

Infant Spatial Cognition and Floor Mobility: Influences of Onset Age and Crawling Mode

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Purpose/Hypothesis: There is a long-held assumption that motor skill acquisition has minimal influence on cognitive development. There are however, recent studies that sheds light on this premise, showing significant increases in spatial cognitive performance after the emergence of hands and knees crawling. Therefore, the act of crawling appears to be a pivotal factor in spatial cognition gains. If mobility appears to be a pivotal factor in early spatial cognitive processing, does different crawling modes such as belly crawling or late onset of crawling facilitate performance? The purpose of this study is to ascertain whether age or belly crawling or age of onset is a discerning factor in propelling spatial cognition.

Materials/Methods: Number of Subjects: 45 typically developing (TD) infants: 8 to 9 month old. Seven infants with lumbar spina bifida. The study was performed at the University of California Berkeley, Infant Study Laboratory. The study used a longitudinal design for SB infants and for the TD infants, implemented a cross sectional design with the age held constant (8-9 months). Eight to nine month old infants were assigned into crawling categories, Hands and knees (HK), Belly Crawling (BC), Prelocomotor (Preloc) based upon video tape analysis. Spatial cognitive testing was performed using the paradigm: Joint Visual Attention (JVA), assessing the ability to follow the point and gaze of an experimenter to a set of targets. Two independent coders blinded to crawling status, quantified the video data using Interact software program. Two-way ANOVA comparisons analyzed the following: HK and Preloc and BC and Preloc with the significance level set at $p < 0.05$. Spina Bifida infants were analyzed from their last non-crawling to their first crawling JVA visit using two-way repeated ANOVA.

Results: The results revealed a significant interaction between the BC and Preloc Group $F(1,56)=8.74, p < 0.01$ and the HK and Preloc analysis documented a main effect for crawling $F(1,56)=4.84, p < 0.01$ and a significant interaction $F(1,56)=13.8, p < 0.0001$. In the spina bifida analysis, there was a main effect for crawling $F(1,24) = 15.18, p < 0.0001$ and a significant interaction $F(1,24)=5.89, p < 0.05$.

Conclusions: In the JVA experiment, there were significant differences looking at the correct location in both the SB and HK group when compared to the non-crawling group. In the BC group, crawling infants spent less time observing the experimenter compared to non-crawling infants.

Clinical Relevance: This study provides a framework for motor and cognitive interaction as there were significant changes after the initiation of self-produced mobility. Moreover, as physical therapists intervening with motor disability, this study may expand concepts of crawling

modes, as each mode may enhance spatial cognition. However, more studies are needed investigating more populations of infants with disability to further ascertain the interaction between motor and cognitive development.