Effects of Sensory Integration, Balance and Gait Training on Pediatric Motor Development

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Background
In pediatric physical therapy, there is difficulty in establishing best practice since each case is unique. At this time there is little relevant literature on the treatment of pediatric patients with developmental disorders such as absent corpus callosum or chromosome deletion. Currently there are a variety of interventions utilized with the pediatric population with a few including treadmill based gait training, sensory integration and music therapy. The little research available investigating treadmill training in children indicates improvements in gait speed, but most potential benefits must be inferred from studies of adults. Sensory integration therapy works to improve vestibular, proprioceptive, and tactile systems through activities such as swinging, rocking, and jumping. Effects of music therapy found in previous studies include the patient being more tolerant of physical therapy treatment, making and maintaining improvements in gross motor skills.

Purpose
This study was designed to investigate the effects of sensory integration, balance and gait training as well as music therapy on the balance, gross motor function and frequency of falls in two children with differing diagnoses of developmental disorders, but who present with similar symptoms. This was done because of lack of consensus about best practice for treatment of children with these disorders.

Case Description
Subject 1: 69 m.o. female with diagnoses of Chromosome Abnormality 46 XX (der) 6, torticollis, and developmental delay who functions at an 18mo. level in stationary skills and 23mo. level in locomotion skills. Subject 2: 81 m.o. male with diagnoses of absent corpus callosum, failure and motor delay who functions at a 28mo. level in stationary skills and 23mo. level in locomotion skills.

Both subjects presented with difficulty during static standing, poor body awareness, poor balance and postural control, as well as multiple falls.

Methods
• This was a case report design in which two children participated.
• 30 minutes of physical therapy 2x a week for 8 weeks.
• Spinning CCW and CW on vestibulator swing, standing on balance board while using UE, walking across mats of varying firmness to collect bean bags, and walking on treadmill.
• Throughout duration of each treatment session, listened to The Listening Program.
• Sensory integration for balance control, ability to scale muscle responses to various levels of external and unpredictable movements, and reported number of falls assessed both pre- and 3 months post-intervention.

Results

Figure 3. SOT Means

- Subject 1 made significant improvements in Condition 3. (Sway referenced vision with a fixed surface)
- Subject 2 made significant improvements in Conditions 4 and 5. (Normal vision with a sway referenced surface and absent vision with a sway referenced surface)

Figure 4 & 5. IEMG Results
• Both subjects significantly worsened in this test. We would have expected negative slopes of the IEMG lines showing the subjects were more able to incorporate somatosensory feedback and scale down their muscle reaction.

Figure 6. SOT Means

- Subject 1: IEMG Results
- Subject 2: IEMG Results

Conclusion
- Results in both children on the main outcome measures indicates mixed results.
• Important to note that the normative values for these tests reflect scores of children with typical development. As both of the subjects in this case report are not developing typically it is difficult to quantify their performance utilizing these outcome measures.
• Subjective discussion with the Physical Therapist indicated that they observed positive changes in balance and a decrease in reported falls.
• We conclude that a combination of sensory integration, balance training, and gait training can have a positive effect on pediatric motor development and function in children with differing medical diagnoses.

Clinical Implications
The results of this study indicate a further need for clinical research in this area. Although two children may present with differing medical diagnoses it is possible that providing a combination of therapy treatments will yield similar results.

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Resources: