al., 2001). The authors concluded that gender differences in rates of depression could not be explained by gender differences in stress levels, whether due to exposure or sensitivity. While the reported effect size in Hyde's 2007 meta-analysis is non-significant, the meta analysis from which this finding is reported is based on an inventory of depression in children (Twenge & Nolen-Hoeksama, 2002). Kendler et al. (2001)'s study, on the other hand, looked at gender differences in depression in adults. Gender differences in depression begin to diverge in adolescence

ENGENDERING AUTISM

(Twenge & Nolen-Hoeksama, 2007) and continue on into adulthood (Rosenfield & Mouzon, 2013).

While Muehlenhard and Peterson (2011) believe that the distinction between gender and sex differences will diminish over time, this artificial distinction has proven to be a valuable avenue for further investigation given the presented evidence. Conflating the effects of biological sex and social gender not only prevents the nuanced exploration of their mutual interaction, but is also problematic for understanding the epidemiology of ASD.

Sex, Gender and ASD: Theoretical Frameworks

Extreme Male Brain (EMB) Theory

One of the most prominent gendered theories of ASD is the Extreme Male Brain theory of Autism (EMB) (Baron-Cohen, 2002). Baron-Cohen describes the male brain as more prone to spontaneously systematizing, while the female brain is more prone to empathizing. The author defines systematizing as an interest in variable manipulation, while empathizing is defined as the attribution of mental states to others alongside an appropriate affective response. Baron-Cohen uses the term sex differences to distinguish between patterns between the different “brains,” although he is careful to make the point that not all men have a male brain and vice versa. While the current work treats distinctions between biological and socialization effects as empirically informative yet practically artificial, such a distinction is not made in Baron-Cohen’s work.

In order to substantiate his claims, Baron-Cohen makes reference to several studies done in neonatal infants; one, for example, demonstrated a significant association between sex and preference in looking at either a mobile or a face for one day old infants (Conellan et al., 2000). A body of work with neonatal and very

young infants does indeed support the notion of biologically-driven sex differences which appear with little to no socialization experience (Alexander & Wilcox, 2014). This evidence, along with the aforementioned work done with children with Turner syndrome as well as twin studies, supports Baron-Cohen’s attempt at distinguishing the social differences in males and females as, at least in part, attributable to sex differences.

As previously mentioned, however, Baron-Cohen downplays the effects of socialization. Looking at the evidence he provides for boys being more skilled systematizers and girls being more skilled empathizers, some problematic examples emerge. Foremost, the author extends his argument beyond neonatal and twin studies, thus making the practice of attempting to distinguish between innate tendencies and environmental influences more and more problematic. This is most apparent in such examples as occupational choice, or Scholastic Aptitude Math Test scores (Baron-Cohen, 2002). Other examples, such as face preference and eye contact, or language styles, are more plausible candidates, yet are still attributable to a combination of influences. If Baron-Cohen seeks within his theory to downplay socio-environmental factors, then a more rigorous re-assessment of his work is required in order to introduce informative distinctions between various influences on gendered behaviour.

Our first step in re-evaluating the EMB theory is to look at its most recent incarnations (Baron-Cohen, 2009, Baron-Cohen et al., 2011). In Baron-Cohen’s 2009 revision, the author concedes that the amount of evidence supporting what he terms the Empathizing-Systemizing (E-S) Theory of ASD, an expansion of the observations initially reported upon in his 2002 account of EMB, is limited and that it may only apply to high-functioning individuals. On the other hand, Baron-Cohen and colleagues provide supportive evidence for EMB through the

ENGENDERING AUTISM

development of the Empathy Quotient (EQ) (Baron-Cohen & Wheelwright, 2004) and the Systemizing Quotient (SQ) (Baron-Cohen et al., 2003). These measures, as mentioned previously by Baron-Cohen, apply only to high-functioning individuals or individuals with Aspergers as they are self-report measures, rather than observational evaluations such as the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2000). It is important to note that, in the most recent version of the Diagnostic and Statistical Manual of Mental Disorders (the Fifth Edition) (American Psychiatric Association, 2013), Asperger's disorder and pervasive developmental disorders have all been grouped into the general category of autism spectrum disorders. Reorganizing definitions will likely make it difficult to track statistical changes in diagnoses over time, confounding the process of uncovering gender differences in ASD. For the purposes of the current work, Aspergers will similarly be categorized alongside other forms of high-functioning ASD.

Returning to the distinction between high and low-functioning ASD, the epidemiology of ASD differs drastically depending on the comorbidity of intellectual disability. The ratio of female to male diagnoses in ASD drops significantly in the presence of intellectual disability; additionally, a greater percentage of females with ASD possess a lower IQ than males (Rivet and Mason, 2011). Baron-Cohen's observations therefore apply only to the phenomenology surrounding high-functioning autism. Furthermore, the use of self-report questionnaires is a weak basis for a theory identifying foetal testosterone as playing a primary role in the development of ASD (Baron-Cohen et al., 2011). While the E-S and EMB theories may provide an explanatory model for a specific part of the autism spectrum, it remains to be seen exactly how far they may generalize to the larger ASD population. In order for this extension to occur, Baron-Cohen and colleagues

must take into account other measures of gendered behaviour, such as play, for example, in addition to self-report measures.

Baron-Cohen's theory may hold untapped potential if a number of steps were to be taken. First, EMB theory requires a tighter definitional framework. For example, perhaps gender differences in ASD are indeed rooted in early genetic differences. These genetic differences may become self-reinforcing over time due to the mutual influences of an individual's behaviour in their environment; what is missing, if such evidence is to be used, is an account of that mutual interaction. Second, an account of how EMB theory relates to the behaviour of low-functioning individuals is necessary if Baron-Cohen wishes to extend his theory beyond an account of high-functioning ASD. Finally, EMB/E-S theories can only gain explanatory power when grounded in evidence that demonstrates how excelling in either empathizing and systemizing relates to either most or all of the symptomatology of ASD, given the overarching explanatory power Baron-Cohen and colleagues are striving for. Perhaps extreme systemizing is a sufficient explanation for the difficulty in generalization that can be seen in individuals with ASD (Baron-Cohen, 2009), or even repetitive behaviours, but does not provide an account of other behavioural outcomes, such as sensory sensitivities.

Levels of Analysis, Emergentism, and Theoretical Approaches to ASD

Having made an initial critical foray into theoretical work on Autism Spectrum Disorders, it is now necessary to take a step back and attempt to address some of the important criticisms which have arisen so far. In discussing relational theory and dynamical systems, I established the validity of the treatment of genetic and environmental influences as separate in the sense that such an artificial distinction can bear empirical fruit, which further informs

ENGENDERING AUTISM

understanding of the dynamic processes of development. In light of the discussion of Baron-Cohen's E-S and EMB theories, it is important to clarify the process by which artificial distinctions must be made in order to become useful within Cohen's theoretical framework.

While dynamical systems serve well as a framework in which to look at the mutual interaction of genetics and the environment, levels of analysis serves as one that is useful for making artificial distinctions workable within dynamical systems theory. Much like dynamical systems, levels of analysis rests on the framework of the concept of emergent properties (Jepperson and Meyer, 2011) - phenomena which emerge only at a given level of complexity. These levels are not always hierarchical in nature. Emergentism contrasts with reductionism, or the idea that all phenomena can and should be explained at the smallest, most basic level possible. Sawyer explains that most physical scientists are reductionist atomists, who believe the most scientific strategy for understanding a system is to break it into component parts, discover the underlying rules and laws describing these components, then analysing interactions among parts (2002). Emergentism, on the other hand, is the idea that some systems manifest emergent higher level properties which are a consequence of the interaction between components (Sawyer, 2002).

Much like the consolidation of split metatheory with relational metatheory, and the resolution of the nature-nurture and sex and gender debates, emergence can be compatible with reductionism (Sawyer, 2002), providing a framework for solving the confusion which arises from explaining a complex system at differing levels of analysis. Levels of analysis (LOA) is the approach within which a system is analyzed at levels differentiated by their emergent properties. LOA has been readily

adopted within other disciplines (Jepperson & Meyer, 2011, Michaelian, 2010). The merit in Baron-Cohen's theory is obfuscated by the attempt to explain a lower-level phenomenon, i.e. the underlying genetic pathology behind Autism Spectrum Disorders, with a higher-level phenomenon, i.e. the behaviour of individuals with high-functioning ASD. The author points to emergent behaviour as evidence for a system that does not demonstrate the same emergent properties in relative isolation. A more helpful approach would be the following. First, identify the levels at which there are differing emergent properties. Possible levels may include: genetic, phenotypic, neurological, psychological, information-processing, perception. and environmental interactions.

Building upon the foundation of dynamical systems through introducing Emergentism and LOA enables a clearer understanding of the relationship between sex and gender. As discussed, behaviour is an emergent property of the dynamic interaction between genetics and the environment which can not be fully explained by treating one or the other as mutually exclusive. It is essential to make this distinction moving forward in order to avoid attributing causality of a higher-level phenomenon to a lower-level process, which has occurred in the case of females on the autism spectrum. Rather than examining higher-level interactional factors behind the behavioural profile of females with high-functioning ASD, the phenomenon has until recently been relegated to a lower-level, genetic explanation.

Levels of Analysis: Sex and Gender Differences in ASD

In the following section, I will examine sex and gender differences from a variety of levels in order to demonstrate their individual contributions to the emergent property of behaviour.

ENGENDERING AUTISM

Genetics and the Prenatal Environment

It is important to note that genes are an emergent property of the environment itself; an individual's genes are inextricably embedded in his or her parents' environment from conception. Autism spectrum disorders are quite heterogeneous, genetically speaking (Geschwind, 2011). There is no clear genetic marker and multiple genes are implicated. The three main sources of genetic influence on ASD are inherited predisposition factors, de novo single gene mutations, and probands from parents contributing to an additive effect (Schwartz and Neri, 2012). Twin studies have indicated an overall genetic heritability of 70 to 80 per cent, suggesting a strong genetic etiology for the disorder, according to the authors. Another area in which ASD shows significant variability is in comorbidity, commonly occurring alongside other conditions such as ADHD (Murdoch and State, 2013).

Effects of Testosterone. The most concrete biological evidence for EMB theory is the association of prenatal exposure to testosterone with ASD and ASD-like traits. During gestation, testosterone peaks in males in weeks 14 and 20 but not in females (Constantinescu and Hines, 2012). Results from studies correlating behaviour with prenatal levels of testosterone have been inconclusive, owing in part to the paucity of research. Restricted interests have been correlated with amniotic testosterone in boys, but not in girls (Constantinescu and Hines, 2012). There is, on the other hand, a positive correlation of testosterone on male-typical behaviors in girls, but not boys. This finding sheds doubt on an EMB theory, as it solely assigns behavioural outcomes in both females and males to elevated testosterone levels. In contrast, Auyeung et al. (2010) found that foetal testosterone levels significantly predicted autistic traits through the administration of the Quantitative Checklist for Autism in Toddlers in

both females and males. Foetal testosterone (FT) levels are a promising avenue of research that merit further exploration, especially in regards to showing sex differences in behavioural outcomes.

Comorbidity of Intellectual Disability.

The difference in gender ratio in ASD depends on the presence or absence of intellectual disability. Intellectual disability (ID) is caused by a number of factors, and part of the difficulty of determining the relationship between ID and ASD is that they appear to be causally intertwined in many cases (Schwartz & Neri, 2012). Given that gender ratios differ in ASD in the presence or absence of an ID, it seems likely that females with a predisposition to high-functioning ASD have a protective phenotypic effect. This theory is further reinforced by some of the only gender-specific genetic work done in ASD. Robinson, Lichtenstein, Anckarsater, Happe, & Ronald found that familial etiological factors related to ASD are likely to be concentrated in females that manifest the disorder (2013). The relationship between ASD, gender, and intellectual disability is still somewhat obfuscated, yet there are some promising leads in terms of etiological load, as well as other phenotypic effects.

Behaviour

While ASD is predominantly genetically based, they are first and foremost diagnosed in accordance with a schedule of behaviours. Social behaviours are typically self-reinforcing, yet in ASD it is the absence of some social behaviours themselves that drive in part developmental outcomes. As previously mentioned, the recent transition between the DSM-IV-TR to the DSM-V has resulted in definitional changes. The DSM-IV-TR posits the following triad of symptoms indicating a potential diagnosis of AS: impairment in social interaction, impairment in communication, and

ENGENDERING AUTISM

restricted and repetitive interests (American Psychiatric Association, 2000). The DSM-V has collapsed the triad into a dyad of “persistent deficits in social communication and social interaction” and “restricted, repetitive patterns of behaviour, interests, or activities”, the diagnostic criteria of which include difficulties in sensory perception (American Psychiatric Association 2013, p. 50).

Work done on the behavioural symptomatology of ASD has found evidence of gender differences. Van Winjgaarden-Cremers et al. (2014) conducted an extensive meta-analysis in which the core triad of impairments were assessed, to find that there were few differences in core symptomatology. Girls showed a decreased frequency of repetitive and stereotyped behaviours. That gender differences in behaviour emerge given a standard, gender-neutral diagnostic tool is significant. Van Winjaarden-Cremeers et al (2014) also recognize this point in their analysis; “If this perspective of sexually dimorphic phenotype would be true, the formal diagnostic criteria of ASD could be unjustly biased towards males” (p. 633). That girls with ASD demonstrate more imaginative play, social relations, and have more socially accepted interests are all evidence pointing to a “protective” or “masking” effect for girls with ASD (Winjaarden-Cremeers et al., 2014).

Role of the Environment

The role of the environment in ASD is the least examined factor in our multi-level assessment for several reasons. First, the environment is the most varied element of a child’s development. It can be broken down into a myriad of influences: parenting techniques, overt and covert beliefs, home, school, policies and procedures, and so on. One of the most challenging elements of studying gender and ASD is therefore exploring environmental influences on the smaller of two already small

sample sizes. One current approach by Cridland, Jones, Caputi, & Magee (2014) is to generate case studies of adolescent girls with ASD. A trend identified by the authors and the mothers they interviewed was the snowball effect of a late diagnosis leading to late intervention. Some behavioural studies help to demonstrate the lack of effect of the environment on behavioural outcomes; for example, girls with congenital adrenal hyperplasia have been observed to have male-like interest in play subjects despite encouragement to the contrary by caregivers (Constantinescu & Hines, 2012). Understanding environmental factors is therefore useful for informing potential behavioural studies as well as exploring the source of non-genetic variation in ASD. Much more work remains to be done before environmental factors are incorporated with an appropriate degree of rigor.

Role of Gender and Sexuality

Bejerot and Eriksson (2014) recently examined sexuality and gender roles in ASD. The authors discovered that individuals with ASD scored lower on the masculine gender scale than both male and female controls. Additionally, the gender role profile for both females and males with ASD was similar. The study also indicated that women in ASD report a tendency towards a more masculine profile in regards to gender behaviour, identity and sexual orientation, yet overall trends pointed to an “a-masculine” (p. 5) gender identity. It does not follow that an extreme male brain will always be an extremely “masculine brain”. Indeed, the authors mention that their results do not necessarily contradict Extreme Male Brain theory (Bejerot & Eriksson, 2014). A potential explanation is that difficulties in socialization typically observed in ASD could translate into an underdeveloped gender role or identity. The presence of intellectual disability also negatively impacts socialization (Walton and Ingersoll 2013, p. 594). Intellectual disability was one of

ENGENDERING AUTISM

the exclusion criteria in Bejerot and Eriksson (2014). The following therefore likely applies only in the absence of an ID.

On the other hand, there is also evidence that gender variance, described by Strang et al. (2014) as a “wish to be the other gender” (p. 1525), is significantly elevated in children with ASD independent of sex. In their work, a distinction is made between gender variance and being transgendered as not all children who experience gender variance become transgendered. Little research has been done on the relationship between gender dysmorphia and ASD in adulthood. One study conducted by Jones and colleagues (2012), Baron-Cohen included, found that transmen (genetic females) scored higher than transwomen on the Broader Autism Phenotype, with 30% in the Medium or Narrow range. A more recent and arguably more rigorous study done in 2014 by Pasterski, Gilligan, & Curtis found no difference between transmen and transwomen.

The above evidence is indicative of a number of things. It is clear that more needs to be done to uncover the relationship between gender identity, sexuality, and ASD traits. The variety seen in the identities of individuals with ASD, including in childhood, has implications for EMB in that it further blurs the line between sex and gender, or “maleness” versus “masculinity”, “femaleness” versus “femininity”. Even in such cases where sex and gender appear to be at odds demonstrate their intertwined relationship. ASD, a biologically based disorder according to Baron-Cohen and others, has been demonstrated to have effects in gender identity, a significantly social phenomenon. As research progresses, these and future findings must be fed downwards through levels of analysis in order to create a model for socio-behavioural outcomes.

Conclusions, Future Directions: Towards a Dynamic Theory of Gender and ASD

Having performed an extensive review of ASD and gender research, as well as underlying theoretical models, I will now move on to a reassessment of EMB theory, a summary of the interactions between various levels of analysis in approaching gender and ASD from a dynamic perspective, as well as an overview of how exploring topics such as perception can inform the interactions between said levels. I will conclude with a discussion of possible directions for research.

Extreme Male Brain Theory: Conclusions

Extreme Male Brain Theory has both merits and shortcomings in its current incarnation. The assertion that elevated levels of testosterone contribute to the symptomatology of ASD is somewhat substantiated, yet some questions remain. The relationship between elevated levels of testosterone and male-oriented behaviours is backed by several sources of research, but is not the only influence on behaviour in ASD. Elevated levels of hormones are only part of a collection of genetic influences which are still in the midst of being uncovered. Intellectual disability, for example, is not exclusively linked with elevated levels of testosterone and has several genetic origins. As previously discussed, EMB also does not account well for genetic influences on behaviour as it relies predominantly on self-report measures assessing personality traits which have been shaped by experience over the lifespan. Testosterone is not the entire explanation when it comes to ASD.

This being the case, what elements ought to be present in a comprehensive theory of ASD? EMB would benefit from tighter definitional distinctions. Keeping in mind the inextricability of genes and the environmental influences, it is important to maintain artificial distinctions for the sake of clarity. Take the case

ENGENDERING AUTISM

of offering SAT-M scores as evidence for an extreme male brain in ASD. Inquiring about the role in the environment would reveal evidence that gender differences in SAT-M scores can be completely accounted for by measures of test anxiety and performance-avoidance goals (Hannon, 2012). Using measures such as gender ratios in given professions requires an acknowledgment of the social and environmental factors at play, a deeper examination than that given by Baron-Cohen.

Second, given current evidence for gender differences in the symptomatology of ASD, it is essential that a comprehensive theory of ASD also accounts for these differences. It is important to recognize that it is significant that gender differences are found given the existence of gender-neutral, perhaps even male-biased diagnostic criteria; these differences are indicative of a larger pattern.

Gender Differences and Sensory Processing in ASD

The study of sensory processing in ASD has multiple implications for sex and gender studies. Sensory processing has emerged recently as a means by which to bridge the gap between self-report measures and behavioural outcomes. The recent transition from the DSM-IV-TR to the DSM-V has resulted in significant changes to the diagnostic criteria of ASD. Sensory processing abnormalities have now become a criterion for diagnosis (Stevenson et al., 2014). The theoretical underpinnings of Stevenson et al.'s work differ from, though are not incompatible with, EMB theory. Sensory processing theories orient on addressing Weak Central Coherence Theory (WCC) (Happé, 2013). WCC refers to the tendency of individuals with ASD to focus on the details of stimuli to the detriment of the larger picture. A reduced ability to integrate the details of objects together results in difficulty with multisensory and multimodal processing.

Multisensory processing, temporal synchrony in particular, is vital for determining the appropriate salience of incoming information in the environment. If information is bound too freely, salient information is drowned out in the noise of irrelevant information. Individuals with ASD bind multisensory information over a wider window than typically developing individuals (Woyarnoski et al., 2012). Lower-level abnormalities in multisensory as well as unisensory processing may result in a number of difficulties. Sensory sensitivities, for example, may be explained in part by the inability to filter out irrelevant stimuli. Performance on this ability may also feed forward into higher cognitive processes, such as the processing of social stimuli. If gender differences exist in ASD, it is important to examine such differences in uni- and multi-sensory processing. As discussed, girls with ASD appear to exhibit less repetitive behaviours and likely possess a social compensatory ability. Sensory processing is a potential candidate for the underlying mechanism by which some gender differences may emerge.

Closing Remarks

It is clear that there are several major obstacles in discovering the role of sex and gender. There are definitional difficulties, in terms of how sex and gender differences are theoretically separated and integrated. There are also diagnostic challenges, in which a male-biased diagnostic criterion is self-reinforcing through the selection of females who match such a set of criteria to the exclusion of females who present differently. Research into gender differences also suffers from the same general challenges ASD research faces, such as the challenge in testing low-functioning individual and small populations in general. As long as the theoretical groundwork has been laid, there are a few ways in which to overcome such challenges.

ENGENDERING AUTISM

One is to explore the Broader Autism Phenotype; symptoms which present in the general population which are milder than the symptomatology of ASD yet suggest genetic susceptibility (Hurley et al., 2007). The BAP allows the exploration of trends on the ASD spectrum, as well as a larger pool of subjects from which to draw upon. It is likely that there exists a cohort of females who score highly on the Broad Autism Phenotype Questionnaire (BAPQ) who would serve as a resource for a closer examination of gender differences in ASD in terms of what a more female-oriented diagnosis may be characterized by.

There is much work to be done in exploring gender differences in ASD, but there are also clear directions and future steps to take. It can only be hoped that as progress continues to be made, females with ASD will not be left out of the equation.

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