

"Baby on the Move!: Infant Initiated Locomotion with Robotic Assisted Technology"

Rachel Dowd, Hannah Rolf, and Karina Feitner

Faculty Sponsors: Judith Pena-Shaff and Laura Muscalu

In collaboration with Carole Dennis, Nancy Rader, Sharon Stanfield, and Helene Larin.

Mastery of independent mobility plays an integral role in the development of many psychological functions (Anderson et al., 2013). It impacts the infants' relationship with their environment as they are able to freely explore. Independent mobility allows them to explore their environment and experiment with problem solving (Zachry & Mitchell, 2012). Independent mobility has been related to the development of executive function (EF) (Koziol & Lutz, 2013). However, children with locomotion disabilities lack opportunities to freely move and explore their environment (Rivera, 2012) and powered mobility is not available to them before the age of 3 (Dennis et al., 2011).

Our study investigates changes in infants' intentional and goal directed locomotion using a novel robotically assisted locomotion device (the WeeBot) that allows infants to control their locomotion by leaning forward, left, or right, while in a sitting position. We expect infants' self-initiated locomotion to increase with repetitive experience and engage in intentional, goal-directed locomotion.

Research questions:

1. Are there changes in time spent intentionally locomoting with the WeeBot?
2. Are there changes in time infants spend in goal-directed locomotion using the WeeBot?

Methodology:

Participants: nine five-month-old (7 female; 2 male) typically developing, pre-crawling infants.

Procedure:

Infants seated in the WeeBot participated in 12 16-minute play sessions over a two-month period. Sessions consisted of a 3-minute free-play period (FP1), a 10-minute period of prompted driver training (DT), and a second 3-minute free-play period (FP2). Sessions were video recorded. We selected the first 12 minutes of free play from Sessions 1 through 3 (Time 1) and the last 12 minutes of Free play from sessions 11-12 (Time 2).

We analyzed: 1) total time moving; 2) total time spent in intentional locomotion; and 3) total time spent in goal-oriented driving. We used time ratios and paired samples t-test to analyze the data.

Results:

Our results showed a statistically significant increase in the proportion of time infants spent in intentional and goal directed locomotion between Time 1 and Time 2. At the end of the 12 sessions, infants spent almost 30% of the time driving intentionally and 15% of the time driving purposefully toward an object or person.

References

- Anderson, D. I., Campos, J. J., Witherington, D. C., Dahl, A., Rivera, M., He, M., Uchiyama, I., & Barbu-Roth, M. (2013). The role of locomotion in psychological development. *Frontiers in Psychology, 4*, 1-17.
- Dennis, C.W. et al. (2011) TheWeeBot: Feasibility of a mobility option for infants. Paper presented at *FICCDAT Third International Symposium on Quality of Life Technology*.
- Koziol, L. F., Budding, D. E., & Chidekel, D. (2012). From movement to thought: executive function, embodied cognition, and the cerebellum. *The Cerebellum, 11*(2), 505-525.
- Rivera, M.(2012). *Spatial cognition in infants with Myelomeningocele: Transition from immobility to mobility*. Ph.D.dissertation, University of California, San Francisco, CA. ProQuest Publication Number:3553864.
- Zachry, A.H., & Mitchell, A.W. (2012). Goal-directed actions and early experience with crawling. *OTJR: Occupation, Participation, and Health, 32*(2), 48-55.