World Academy of Science, Engineering and Technology
International Journal of Medical and Health Sciences
Vol:17, No:08, 2023

Sensory Integration for Standing Postural Control Among Children and Adolescents with Autistic Spectrum Disorder Compared with Typically Developing Children and Adolescents

Authors : Eglal Y. Ali, Smita Rao, Anat Lubetzky, Wen Ling

Abstract : Background: Postural abnormalities, rigidity, clumsiness, and frequent falls are common among children with autism spectrum disorders (ASD). The central nervous system's ability to process all reliable sensory inputs (weighting) and disregard potentially perturbing sensory input (reweighting) is critical for successfully maintaining standing postural control. This study examined how sensory inputs (visual and somatosensory) are weighted and reweighted to maintain standing postural control in children with ASD compared with typically developing (TD) children. Subjects: Forty (20 (TD) and 20 ASD) children and adolescents participated in this study. The groups were matched for age, weight, and height. Participants had normal somatosensory (no somatosensory hypersensitivity), visual, and vestibular perception. Participants with ASD were categorized with severity level 1 according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) and Social Responsiveness Scale. Methods: Using one force platform, the center of pressure (COP) was measured during quiet standing for 30 seconds, 3 times first standing on stable surface with eyes open (Condition 1), followed by randomization of the following 3 conditions: Condition 2 standing on stable surface with eyes closed, (visual input perturbed); Condition 3 standing on compliant foam surface with eyes open, (somatosensory input perturbed); and Condition 4 standing on compliant foam surface with eyes closed, (both visual and somatosensory inputs perturbed). Standing postural control was measured by three outcome measures: COP sway area, COP anterior-posterior (AP), and mediolateral (ML) path length (PL). A repeated measure mixed model Analysis of Variance was conducted to determine whether there was a significant difference between the two groups in the mean of the three outcome measures across the four conditions. Results: According to all three outcome measures, both groups showed a gradual increase in postural sway from condition 1 to condition 4. However, TD participants showed a larger postural sway than those with ASD. There was a significant main effect of condition on three outcome measures ($p< 0.05$). Only the COP AP PL showed a significant main effect of the group ($p<0.05$) and a significant group by condition interaction ($p<0.05$). In COP AP PL, TD participants showed a significant difference between condition 2 and the baseline ($p<0.05$), whereas the ASD group did not. This suggests that the ASD group did not weight visual input as much as the TD group. A significant difference between conditions for the ASD group was seen only when participants stood on foam regardless of the visual condition, suggesting that the ASD group relied more on the somatosensory inputs to maintain the standing postural control. Furthermore, the ASD group exhibited significantly smaller postural sway compared with TD participants during standing on the stable surface, whereas the postural sway of the ASD group was close to that of the TD group on foam. Conclusion: These results suggest that participants with high functioning ASD (level 1, no somatosensory hypersensitivity in ankles and feet) over-rely on somatosensory inputs and use a stiffening strategy for standing postural control. This deviation in the reweighting mechanism might explain the postural abnormalities mentioned above among children with ASD.

Keywords : autism spectrum disorders, postural sway, sensory weighting and reweighting, standing postural control
Conference Title : ICA 2023 : International Conference on Autism
Conference Location : New York, United States
Conference Dates : August 10-11, 2023

Open Science Index, Medical and Health Sciences Vol:17, No:08, 2023 publications.waset.org/abstracts/166946.pdf