



ECPS5004 INDIVIDUAL DIFFERENCES ACROSS LIFESPAN

TOPIC:

AUTISM SPECTRUM DISORDER

Autism Spectrum Disorder (ASD) is a demanding area of study in psychology that attracts scholars and professionals to understand its intricacies. It was first described by psychiatrist Leo Kanner in 1943, autism has expanded from a limited understanding to a spectrum that includes a broad range of neurological differences (Harris, 2018). The study of autism in psychology involves more than just identifying the symptoms and signs of the illness. Kodak and Bergmann (2020) stated, despite the fact that some people with autism are able to live without assistance, other individuals have significant difficulties and require care and support throughout their whole lives. Moreover, it is essential to recognise that although individuals with autism may encounter difficulties in higher education and employment, these obstacles are not directly attributable to autism per se, but rather to barriers in the professional and academic settings (Von Below et al., 2019). According to a study conducted by Cai and Ricdale (2015), a significant number of children with autism spectrum disorder who are cognitively capable have been unable to finish higher education because of issues such as isolation from society, high levels of stress and high dependency on their families.

Lord et al. (2020), stated that ASD is characterised by difficulties in social interaction and involvement, intellectual disabilities, sensory abnormalities, and repetitive habits. Individuals with ASD frequently exhibit distinctive learning preferences. Stuurman et al. (2020), mentioned their strengths may lie in areas such as memorization, tasks that require extra attention to the detail, visual learning, or particular areas of interest, while they may struggle in areas that require a more comprehensive understanding of logic or social concepts. Due to the pragmatic impairment, individuals with ASD also exhibit a variety of language abnormalities, including echolalia, pedantic speech, misinterpretation of metaphorical language, and many other abnormalities (Santos et al., 2022). It has been shown that children with ASD exhibit incorrect language behaviour in social circumstances, such as, these kids

rarely seek information or give any kind of remarks. This shows that there is a significant connection that is present between linguistic and social issues (Vogindroukas et al., 2022).

Since ASD is a spectrum disorder, it emphasises the variety of the condition and the fact that no two people with autism are precisely identical (Warrier et al., 2022). Interactions involving individuals with autism may be optimised in many ways, depending on the circumstances and the people involved (Heasman & Gillespie, 2018). Heasman and Gillespie (2018) also mentioned that as a result, autistic people have trouble interacting with others their whole lives. However, different aspects of the situation can either make it easier or harder for people to relate to each other. In a study conducted by Baron-Cohen and colleagues, he proposed that the presence of talent in autism is associated with three traits that are common across the autism spectrum. These qualities are sensory hypersensitivity, attention to details, and a drive to markedly systematise the world (Pennisi et al., 2020).

In this research, the Extreme Male Brain (EMB) theory would be explored further. The EMB theory was introduced by psychologist Simon Baron-Cohen. This theory implies that individuals with autism possess a brain that is highly masculinized and thrives in systemizing in contrast to empathy (May et al., 2019). Upon studying this theory, Baron-Cohen used three self-report questionnaires, such as: the autism quotient, the empathy quotient, and systemizing quotient (Wheelwright, 2006). Following his past work on the "Empathizing-Systemizing" and the "Theory of Mind" hypothesis, Baron-Cohen presented this theory in the early twenty-first century as an extension of his prior research. Craig et al. (2019) mentioned in his research that the theory of Empathizing-Systemizing (E-S) was later revised as the Extreme Male Brain (EMB) explanation of autism by Baron-Cohen in 2002, suggesting that ASD represents an extreme version of the average male profile.

As mentioned in the debate, it is said that the brain of a female is more empathising, whereas, male brain is more systemizing. Greenberg et al. (2018), stated with correlation to the ability to empathise and to arrange information, this suggests that autistic people, on average, have a brain type that is more “masculine”. Surveys based on self-report indicated that autistic males exhibited lower levels of masculinity than neurotypical males, while autistic females displayed higher levels of masculinity and lower levels of feminine characteristics than neurotypical females (Cooper et al., 2018). EMB is a theory that investigates whether there are variations in cognitive approaches between male and female, with a special focus on the characteristics of empathising and systemizing. It is possible that this is the reason why males are diagnosed with autism at a rate that is approximately higher than girls with the ratio of 4:1 (Halladay et al., 2015).

Baron-Cohen (2002), has mentioned in his research that the capacity to understand and respond to the thoughts and feelings of another with a suitable response is known as empathy. Being able to empathise enables one to anticipate the actions of another person and to be concerned about how they are experiencing (Krahn & Fenton, 2012). In order to predict human behaviour, empathising is very much needed. It also emphasises the intuitive emotion recognition, interpersonal relationship, and social indicators. To put it another way, people who have a greater empathising quotient are thought to be more sensitive to the feelings that are experienced by those who are directly around them (Brosnan et al., 2010). In contrast to empathising, systemizing has the capacity to build and analyse the system, regardless of whether they are technical or analytical (Valla et al., 2010). Individuals with a high inclination for methodical organisation may find success in fields like science and technology, information technology, numbers, or any other discipline requiring a profound awareness of rules, logic as well as patterns (Krahn & Fenton, 2012). In compliance with EBM theory, individuals that have ASD are sometimes viewed as someone who is extreme in systemizing. These people

might be struggling with being empathetic or socialising with others, but these people focus intensely on only a few categories of interests and pay close attention to the details. It should be noted, however, that this does not represent the entire spectrum of ASD manifestations.

In addition, in order to understand that this theory can be considered a continuation of the E-S theory, one must grasp that the theory proposes two distinct dimensions (E for empathy and S for systemizing) where variations among individuals are identified in the overall community (Baron-Cohen, 2002). According to the E–S model, it is hypothesised that a greater proportion of females have a brain of type E, whereas a greater proportion of males have a brain of type S. Individuals with autism, assuming they represent an extreme of the male brain, are expected to have an Extreme Type S brain (Baron-Cohen, 2010). The balance between empathy (E) and systemizing (S) abilities determines the identity of multiple diverse brain types. Individuals who are identified as type E are more empathetic as compared to those who are classified in the systemizing category and these people prioritise their intellectual thinking more. Type S, however, these individuals are good at organising data and think rationally as compared to being more empathetic. Type B personalities possess equal systemizing and empathising skills that can be applied positively or negatively. Extreme Type E personalities exhibit "system-blind" behaviour because they have great empathy but poor systemizing capabilities. Lastly, are individuals with extreme type S. Individuals with extreme type S are likely to have “mindblind” due to having difficulty towards empathy but are great at organising or systemizing. The above categories provide an extensive range of information regarding the ways in which individuals are able to establish an appropriate balance in their mental activities between empathising and systemizing (Krahn & Fenton, 2012).

A study conducted by (Kung et al., 2016) stated that experimentally manipulating testosterone throughout early human development is not possible due to ethical constraints.

Research on the effects of androgen has been gathered from individuals who were impacted by abnormal levels of testosterone and other androgenic substances before birth due to health disorders like classical congenital adrenal hyperplasia (CAH). The condition known as CAH is an incredibly rare hereditary disease that has no impact on males nevertheless causes females to have unusually high levels of testosterone during the pregnancy. (Kung et al., 2020). Coscini et al. (2021), stated in her article mentioning that, in response to the related androgen or foetal testosterone in the theory of ASD, the foetal brain develops in response to the presence of greater levels of testosterone during pregnancy, which leads to masculinizing it and driving it to show "systemizing" tendencies, which in turn causes ASD. During the crucial stages of prenatal development, the concentrations of androgens have a significant impact on the way testosterone influences the sexual differentiation of the reproductive system. In a study by (Ostatníková et al. 2020), stated that the EBM that is associated with autism is probably not solely caused by an increase in testosterone level, rather, it is possible that other steroid hormones that have androgen action are also involved. A previous study on the impact of foetal androgen on childhood behaviour found that the lack of androgen during foetal development leads to feminine behaviour in biological males, whereas an excessive amount of androgen results in masculine behaviour in females (Wen & Wen, 2014). However, as mentioned in the debate, there were no significant findings on the increase of systemising.

Bernier et al. (2011) has discovered that parents who have children that have been confirmed to have ASD frequently display social characteristics which are comparable to those of ASD. Referred to as the Broader Autism Phenotype (BAP), this term describes the occurrence of sub-clinical autism spectrum disorder characteristics in families that have children with ASD. Rubenstein et al. (2018) mentioned, the symptoms of BAP include difficulties in having social connections, anxiety, absentmindedness, difficulties in expressing themselves, and a lack of social competencies. The people who struggle with this BAP usually

display these traits. According to research studies, the classification of a child with autism spectrum disorder in a phenotypic class was significantly correlated with the existence of BAP among the guardians of the child (Rubenstein et al., 2018). In addition, in connection with the EBM theory, it is said that high prenatal testosterone levels have an effect on the extreme male brain, which displays traits and features that range from moderate autistic features to severe autism spectrum disorder (Husarova et al., 2016). Moreover, studies appear to indicate that the parents who hold responsibility for taking care of a kid who has autism spectrum disorder have a greater tendency to have a range of negative impacts, such as higher levels of stress, anxiety and despair (Langley et al., 2017).

Individuals who have ASD are said to have cognitive characteristics that more closely correspond with typical male cognitive patterns, according to the EMB theory (Van Eijk & Zietsch, 2021). Although it has been subjected to criticism and disagreements, the theory does bring to light certain benefits that are connected with a cognitive style that is more systemizing and analytical. There is a possibility that those who have an excessive masculine brain have a heightened attention to detail, outstanding observation skills, and a strong ability for rational decision-making. These characteristics are beneficial in areas like engineering, mathematics, and information technology, where preciseness and problem-solving skills are essential and needed. In addition, the EMB theory encourages a more in-depth comprehension of the many cognitive profiles that exist throughout the human population. This theory highlights the significance of accepting neurological diversity and valuing the distinctive advantages that people with autism contribute to a variety of fields.

There are also limitations to the EMB theory. One of the most obvious differences between the sexes in autism spectrum disorder (ASD) is the rate of diagnosis, with almost four times the number of boys as girls having been diagnosed with ASD (Werling, 2016). Due to the majority of males in studies on the characteristics and physical traits of ASD, it can be

pointed out that the diagnostic standards and instruments to evaluate ASD generally represent how ASD manifests in males. Werling (2016) stated in his study that it would be informative to study diagnosed females in order to have a better understanding of the autistic phenotype of females. Nevertheless, the outcomes must be evaluated with the awareness that these are the females who are identified based on diagnostic criteria that could possibly be biased towards males. Moreover, people think that normal individuals without ASD would live and be shaped by a normal social environment. In this case, this would not be the same as those people with ASD. These people lack empathy, having difficulty in expressing themselves and many more (Krahn & Fenton, 2012). According to a study by Hauth et al. (2014), the inability to differentiate between the sexes prevented this study from acknowledging the importance of the ratio between 2D to 4D as a precise biomarker of prenatal testosterone exposure. The 2D to 4D ratios did not exhibit the anticipated pattern of lower ratios that are correlated with more masculine (systemizing) and poorer female (empathising) abilities, nor did they demonstrate a correlation with ASD. The results are consistent with the findings of a recently published meta-analysis on the association between the 2D to 4D and measures related to ASD and empathising or systemizing. It has been discovered that there is very little correlation between autism spectrum measures and 2D to 4D in nonclinical samples, leading to issues with the sensitivity of 2D to 4D as a measure of EMB theory or the foetal testosterone.

To summarise, the progression from Leo Kanner's explanation for ASD in 1943 to the current knowledge of this neurological disorder as a spectrum highlights the significant complexity of this condition. According to Baron-Cohen's EMB theory, an individual's brain that is suffering from autism are likely to have a highly masculinized brain that is made up of systemizing compared to empathising. Besides, there is the fact that EMB theory has impacted our understanding of ASD. The 2D to 4D ratios were criticised based on the theory's accuracy

on differentiation of gender in autism spectrum disorder. Border Autism Phenotype or (BAP) was found in the parents of those children that were diagnosed with autism spectrum disorder due to high levels of androgen which has also led to other complicated genetic compositions.

To have a complete knowledge of autism, it is necessary to look at more than only the EMB theory in the field of psychology. In addition to this, it involves examining the difficulties that people with autism spectrum disorder (ASD) have in their daily lives, such as difficulties in education, limitations to interaction, and expectations from society around them. Taking into consideration the challenges associated with comprehending as well as offering care for those who have autism spectrum disorder (ASD), it is of the utmost importance that we extend our research and work together with experts, scholars, as well as members of the general population from all different fields.

REFERENCES

- Baron-Cohen, S. (2002). The extreme male brain theory of autism. *Trends in Cognitive Sciences*. [https://doi.org/10.1016/S1364-6613\(02\)01904-6](https://doi.org/10.1016/S1364-6613(02)01904-6)
- Baron-Cohen, S. (2010). Empathizing, systemizing, and the extreme male brain theory of autism. In *Progress in Brain Research* (pp. 167–175). <https://doi.org/10.1016/b978-0-444-53630-3.00011-7>
- Bernier, R., Gerdts, J., Munson, J., Dawson, G., & Estes, A. (2011). Evidence for broader autism phenotype characteristics in parents from multiple-incidence autism families. *Autism Research*, 5(1), 13–20. <https://doi.org/10.1002/aur.226>
- Brosnan, M., Daggar, R., & Collomosse, J. (2009). The relationship between systemising and mental rotation and the implications for the extreme male brain theory of autism. *Journal of Autism and Developmental Disorders*, 40(1), 1–7. <https://doi.org/10.1007/s10803-009-0815-3>
- Cai, R. Y., & Richdale, A. L. (2015). Educational Experiences and Needs of Higher Education Students with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, 46(1), 31–41. <https://doi.org/10.1007/s10803-015-2535-1>
- Coscini, N., Williams, K., Chew, D., Pang, K. C., O’Connell, M. A., & May, T. (2021). Association between early androgens and autistic traits: A systematic review and meta-analysis. *Research in Autism Spectrum Disorders*, 85, 101789. <https://doi.org/10.1016/j.rasd.2021.101789>
- Cooper, K., Smith, L. G. E., & Russell, A. (2018). Gender Identity in Autism: Sex Differences in Social Affiliation with Gender Groups. *Journal of Autism and Developmental Disorders*, 48(12), 3995–4006. <https://doi.org/10.1007/s10803-018-3590-1>
- Craig, F., De Giacomo, A., Savino, R., Ruggiero, M., Russo, L., Fanizza, I., Margari, L., & Trabacca, A. (2019). The Empathizing–Systemizing Theory and ‘Extreme Male Brain’ (EMB) Theory in Parents of Children with Autism Spectrum Disorders (ASD): An Explorative, Cross-Sectional Study. *Journal of Autism and Developmental Disorders*, 49(10), 4067–4078. <https://doi.org/10.1007/s10803-019-04114-w>

Greenberg, D. M., Warrier, V., Allison, C., & Baron-Cohen, S. (2018). Testing the Empathizing–Systemizing theory of sex differences and the Extreme Male Brain theory of autism in half a million people. *Proceedings of the National Academy of Sciences of the United States of America*, 115(48), 12152–12157. <https://doi.org/10.1073/pnas.1811032115>

Harris, J. C. (2018). Leo Kanner and autism: a 75-year perspective. *International Review of Psychiatry*, 30(1), 3–17. <https://doi.org/10.1080/09540261.2018.1455646>

Halladay, A., Bishop, S., Constantino, J. N., Daniels, A., Koenig, K., Palmer, K., Messinger, D. S., Pelphrey, K. A., Sanders, S., Singer, A., Taylor, J. L., & Szatmári, P. (2015). Sex and gender differences in autism spectrum disorder: summarizing evidence gaps and identifying emerging areas of priority. *Molecular Autism*, 6(1). <https://doi.org/10.1186/s13229-015-0019-y>

Heasman, B., & Gillespie, A. (2018). Neurodivergent intersubjectivity: Distinctive features of how autistic people create shared understanding. *Autism*, 23(4), 910–921. <https://doi.org/10.1177/1362361318785172>

Hauth, I., De Bruijn, Y. G. E., Staal, W., Buitelaar, J. K., & Rommelse, N. (2014). Testing the extreme male brain theory of autism spectrum Disorder in a familial design. *Autism Research*, 7(4), 491–500. <https://doi.org/10.1002/aur.1384>

Husarova, V., Lakatošová, S., Pivovarciova, A., Babinská, K., Bakoš, J., Durdiaková, J., Kubranská, A., Ondrejka, I., & Ostatníková, D. (2016). Plasma Oxytocin in Children with Autism and Its Correlations with Behavioral Parameters in Children and Parents. *Psychiatry Investigation*, 13(2), 174. <https://doi.org/10.4306/pi.2016.13.2.174>

Kodak, T., & Bergmann, S. (2020). Autism spectrum Disorder. *Pediatric Clinics of North America*, 67(3), 525–535. <https://doi.org/10.1016/j.pcl.2020.02.007>

Krahn, T., & Fenton, A. (2012). The Extreme Male Brain Theory of Autism and the Potential Adverse Effects for Boys and Girls with Autism. *Journal of Bioethical Inquiry*, 9(1), 93–103. <https://doi.org/10.1007/s11673-011-9350-y>

Kung, K. T. F. (2020). Autistic traits, systemising, empathising, and theory of mind in transgender and non-binary adults. *Molecular Autism*, 11(1). <https://doi.org/10.1186/s13229-020-00378-7>

Kung, K. T. F., Thankamony, A., Ong, K. K., Acerini, C. L., Dunger, D., Hughes, I. A., & Hines, M. (2020). No relationship between prenatal or early postnatal androgen exposure and autistic traits: evidence using anogenital distance and penile length measurements at birth and 3 months of age. *Journal of Child Psychology and Psychiatry*, 62(7), 876–883. <https://doi.org/10.1111/jcpp.13335>

Langley, E., Totsika, V., & Hastings, R. P. (2017). Parental relationship satisfaction in families of children with autism spectrum disorder (ASD): A multilevel analysis. *Autism Research*, 10(7), 1259–1268. <https://doi.org/10.1002/aur.1773>

Lord, C., Brugha, T., Charman, T., Cusack, J., Dumas, G., Frazier, T., Jones, E. J., Jones, R. M., Pickles, A., State, M. W., Taylor, J. L., & Veenstra-VanderWeele, J. (2020). Autism spectrum disorder. *Nature Reviews Disease Primers*, 6(1). <https://doi.org/10.1038/s41572-019-0138-4>

Ostatníková, D., Lakatošová, S., Babková, J., Hodosy, J., & Celec, P. (2020). Testosterone and the brain: from cognition to autism. *PubMed*, 69(Suppl 3), S403–S419. <https://doi.org/10.33549/physiolres.934592>

Pennisi, P., Giallongo, L., Milintenda, G., & Cannarozzo, M. (2020). Autism, autistic traits and creativity: a systematic review and meta-analysis. *Cognitive Processing*, 22(1), 1–36. <https://doi.org/10.1007/s10339-020-00992-6>

Rubenstein, E., Wiggins, L. D., Schieve, L. A., Bradley, C. B., DiGuseppi, C., Moody, E. J., Pandey, J., Pretzel, R. E., Howard, A. G., Olshan, A. F., Pence, B. W., & Daniels, J. L. (2018). Associations between parental broader autism phenotype and child autism spectrum disorder phenotype in the Study to Explore Early Development. *Autism*, 23(2), 436–448. <https://doi.org/10.1177/1362361317753563>

Santos, S., Ferreira, H., Martins, J., Gonçalves, J., & Castelo-Branco, M. (2022). Male sex bias in early and late onset neurodevelopmental disorders: Shared aspects and differences in Autism Spectrum Disorder, Attention Deficit/hyperactivity Disorder, and Schizophrenia. *Neuroscience & Biobehavioral Reviews*, 135, 104577.

<https://doi.org/10.1016/j.neubiorev.2022.104577>

Stuurman, S., Passier, H., Geven, F. E., & Barendsen, E. (2019). Autism: Implications for Inclusive Education. *Association for Computing Machinery*.

<https://doi.org/10.1145/3375258.3375261>

Valla, J. M., Ganzel, B., Yoder, K. J., Chen, G. M., Lyman, L. T., Sidari, A. P., Keller, A. E., Maendel, J. W., Perlman, J. E., Wong, S. K., & Belmonte, M. K. (2010). More than maths and mindreading: Sex differences in empathizing/systemizing covariance. *Autism Research*, 3(4), 174–184. <https://doi.org/10.1002/aur.143>

Van Eijk, L., & Zietsch, B. P. (2021). Testing the extreme male brain hypothesis: Is autism spectrum disorder associated with a more male-typical brain? *Autism Research*, 14(8), 1597–1608. <https://doi.org/10.1002/aur.2537>

Vogindroukas, I., Stankova, M., Chelas, E., & Proedrou, A. (2022). Language and speech characteristics in autism. *Neuropsychiatric Disease and Treatment, Volume 18*, 2367–2377. <https://doi.org/10.2147/ndt.s331987>

Von Below, R., Spaeth, E., & Horlin, C. (2021). Autism in Higher Education: dissonance between educators' perceived knowledge and reported teaching behaviour. *International Journal of Inclusive Education*, 1–18. <https://doi.org/10.1080/13603116.2021.1988159>

Warrier, V., Zhang, X., Reed, P. M., Havdahl, A., Moore, T. M., Cliquet, F., Leblond, C. S., Rolland, T., Rosengren, A., Cáceres, A. S. J., Hayward, H., Crawley, D., Faulkner, J., Sabet, J., Ellis, C., Oakley, B., Loth, E., Charman, T., Murphy, D., . . . Baron-Cohen, S. (2022). Genetic correlates of phenotypic heterogeneity in autism. *Nature Genetics*, 54(9), 1293–1304. <https://doi.org/10.1038/s41588-022-01072-5>

Werling, D. M. (2016). The role of sex-differential biology in risk for autism spectrum disorder. *Biology of Sex Differences*, 7(1). <https://doi.org/10.1186/s13293-016-0112-8>

Wheelwright, S., Baron-Cohen, S., Goldenfeld, N., Delaney, J., Fine, D., Smith, R. J., Weil, L. G., & Wakabayashi, A. (2006). Predicting Autism Spectrum Quotient (AQ) from the Systemizing Quotient-Revised (SQ-R) and Empathy Quotient (EQ). *Brain Research*, 1079(1), 47–56. <https://doi.org/10.1016/j.brainres.2006.01.012>