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Observational and Biomechanical Assessment of Eating Behaviors in Autism Spectrum Disorder (ASD)

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ABSTRACT

Autism Spectrum Disorder (ASD) is typically diagnosed as a social developmental delay disorder. However, research shows the presence of gross and fine motor skill deficits that potentially affect activities of daily living (ADL) such as eating, reaching, and grasping. 

PURPOSE: This study analyzed eating behaviors to understand the impact motor deficits have in ASD as an integral component of diagnosis. METHODS: 19 subjects (9 with ASD, 10 without ASD; 19.0 ± 2.1 y.o, 19.8 ± 2.3 y.o without ASD); 79% males) were recruited and granted informed consent prior to participating in this study. Hi-speed video recording (210 Hz) was taken in both the frontal and sagittal plane of each subject eating a soft substance. One hand was used to hold the container containing the food while the other hand grasped a spoon to perform the eating task. No instructions were given to participants as to how to hold the container or spoon. A novel qualitative assessment of eating posture was completed by two raters. The rubric assessed seven items related to the subjects’ grasping and eating posture. Knowes software was utilized to assess: 1) temporal analysis of the spoon leaving the container to the spoon entering the mouth; 2) distance from container to spoon entering the mouth; 3) trunk flexion when the spoon entered the mouth. SPSS software was used to run Chi Square. 

RESULTS: There were no significant biomechanical differences between trunk flexion, temporal analysis of the spoon, and extra movements. Significant differences were found in distance from container to spoon (p<0.01), trunk flexion (p<0.01), and extraneous movements (p<0.01). CONCLUSIONS: Although there was no significance in every area assessed, it is evident that there are motor impairments in individuals with ASD that negatively modify eating movement.

PARTICIPANTS

Five subjects diagnosed with ASD (8 male and 1 female, ages 19.0 ± 2.1 y.o) were recruited and granted informed consent prior to participating in the study. 10 subjects, seven males and three females, ages 19.8 ± 2.3 y.o without ASD served as a control group.

METHODS

All ASD subjects participated in the Childhood Autism Rating Scale (CARS) assessment. In this study all subjects scored within the range of severe ASD (average: S1.11 ± 1.80). Subjects were seated and asked to keep one hand on the container while the contralateral hand grasped the spoon used to eat. No instructions were given to subjects as to how to hold the container or food.

A novel assessment rubric to examine posture and feeding conduct in ASD compared to age matched controls was completed by two researchers. Biomechanical measures assessed were: 1) temporal analysis of the spoon leaving the container to the spoon entering the mouth (seconds); 2) distance from container to spoon entering the mouth (cm); and 3) trunk flexion when the spoon entered the mouth relative to the angle of horizontal (degrees). Biomechanical measures were taken for five consecutive eating trials and then averaged for each participant.

RESULTS

The results of this study showed that there are multiple flawed eating behaviors in individuals with ASD including: 1) maintaining a tripod grasp; 2) avoiding extraneous activity and; 3) establishing proper distance from mouth and container with food. Only one individual with ASD was able to employ a tripod grasp. 

TAKING HOME MESSAGES

• Inability of cognitive motor planning led to motor skill impairments in the reach to grasp movement of eating.
• A symptom of ASD is delay in developmental milestones implying that individuals will eventually improve. However, these young adults with severe ASD still exemplify motor skill impairments suggesting there are concrete motor deficits as opposed to delays.
• Motor milestone delays may increase presence of other motor skill deficits such as reaching to grasp movement. If an ASD individual is delayed in grasping a spoon they may be spoon fed and thus fail to practice the reaching portion of the movement as well as the grasping.
• More research must be done to understand whether these distinctions are due to cognitive deficits in motor planning and execution, or whether there may be an additional musculoskeletal component such as hypotonia.