**The Effect of Prematurity on Learning and Motor Proficiency Over Time**

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**Background:** The cost associated with premature birth in the US exceeds $26.2 billion with more than $611 million spent on early intervention services and $1.1 billion on special education services. The World Health Organization (WHO) defines four levels of prematurity based on gestational age (GA): extremely preterm (EP) (<28 weeks), very preterm (VP) (28-<32 weeks), and late preterm (LP) (32-<37 weeks). While studies show that preterm infants are more susceptible to developmental delays when compared to term infants, there is limited research about the effect of the degree of prematurity on learning and motor proficiency. Even less known is how prematurity levels affect infant movement learning in infants with brain insult who are overrepresented in this population.

**Purpose:** The purpose of this pilot study was to examine learning and motor proficiency in infants with varying levels of prematurity during acquisition of prone locomotion skills using the Self-Initiated Prone Progression Crawler (SIPPC-3). The SIPPC-3 is an interventional robotic system that assists with prone mobility and simultaneously captures movement learning. We hypothesized similar learning strategies for all preterm infants but low magnitude of change based on prematurity and brain insult.

**Methods:** Forty infants (40) were divided into 2 groups: typically developing (28) and brain insult (12). Infants were trained to engage in prone locomotion on the SIPPC-3 for 15 minutes, two times per week, for up to 20 weeks. Each training session was video recorded to capture movement learning. We used the Movement Observation Coding System (MOCS) to capture movement learning. Scores were computed into a composite index of a Motor Proficiency Score (MPS). Because of the small within-group numbers for some of the GA levels, we used descriptive statistics, visual inspection of graphs, and Spearman to test our hypotheses.

**Results:** In the typically developing group, mean change MPS for LP infants was the highest at 13.06, followed by EP infants at 7.39, and VP infants at 4.80. The mean change MPS for infants born at full term was 8.78. For the brain insult group, the mean change MPS was highest for the full term infants at 10.83, followed by 5.37 for the EP and 5.0 for the VP infants. Correlation coefficients between GA and MPS for the typically developing group were 0.64 and 0.88 for the EP and LP infants, respectively ($p=.05$), and 0.48 for the VP group. For the brain insult group coefficients were 0.83 for the EP and 0.79 for the VP infants ($p=.05$). There we insufficient number of LP infants in the brain insult group.

**Discussion:** Our findings reveal that typically developing preterm infants learn a new skill at the same rate as term-age infants. This finding was supported by correlation results, except for VP infants. The high magnitude of change among EP infants suggest that they are capable of catching up with term-born infants. Larger sample sizes are needed to confirm this finding. While gains from the brain insult group were lower than those of the TD group, their learning increased regardless of GA levels. The correlation results supported this tight age-skill coupling implicating learning-dependent neuroplasticity. Overall these results suggest that the impact of prematurity level on skill learning is minimal.

**Relevance to Allied Health:** Learning patterns of infants born at varying levels of prematurity can promote better understanding of how to tailor early learning opportunities for this group. A skill such as promote prone locomotion is associated with development of language and cognitive skills and therefore impactful. The information about the rate of learning by premature infants with brain insult can also be used by other allied health professionals to set realistic expectations for families.

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