

Is Visual-Motor Coordination Impaired in Children and Adolescents with Autism Spectrum Disorder and Intellectual Disability?

Valagussa Giulio, Bianchi Francesca Ilaria, Mari Alessandra, Castagna Eleonora, Grossi Enzo, Perin Cecilia, Purpura Giulia

Background and aims:

Difficulties in visual behaviour are frequently reported in children with autism spectrum disorder (ASD), as well as motor impairments, which are described as pervasive in this population^{1,2}. Moreover, early visual-motor abilities predict social communication skills during childhood¹. However, although the importance of sensory-motor coordination is recognized in neurodevelopment, its evaluation is not always considered in low-functioning ASD individuals. Conversely, visuomotor assessment could play a crucial role in planning specific interventions for this population, which shows worse difficulties in adapting to the social environment². We aimed to analyse the visual-motor profiles of children with ASD and intellectual disability and to examine the relationship between motor coordination and the severity of autism symptoms.

Methods:

Thirty low-functioning ASD subjects (mean age: 9.62 +/- 2.3 years; age range: 5-14.1 years; 22 males) diagnosed following DSM-5 criteria were recruited. We used the Childhood Autism Rating Scale – Second Edition (CARS-2) to assess ASD severity, Raven's Coloured Progressive Matrices (CPM) to measure IQ and visual-perceptual reasoning, the Vineland-II scale to evaluate the adaptive behaviours, and the Repetitive Behaviour Scale – Revised (RBS-R) questionnaire was administered to caregivers. Moreover, a direct neuro-visual assessment (including visual pursuit, saccadic movements, visual acuity resolution, stereopsis, visual field and contrast sensitivity) and a direct motor coordination evaluation using the Developmental Coordination Disorder Questionnaire (DCD-Q) as a checklist, were performed by therapists with specific expertise. The Spearman Correlation Test was used to analyse the relationship between outcome measures. A p-value <0.05 was set as significant.

Results:

We found that 90% of the sample (27 out of 30 subjects) obtained a score compatible with a DCD condition (Figure 1). Moreover, 56.7% of children showed difficulties in visual pursuit, 43.3% showed dysfunctions in saccadic movements, and 16.7% deficit in contrast sensitivity. Motor function (evaluated indirectly by Vineland-II and directly by DCD-Q) was significantly correlated to the severity of autistic symptoms (CARS-2) and with the abilities in visual-perceptive reasoning (CPM) (Figure 2). Finally, the general motor coordination subscale of DCD-Q was negatively related to higher intensity ($\rho=-0.524$; $p=0.004$) and frequency ($\rho=-0.388$; $p=0.041$) of stereotyped behaviours assessed through the RBS-R questionnaire.

Conclusions: Our findings revealed frequent visual and motor impairments in children and adolescents with ASD and intellectual disability. This may be considered a clinical sign of difficulty integrating perception with action to control movement, underscoring the importance of considering visual-motor skills in early interventions for low-functioning children. Further research is required to confirm the results.

References

- 1) Bhat A. (2023). Multidimensional motor performance in children with autism mostly remains stable with age and predicts social communication delay, language delay, functional delay, and repetitive behavior severity after accounting for intellectual disability or

cognitive delay: A SPARK dataset analysis. *Autism research : official journal of the International Society for Autism Research*, 16(1), 208–229. <https://doi.org/10.1002/aur.2870>

- 2) Purpura, G., Petri, S., Tancredi, R., Tinelli, F., & Calderoni, S. (2024). Haptic and visuo-haptic impairments for object recognition in children with autism spectrum disorder: focus on the sensory and multisensory processing dysfunctions. *Experimental brain research*, 242(7), 1731–1744. <https://doi.org/10.1007/s00221-024-06855-2>