Mobility Matters! Manual Cart Propulsion Facilitates Spatial Cognition in Infants with Spina Bifida

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Abstract:

Background: Spina bifida (SB) is a neural tube defect that results in lower limb paralysis along with significant delays in motor acquisition, especially in the realm of floor mobility and ambulation. Additionally, children have structural deficits in the posterior fossa which leads to perceptual difficulties, most notably in spatial cognition. There are however, those who advocate that the motor delay and the loss of ongoing mobility experiences are partially leading to spatial cognitive delays. Evidence in the typically developing (TD) infants show that mobility either crawling, assisted, or powered, provided to pre crawling infants, promotes significant gains in spatial cognitive performance. Additionally, infant with sacral and lumbar SB have shown that after the onset of crawling, increases in spatial cognitive performance.

Specific aims: 1) To determine whether a 3 week intervention of self propulsion of a manual floor cart in pre-crawling infants with spina bifida will show increases in spatial cognitive performance compared to the pre-intervention testing Subjects:10 pre-crawling infants with spina bifida. Inclusion criteria are infants from the ages of 7 to 24 months of age, born with sacral or lumbar spina bifida and floor sitting with independent reach. Exclusion criteria are crawling infants and infants' using a motorized or propelled device. Additional exclusion criteria are motor deficits such as paralysis of the upper extremities, blindness, a hemorrhagic or an anoxic brain event.

Design: The proposal is a single group pre-post time series design. There will be three testing periods, Testing 1 will be performed three weeks prior to start of intervention, Testing 2 is just prior to the start of the cart intervention and Testing 3 will occur at the end of the three week intervention using Zip Zac floor cart. Measurement instruments are three spatial cognitive outcome measures: spatial search for hidden object, Form Extraction (FE) and Joint Visual Attention (JVA). Video data coding will be used implementing Mangold Interact software for the FE experiment and Tobii eye tracking to assess visual responses in the JVA paradigm. Data Analysis will be performed using pre and post t tests for the spatial search experiment and a one way ANOVA repeated measures for both the JVA and FE experiments. The expected results will provide evidence that self-propelled mobility in infants with SB will show a significant increase in spatial cognitive tasks.

Relevance: The relevance of this study will provide a device for infants with motor deficits not only for exploration and mobility, but also to foster the development of spatial cognitive skills in at risk infants.