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How is Focused Attention Related to Infants Learning to Sit?

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RUI: The Role of Sleep in Infant Motor Problem Solving
Abstract

Focused attention is when an individual is completely absorbed in a task or attending to an object. This concept has been connected to learning and other cognitive skills. The Gross Motor Function Measure (GMFM) is a tool used to quantify change in gross motor skills over time. The purpose of the study was to investigate the relationship between total focused attention time and GMFM scores in early sitting infants. 26 infants, all between 6-8 months old, were given 3 different types of toys each for 90 seconds and were videotaped while they explored. Videos were later coded using Datavyu, a coding software allowing accurate measurement of timed periods of focused attention to the toys. The total time of focused attention was calculated and correlated to the scores from the GMFM. The relationship between GMFM scores and total focused attention was negative and moderately associated ($r=-0.30$, $p=0.07$), such that infants with higher motor scores had less focused attention. This result supports previous research showing that children with delays have lower attention when transitioning from being sitters to crawlers. As infants gain new motor skills, they engage in greater exploration of their environment, potentially leading to shorter periods of focused attention to objects. The relationship between motor skills (sitting) and cognitive skills (focused attention) is important in early intervention. This study adds to the evidence that motor skills and cognitive skills are interrelated in complex ways. The trend in this small sample will be further explored with additional children.

Keywords: Early intervention, Exploration, Focused Attention, Gross Motor Function Measure, Infants
How is Focused Attention Related to Sitting?

An infant’s development increases dramatically during their first 4-8 months. There is an increase in skills, like gross motor development, allowing them to explore their surroundings. Infants learn by exploring their environment (Hockenberry, 2017, p.286). This exploration can be seen in toy interactions like banging, turning them over, feeling the textures, and exploring details. The GMFM scores posture and functional movement in children. The ability to sit follows two skills: the ability to straighten the back and maintain head control. When achieving muscular control, the infant can increase information processing (Harbourbe et.al,. 2014). At this point, an infant may still seek support from propping in their hands. Propping is when the infant leans on one or both hands when sitting. These behaviors are scored using the sitting subsection in the Gross Motor Function Assessment (GMFM). As the GMFM was created to measure motor skills in children who have cerebral palsy, the research team concluded it would be appropriate to use when measuring an infant’s function sitting skills. Focused attention is when a subject is completely devoted to a task or an object. For example, an infant can show focused attention when handling or looking at an object during play. The development of focused attention skills is linked to learning and cognitive development in infants. The developmental process seen in infants requires unique observation in order to screen for developmental delays. To promote the most optimal outcomes in development, early identification in developmental delays is key to early intervention. The ability to sit independently has been correlated to less time to process information. Infants with motor delays spend more time looking and exploring an object (Harbourne et.al, , 2014). We investigated how focused attention was related to infants learning to sit.
Methods

In our procedure we collected two measurements of infant development. We used focused attention (FA) and GMFM sitting subsection results to compare to each other. GMFM scores the motor development and focus attention scores attention to a task. Our participants were recruited through the Pitt + Me research site and the Nanit baby monitoring company in a larger National Science Foundation study. Both the GMFM and FA were recorded and coded later by two researchers each to compare results. The four coders were trained on how to correctly score the videos.

Participants

We recruited 26 infants in this study that were between 6 to 8 months old. The inclusion criteria were that the infants had to be able to sit and reach independently but had not begun crawling. We included term and late preterm infants. Our exclusionary criteria included any infants with atypical development. An example of atypical development would be a diagnosed musculoskeletal impairment. The caretaker or parent would fill out a google form answering questions about how well the infant sits and if they attempt to crawl. The google form also includes birth date, their gestational age at birth, and if they were born prematurely.

Procedure

All procedures were performed in the infants’ home environment. The setting was made as comfortable as possible with minimal distractions. Both procedures were performed by one of the trained researchers and recorded to be coded later. For the FA specifically, it was important to maintain a quiet comfortable area to maximize the interaction with the toys. The infant is placed in a sitting position for the FA. In some cases where the child would wobble and possibly tip over, an adult may sit behind the infant. The infant was then given 3 different toy types, each for 90 seconds. The infant was left to explore, and distractions were minimized. The result was a sum of the focused attention times in which the infant was interacting with the toys such as looking at them while turning them over, banging them together or exploring details and textures. These periods of attention or bouts were timed using the video coding
software Datavyu, and summed up for a total focused attention value for each child. A bout was not counted if the child was making noise or had extraneous movement (suggesting a lack of concentration).

Our second procedure is the Gross Motor Function Measure, sitting subsection. The GMFM was scored on how well an infant sat or reached while playing with toys. The GMFM is traditionally used to measure motor skills in children with cerebral palsy. However, using the sitting subsection we found that the scoring system would provide us specific data on the infant's motor development. The score would be 0, 1, 2, or 3. For example, a child that does not attempt to reach for a toy at 45 degrees to their right would be a 0. If a child refused or chose not to reach for a toy it was also a 0. We prevented these occurrences by switching toys or making the task more interesting for the infant. We used the detailed scoring guidelines in the GMFM manual for accuracy and reliability. The scores are summed together and then a percentage score is calculated using the sum of the entire sitting subsection. During the home visits the adults present were given information as to why these reaching skills and attention skills are important. A major factor of child development is their manner of play. The context as to why we are measuring the FA and GMFM provides the parents with the purpose and benefit of the procedures.

**Results**

Using the SPSS statistical program, we performed a correlation analysis. We found that GMFM scores and total focused attention were negatively moderately correlated. The r value was -0.30 and the p value was 0.07. We determined that infants with higher motor skills often had less focused attention time. Seen in Figure 1, as GMFM scores increased the total FA time decreased. This supports previous research showing that children with delays have lower attention as they gain motor skills, specifically as they begin to transition from being sitters to crawlers. As infants gain new motor skills, they engage in greater exploration of their environment, potentially leading to less periods of focused attention to objects. Also, due to their greater cognitive ability and being able to process information more quickly, they do not require such long periods of focused attention to a single object (Surkar et al, 2015).
Discussion

The development seen in infants 6-8 months is vast. Exploration is a huge key into cognitive development, and exploration goes hand-in-hand with motor development. Providing research on detailed cognitive developmental stages can lead to early identification and promote early intervention. When collecting this data, there are flaws we may take into account. First, infants may be tired or getting frustrated during our procedure, this could lead to less interest in our toys or us in general. We tried our best to prevent this by keeping the FA fast and interesting. Also, we would switch out toys to reach for with more interesting ones like rattles or bells. Second, it should be acknowledged that although the researchers are given specific instruction, there may be a slight variation in the GMFM and FA execution. For example, since this is done in their homes, pets and other siblings may distract the infant. Overall, we minimized bias in scoring by having two coders separately code and compare results. The GMFM manual had a specifically laid out key as to scoring the reaching and sitting ability of the subject, along with the FA, therefore, minimizing bias.

Infants with typical development will reach and retrieve objects around 4-5 months and will then will go on to maintain a sitting position in which they can use both their hands. The freedom of the movement expands their environment and ways to interact with the world around them (Lobo, Harbourne, Dusing, & Westcott McCoy, 2013). Seen in previous research on children with Cerebral Palsy using the GMFM and FA, as the children moved out of sitting position onto further motor development their sustained attention decreased (Surkar et al, 2015). This supports our results that the infants with increased motor development had a decrease in FA during their transition stage.

Conclusion

Motor and cognitive development in infancy plays an important part in thinking and exploration. Adding research to the baseline of typical development is important in early intervention. Early intervention for infants should target their ability to explore their environment using function motor skills.
Although we see no significant difference in our term and late preterm infants, it is possible that due to the limited postural abilities, a preterm baby may have limited ability to explore a toy with two hands. Building the research behind early intervention is key to optimal development (Lobo, Harbourne, Dusing, & Westcott McCoy, 2013.) Expanding the research on cognitive development can assist in early intervention especially since longer look times or decrease processing can be found in infants with cognitive delays (Harbourne et.al, , 2014). Further research with a larger sample size will be investigated in the future.
References


Figures

Figure 1. In this graph above you can see the relationship between GMFM and total FA duration. As Gross Motor Function Measure increased, FA decreased.