

SENSORY PROFILE AND ADAPTATION IN ADULTS WITH AUTISM SPECTRUM DISORDER WITHOUT COGNITIVE IMPAIRMENT

Antonella Cavallaro, Luca Simione, & Alessandro Frolli
Università degli Studi Internazionali di Roma (Italy)

Abstract

Autism Spectrum Disorder (ASD) is a disorder included into neurodevelopmental disorders. ASD is characterized by social and communication issues, restricted and repetitive patterns of behavior or interests, and alterations in sensory perception. These impairments significantly impact people's lives, leading to a decrease in their quality of adaptation. Autism Spectrum Disorder can manifest either in comorbidity with other neurodevelopmental disorders or in isolation. Due to increased sensitivity and awareness, many individuals seek a diagnosis in adulthood. Many of them seek a diagnosis because one or more relatives have received an Autism diagnosis. Some individuals learn about the disorder through friends or social channels, while others receive a diagnosis after developing secondary symptoms such as depression or anxiety disorders. Literature shows that not all individuals with autism traits experience impairments in their lives; they are often referred to as having a 'broader phenotype.' However, some individuals experience difficulties in school and work even in the absence of disabilities, while others exhibit challenges in adapting to various aspects of life. In our study, we aim to investigate whether sensory alterations have a negative impact on adaptive functioning in adults with autism who received their diagnosis in adulthood. Specifically, the goal of our study is to examine the correlation between the sensory profile, adaptive quotient, and the development of depression and anxiety disorders. We used the Wechsler Adult Intelligence Scale, 4th edition, to assess cognitive impairment and the Ritvo Autism Asperger Diagnostic Scale–Revised (RAADS–R) for diagnosing autism in adulthood. A total of 25 subjects met our criteria. To assess sensory processing dysfunction, we utilized the Glasgow Sensory Questionnaire (GSQ). For investigating the adaptive quotient, we administered the Vineland Adaptive Behavior Scale II. Depression is assessed using the Beck Depression Inventory (BDI), while anxiety traits or disorders are measured with the Hamilton Anxiety Rating Scale" (HAM-A). Correlation between sensory profile and depression/anxiety levels measured. Our results show that a significant change in sensory processing correlates with prominent symptoms of anxiety and depression. In addition, changes in sensory processing are also correlated with low adaptive functioning in the daily and social domains.

Keywords: *Autism Spectrum Disorder, sensory impairment, adaptive quotient, Autism in adulthood, adults.*

1. Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by persistent and pervasive impairments in communicative and social development and the presence of repetitive and inflexible patterns of thought and behaviour. The disorder also involves an alteration in sensory perception (American Psychiatric Association, 2013). The most common comorbidities in ASD are intellectual disability in 50 to 80 per cent (Simonoff et al., 2008; Mpaka et al., 2016), attention deficit hyperactivity disorder (ADHD) in 20 to 85 per cent (Simonoff et al., 2008; Rommelse et al., 2011; Mpaka et al., 2016) and epilepsy in 30 per cent (Tuchman & Rapin, 2002). The presence of these comorbidities and especially the presence of intellectual disability are predictors of the worst adaptive quotient (AQ), especially the intellectual quotient (IQ) can be considered a good predictor of adaptive behaviour, moreover the gap between IQ and AQ decreases in low functioning individuals with autism and increases in older individuals (Kanne et al., 2011). The diagnosis of ASD is typically made in early childhood, although in some cases, it may not be made until a person reaches adulthood and undergoes a specialized assessment. In such cases, no cognitive impairment is typically observed, and their AQ scores are only slightly worse than those of controls. However, other psychological difficulties such as anxiety disorders or depression are measured (Piven & Palmer., 1999). Sometimes, a neuropsychological assessment may

be requested due to a family member being diagnosed with ASD. Relatives of people with autism may exhibit milder traits associated with autism, known as the Broader Autism Phenotype (BAP). However, it does not appear to indicate a clinical severity of the disorder or a significant impairment of adaptation. BAP is characterized by impairment in pragmatic language skills and social responsiveness, as well as other areas of reciprocal social interaction (Dawson et al., 2002). However, it does not meet the clinical criteria for autism spectrum disorder or result in a lack of adaptability. Finally, research has shown that individuals with the Broad Autism Phenotype (BAP) exhibit elevated rates of certain personality traits, such as 'aloofness', 'rigidity', and 'hypersensitivity', as well as increased rates of comorbid psychiatric conditions, including anxiety and depression (Sucksmith, Roth, & Hoekstra, 2011). However, there is limited research on the sensory profile of individuals with BAP and those diagnosed with Autism Spectrum Disorder (ASD). Due to the increased clinical sensitivity regarding the range of autism symptoms, more individuals with BAP are now diagnosed with ASD level 1. In recent years, there has been an increase in studies examining sensory profiles in individuals with ASD. Sensory reactivity is a diagnostic criterion for ASD and has been linked to poorer functional outcomes, behavioural difficulties, and increased autism severity throughout the lifespan (DuBois, Lymmer, Gibson, Desarkar, & Nalder., 2017). Leekman et al. (2007) found that over 90% of children with autism exhibit sensory abnormalities across multiple domains, which persist into adulthood. It is important to note that these evaluations are objective and based on empirical evidence. Age and IQ level may affect some sensory symptoms, but further research is needed. The objective of this study is to examine the influence of sensory profiles on adaptive behaviour in individuals who meet the criteria for BAP or are diagnosed with Autism Spectrum Disorder (ASD) level 1 without cognitive impairment and low autistic symptoms. The study will investigate the correlation between sensory profiles, anxiety, depression, and adaptation.

2. Methods

2.1. Participants

This study involved the blind participation of 25 subjects recruited among patients of FINDS Neuropsychiatry Clinic. The participants were selected by expert clinicians based on their diagnosis and cognitive profile. To be included in the study, participants had to meet the following criteria: (a) An ASD diagnosis (DSM-5, 2013) is received when the individual is over 18 years old. (b) Participants' scores on the RAADS scale should not exceed 130. (c) IQ should be assessed using the Wechsler Adult Intelligence Scale (WAIS-IV) and should not be less than 100. (d) Participants should not have any comorbidities or defined genetic syndromes. The Ritvo Autism Asperger Diagnostic Scale–Revised (RAADS–R) was used to diagnose autism in adulthood (Ritvo et al., 2008; Ritvo et al., 2011). The final sample consisted of 23 subjects (17 male and 6 female) aged between 22 and 34 years (mean age 29,09). Two subjects did not complete one or more tests.

2.2. Procedures

After the sampling procedure, the participants were administered with experimental protocols. The sensory profile of the participants was identified using the Glasgow Sensory Questionnaire (GSQ); the Vineland II was used to measure the adaptive profile in communication, social skills, and daily skills. The Beck Depression Inventory (BDI) and Hamilton Anxiety Rating Scale" (HAM-A) were respectively used to assess depression and anxiety symptoms. Informed consent was obtained for the treatment of the results without any prior explanation of experimental hypotheses before administering the tests.

The Glasgow Sensory Questionnaire (GSQ) is a self-administered questionnaire for adults that investigates both hypersensitivity and hyposensitivity to sensory stimuli (Robertson and Simmons, 2013).

The Beck Depression Inventory (BDI) is a self-report questionnaire that evaluates the presence and severity of depressive symptoms. It consists of 21 items divided into two scales: the somatic-affective scale, which measures somatic affective symptoms such as sleep problems and anhedonia, and the cognitive scale, which measures cognitive characteristics of depression such as belief and guilt (Sica & Ghisi, 2007).

The Hamilton Anxiety Rating Scale (HAM-S) is a self-report questionnaire used to evaluate anxiety levels in individuals from adolescents to adults. It comprises 15 items that assess various anxiety symptoms related to feelings, beliefs, and behaviour (Hamilton, 1959).

The Vineland Adaptive Behavior Scale II (VABS II) is an interview used to measure an individual's level of adaptive behaviour. It consists of three main scales: Communication, Daily Living Skills, and Socialisation. For children under 8 and the elderly over 56, the Motor Skills Scale is also included (Sparrow et al., 2005).

2.3. Methods

The statistical survey software SPSS 25.0 (2017) (ARMONK, NY and CHICAGO) was used for data analysis. The statistical test used is the Pearson correlation coefficient test. The correlation coefficient measures the strength and direction of the relationship between two variables. The significance threshold was set at $p < 0.01$. Results are showed in Tab.1. The data analysis showed a significant positive correlation between the GSQ (total) variables and the BDI and HAM-S variables. The former measures the levels of alteration in total sensory perception (both hypo and hyper), while the latter measures depressive symptoms (BDI) and anxiety-related symptoms (HAM-S). A significant negative correlation was found between the GSQ variables and the VABS-Daily and VABS-Soc variables, which respectively indicate daily living skills and socialization abilities. In particular, higher levels of HY (hypersensitivity) are associated with lower values on the VABS-D and VABS-S scales, while higher levels of HO are associated with greater levels of depressive symptoms. Higher levels of anxiety measured by HAM and depression measured by BDI are also associated with lower levels of domestic and social autonomy.

Table 1. Results.

	BDI	HAM - S	VABS - C	VABS - D	VABS -S
GSQ tot	,892** ,000	,893** ,000	-,490 ,018	-0,796** 0,000	-,909** ,000
GSQ HO	,685** ,000	,657** ,001	-,387 ,068	-,321 ,136	-,626** ,001
GSQ HY	,710** ,000	,602** ,002	-,485 ,019	-,841** ,000	-,792** ,000

** The correlation is significant at the 0.01 level (two-tailed).

3. Discussion

A preliminary analysis of the data revealed a positive correlation between altered sensory perception and anxious and depressive symptoms in adult subjects diagnosed with level 1 ASD, both when they presented hypersensitivity to sensory stimuli and in cases of sensory hyposensitivity. This data appears to indicate that an alteration in sensory processing is associated with higher levels of anxiety symptoms. This finding has been reported in the literature even in individuals without a diagnosis of autism spectrum disorder or other neurodevelopmental disorders (Cervin, M., 2023, and Conelea, Carter & Freeman, 2014). Paquet et al. (2022) found that high levels of sensory processing difficulties are associated with symptoms of anxiety, depression, and low self-esteem. Difficulties in sensory processing, both excessive and deficient, are also linked to lower performance in daily life tasks, even in the absence of cognitive disabilities. In addition, sensory processing difficulties would affect socialization skills but not communication skills, highlighting the integrity of underlying cognitive processes and an influence on the ability to adapt one's behavior to environmental contingencies, which are more difficult to process due to altered sensory stimulus processing.

4. Conclusions

The presence of sensory processing alterations has been found to be correlated with a higher tendency to develop anxious or depressive symptoms. Additionally, it appears to cause greater difficulty in environmental adaptation for these individuals, both in domestic and community daily life tasks, as well as in interpersonal relationships, resulting in greater difficulties in the workplace and social settings in general. The presence of sensory processing alterations in close relatives of individuals with autism or other neurodevelopmental disorders such as ADHD (Ghanizadeh, 2011) may suggest a sort of phenotypic anticipation or typical neuropsychological profile that should be further investigated in order to identify the underlying neuropsychological processes that would make such individuals more vulnerable to the development of anxious or depressive symptoms. Our study has highlighted the presence of sensory processing profiles in adult subjects, both in terms of hypo and hyper reactivity. This is consistent with the findings in the literature for children (Ashburner, Ziviani & Rodgers 2008; Ben-Sasson et al., 2009; Tomchek, Little, & Dunn 2015). According to Dellapiazza F. et al. (2019), children who exhibit sensory seeking behaviour have lower adaptive scores in all Vineland domains, particularly in socialization skills (Tomchek et al., 2015). Our findings suggest that a similar pattern of impairment in adaptive social skills is present in adults with ASD without cognitive impairment. The text stresses the importance of focusing on sensory stimuli and its impact on various aspects of an individual's life, including school, work, and

socialization. It highlights the need to improve the quality of life for individuals with ASD by addressing this issue. We identify several limitations in this study. First of all the sample is very small size. It need to investigate the effect on a sample bigger. In second place, correlation does not provide information about the direction of the changes. It is interesting to verify if the effect is influenced by the sensory profile. In addition, it would be interesting to include data on the levels of autistic symptoms and impairment in the various domains involved in the diagnosis of autism to understand which domain has the greatest impact on levels of adaptation and symptomatology. In our study, we only investigated the sensory level.

References

- Ashburner, J., Ziviani, J., & Rodger, S. (2008). Sensory processing and classroom emotional, behavioral, and educational outcomes in children with autism spectrum disorder. *The American Journal of Occupational Therapy*, 62(5), 564-573.
- Ben-Sasson, A., Hen, L., Fluss, R., Cermak, S. A., Engel-Yeger, B., & Gal, E. (2009). A meta-analysis of sensory modulation symptoms in individuals with autism spectrum disorders. *Journal of autism and developmental disorders*, 39, 1-11.
- Cervin, M. (2023). Sensory processing difficulties in children and adolescents with obsessive-compulsive and anxiety disorders. *Research on Child and Adolescent Psychopathology*, 51(2), 223-232.
- Conelea, C. A., Carter, A. C., & Freeman, J. B. (2014). Sensory over-responsivity in a sample of children seeking treatment for anxiety. *Journal of Developmental and Behavioral Pediatrics*, 35(8), 510-521.
- Dawson, G., Webb, S., Schellenberg, G. D., Dager, S., Friedman, S., Aylward, E., & Richards, T. (2002). Defining the broader phenotype of autism: Genetic, brain, and behavioral perspectives. *Development and Psychopathology*, 14(3), 581-611.
- DuBois, D., Lymer, E., Gibson, B. E., Desarkar, P., & Nalder, E. (2017). Assessing sensory processing dysfunction in adults and adolescents with autism spectrum disorder: A scoping review. *Brain sciences*, 7(8), 108.
- Ghanizadeh, A. (2011). Sensory processing problems in children with ADHD, a systematic review. *Psychiatry Investigation*, 8(2), 89-94.
- Hamilton, M. A. X. (1959). The assessment of anxiety states by rating. *British Journal of Medical Psychology*, 32(1), 50-55.
- IBM to Acquire SPSS Inc. to Provide Clients Predictive Analytics Capabilities. Available online: ibm.com (accessed on 8 August, 2017).
- Kanne, S. M., Gerber, A. J., Quirnbach, L. M., Sparrow, S. S., Cicchetti, D. V., & Saulnier, C. A. (2011). The role of adaptive behavior in autism spectrum disorders: Implications for functional outcome. *Journal of Autism and Developmental Disorders*, 41(8), 1007-1018.
- Leekam, S. R., Nieto, C., Libby, S. J., Wing, L., & Gould, J. (2007). Describing the sensory abnormalities of children and adults with autism. *Journal of Autism and Developmental Disorders*, 37, 894-910.
- Mpaka, D. M., Okitundu, D. L. E. A., Ndjukendi, A. O., N'situ, A. M., Kinsala, S. Y., Mukau, J. E., ... & Steyaert, J. (2016). Prevalence and comorbidities of autism among children referred to the outpatient clinics for neurodevelopmental disorders. *The Pan African Medical Journal*, 25, 82.
- Paquet, A., Calvet, B., Lacroix, A., & Girard, M. (2022). Sensory processing in depression: Assessment and intervention perspective. *Clinical Psychology & Psychotherapy*, 29(5), 1567-1579.
- Piven, J., & Palmer, P. (1999). Psychiatric disorder and the broad autism phenotype: Evidence from a family study of multiple-incidence autism families. *American Journal of Psychiatry*, 156(4), 557-563.
- Robertson, A. E., & Simmons, D. R. (2013). The relationship between sensory sensitivity and autistic traits in the general population. *Journal of Autism and Developmental disorders*, 43, 775-784.
- Robertson, A. E., & Simmons, D. R. (2019). Glasgow Sensory Questionnaire (GSQ). In F. Volkmar (Ed.) *Encyclopedia of Autism Spectrum Disorders*. New York, NY: Springer. https://doi.org/10.1007/978-1-4614-6435-8_102303-1
- Rommelse, N. N. J., Geurts, H. M., Franke, B., Buitelaar, J. K., & Hartman, C. A. (2011). A review on cognitive and brain endophenotypes that be common in autism spectrum disorder and attention-deficit/hyperactivity disorder facilitate the search for pleiotropic genes. *Neuroscience and Biobehavioral Reviews*, 35(6), 1363-1396.
- Ritvo, R. A., Ritvo, E. R., Guthrie, D., Yuwiler, A., Ritvo, M. J., & Weisbender, L. (2008). A scale to assist the diagnosis of autism and Asperger's disorder in adults (RAADS): A pilot study. *Journal of Autism and Developmental Disorders*, 38(2), 213-223.

- Ritvo, R. A., Ritvo, E. R., Guthrie, D., Ritvo, M. J., Hufnagel, D. H., McMahon, W., ... & Eloff, J. (2011). The Ritvo Autism Asperger Diagnostic Scale-Revised (RAADS-R): A scale to assist the diagnosis of autism spectrum disorder in adults: an international validation study. *Journal of autism and developmental disorders*, 41(8), 1076-1089.
- Sica, C., & Ghisi, M. (2007). The Italian versions of the Beck Anxiety Inventory and the Beck Depression Inventory-II: Psychometric properties and discriminant power. In M. A. Lange (Ed.), *Leading-edge psychological tests and testing research* (pp. 27-50). Nova Science Publishers.
- Simonoff, E., Pickles, A., Charman, T., Chandler, S., Loucas, T., & Baird, G. (2008). Psychiatric disorders in children with autism spectrum disorders: prevalence, comorbidity, and associated factors in a population-derived sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 47(8), 921-929.
- Sparrow, S. S., Balla, D. A., Cicchetti, D. V., & Doll, E. A. (2005). *Vineland-II, Vineland Adaptive Behavior Scales: survey forms manual*. Circle Pines, MN: AGS Publishing.
- Sucksmith, E., Roth, I., & Hoekstra, R. A. (2011). Autistic traits below the clinical threshold: re-examining the broader autism phenotype in the 21st century. *Neuropsychology Review*, 21(4), 360-389.
- Tomchek, S. D., Little, L. M., & Dunn, W. (2015). Sensory pattern contributions to developmental performance in children with autism spectrum disorder. *The American Journal of Occupational Therapy*, 69(5), 6905185040p1-6905185040p10.
- Tuchman, R., & Rapin, I. (2002). Epilepsy in autism. *The Lancet Neurology*, 1(6), 352-358.