



The Extreme Male Brain theory and gender role behaviour in persons with an autism spectrum condition[☆]

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ABSTRACT

According to the Extreme Male Brain theory persons with autism possess masculinised cognitive traits. In this study masculinisation of gender role behaviour is evaluated in 25 persons with an autism spectrum condition (ASC) and matched controls with gender role behaviour as part of a shortened version of the Minnesota Multiphasic Personality Inventory-2 and the Empathizing Quotient and Systemizing Quotient. Both males and females with an ASC showed minimum male role behaviour. It is suggested that the minimum male gender role could be related to an underdeveloped Theory of Mind, a well-known feature of autism.

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1. Introduction

Autism is considered to be one of the most devastating childhood disorders. It is characterized by an abnormal development in social behaviour, communication, and the presence of stereotyped behaviour, interests and activities (DSM-IV, 1994). Despite the high prevalence of this lifelong disorder the causes and symptoms of autism are still unclear (Hill & Frith, 2003). The extreme heterogeneity, leading to the collective term autism spectrum condition (ASC), is hampering research into the causes of autism. Bridging brain and behaviour, cognitive theories could be vital in reducing dozens of behavioural features down to one or two underlying psychological processes. One such cognitive theory is the Extreme Male Brain (EMB) theory which tries to elucidate both social and non-social features of autism (Baron-Cohen, 2002, 2009).

The EMB theory proposes that persons with autism are characterized by weak empathizing skills (the ability to identify the mental states of others and give an appropriate emotional reaction to another person's thoughts and feelings) and strong systemizing skills (meaning the drive to analyze or construct systems by noting regularities and rules) (Baron-Cohen, 2009; Baron-Cohen, Knickmeyer, & Belmonte, 2005). Since females on average have stronger empathy skills and males have a stronger drive to systemize, the EMB theory states that persons with autism possess an extreme male brain (Baron-Cohen, 2002; Baron-Cohen et al., 2005). According to the EMB theory the shift to an extreme male brain in people with autism is the result of elevated levels of prenatal testosterone (Auyeung et al., 2009).

Taken together, the EMB theory states that people with autism have had elevated levels of prenatal testosterone leading to an extreme male brain with regard to their cognitive skills. Although this theory can explain a lot of the characteristics of autism, the disorder is still not completely understood. For this reason it would be interesting to see to what extent the

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'masculinisation' introduced by the EMB theory is apparent in other domains next to cognition. In this study we choose to focus on gender role behaviour since this is also under the influence of prenatal testosterone and stands for fundamental male and female behaviours (Hines, 2006). Therefore it would be interesting to study in what way these evolutionary behaviours are different in people with autism.

Gender role behaviour regards shared expectations of behaviour may differ by gender (Grumbach, Hughes, & Conte, 2003; Stets & Burke, 2000). Men and women differ in certain behaviour domains like aggression, parenting rehearsal, and peer/group interaction. A typical gender role might include men who invest in the worker role and women who invest in the family role. Behavioural features matching with these gender roles are assertiveness, independence and self-confidence for 'typical' males and gentle, communicative and tactfulness for 'typical' females (Delfos, 2003; Peterson & Dahlstrom, 1992).

Determinants of gender role behaviour are thought to be both biological and social-cognitive (Hines, Brook, & Conway, 2004). Because autism is related to prenatal testosterone there is a focus on the role of androgens in psychosexual development. Information about the relationship between elevated rates of testosterone and the human gender roles has come from persons with an unusual hormonal environment, like persons with congenital adrenal hyperplasia, a congenital deficiency that may result in an overproduction of androgens, including testosterone (Pinel, 1999).

Childhood play behaviour is a typical example of gender role behaviour which is often studied and can be used to examine the relationship between elevated prenatal testosterone levels and gender role behaviour. It appears that boys with congenital adrenal hyperplasia show decreased rough-and-tumble play compared to normal males (Hines & Kaufman, 1994). This led to the hypothesis that the effect of prenatal testosterone on play behaviour in boys may show an inverted-U relationship (Knickmeyer, Wheelwright, & Baron-Cohen, 2008). When girls are exposed to high levels of prenatal testosterone levels their childhood play behaviour changes to more typical boy behaviour. In case of girls with an ASC there would be a linear relationship between prenatal testosterone and masculinisation of play behaviour.

We expect males with an ASC to show less male role behaviours and more female role behaviours as compared to controls due to the inverted-U relationship mentioned above. Females with an ASC are expected to show more male role behaviours and less female role behaviours as compared to controls. As far as we know, current research has yet to explore the gender role behaviour of persons with an ASC.

The aim of the present study is to examine the gender role behaviour of adults with an ASC to see to what extent these gender roles are masculinised or feminised by their autistic condition. Since the sample of this study is relatively small, different diagnoses of an ASC were included. Two measures of the EMB theory were employed in order to confirm the theory: the Empathizing Quotient (EQ) (Baron-Cohen & Wheelwright, 2004) and the Systemizing Quotient (SQ) (Baron-Cohen, Richler, Bisarya, Guranathan, & Wheelwright, 2003). Next to this, gender role behaviour was measured with the Gender-Masculine (GM) scale and the Gender-Feminine (GF) scale of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2). The GM and GF scales measure stereotypically masculine and feminine occupations (Woo & Oei, 2008).

2. Methods

2.1. Participants

2.1.1. ASC group

This group contained 25 adults with an autism spectrum condition (16 males, 9 females). Participants in this group were recruited by a mental health clinic through an information letter (Mondriaan Zorggroep, locations Maastricht and Heerlen). All subjects had been diagnosed by experienced clinicians using established criteria for an ASC. The standard diagnostic process includes anamneses, a heteroanamnesis, a psychiatric examination, a neuropsychological examination, and a logopedic examination. The intake anamneses was executed with a questionnaire based on the three ASC criteria described in the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV, 1994). Parts of the E2-Rimland questionnaire were used during the heteroanamnesis (Rimland, 1968). The neuropsychological examination comprised among others the full version of the Wechsler Adult Intelligence Scale-Revised (WAIS-R) (Wechsler, 1997). 9 subjects (7 males, 2 females) were diagnosed with Asperger Syndrome, 8 subjects (6 males, 2 females) were diagnosed with autism, and another 8 subjects (3 males, 5 females) were diagnosed with Pervasive Developmental Disorders Not Otherwise Specified (PDD-NOS).

2.1.2. Control group

This group comprised 25 volunteers (16 males, 9 females) selected on the basis of being age- and sex matched with the ASC group. The subjects of this group were students from Maastricht University and family members of the researcher.

This research has obtained approval by the Ethical Committee of The Faculty of Psychology and Neuroscience of Maastricht University (ECP-03-07-2009/2).

2.2. Procedure

Participants with an ASC were invited to take part in the study with an information letter they received from their clinician. If they agreed to participate in the study, they were invited for assessment. Before the assessment started, they completed an informed consent. Next, they received three questionnaires, the Empathy Quotient (EQ), the Systemizing

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