Characteristics Associated with Toe-Walking in Children with Autism

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Background

Autism is one of the most prevalent neurodevelopmental disorders in children today.1 It is typically characterized by deficits in communication and socialization, as well as stereotyped repetitive and restricted behaviors.2,3,4 Research has shown that 50-73% of children with Autism present with gross and fine motor delays,1 including impaired gait patterns like toe-walking.5

• The rate of toe-walking in children with Autism is reported to be between 20-53%, 7,8,9
• Toe-walking is normal in the young child’s gait cycle, but is considered atypical when it persists, and may be associated with developmental disorders, specifically Autism.5,9
• If left untreated, toe-walking can lead to damage to calf muscles and may require surgical intervention.4
• To date, there is no available research providing a clear and comprehensive explanation of the underlying causes of toe-walking in children with and without Autism.
• Treatment often provides inconsistent and inadequate outcomes, suggesting multiple causes, rather than a single etiology.
• Various etiologies may be difficult to differentiate from a medical perspective, but it may be possible to identify underlying characteristics seen clinically, providing a means for more target-specific interventions.

Purpose

The purpose of this pilot study is to describe underlying characteristics seen clinically in toe-walking for children with Autism in order to provide a baseline for examining future toe-walking interventions.

Methods

One hundred children with a diagnosis of Autism will be recruited from the Thompson Center for Autism and Neurodevelopmental Disorders in Columbia, MO, during their regularly scheduled clinic appointments.

Inclusion criteria:
• between 10 months and 17 years of age
• independent in ambulation with or without assistive devices
• able to follow simple directions such as “stand still” or “walk down the hall”

Data collection will occur on site during the child’s clinic visit. This study is approved by the University of Missouri Health Sciences IRB.

Measures/Outcomes

Suspected causes of persistent toe-walking to be evaluated in this study include gastrosoleus muscle tightness, lower extremity range of motion, spasticity (R1), posture, and sensory differences. Outcomes will be measured using the following:

- **Sensory Profile:** Questionnaire will be completed by parents to evaluate potential sensory differences.
- **Range of motion:** Manual measurement of joint range will be performed using a goniometer.
- **Spasticity:** Visual/kinesthetic estimation of first catch (R1) and end range (R2) will be performed at the ankles. (Figure 2)
- **Scoliosis Screen:** Visual assessment of spinal alignment will be performed. (Figure 3)
- **Posture:** Alignment of C7, apex of lordosis, and the sacral landmark will be assessed through motion analysis of angle measurement from video. (Figure 4)
- **Foot alignment:** Positioning will be checked while weight-bearing in standing. (Figure 5)

Gait: Walking will be video-recorded and analyzed in the sagittal plane to assess for the presence of toe-walking.

Discussion

This poster demonstrates the set up of a study that will seek to better understand the clinical manifestations of characteristics that underlie toe-walking in children with Autism. The study will specifically examine gastrosoleus muscle tightness, lower extremity range of motion, spasticity (R1), posture, and sensory differences. Comparisons between children with Autism who toe-walk and those who do not toe-walk will provide valuable information in understanding underlying impairments specific to this pediatric population. The data collected in this study will supply a means for physical therapists to provide more targeted and comprehensive treatment interventions leading to a better prognosis for children with Autism who toe-walk.