

Standing Tall: Exploration and play in a novel modified ride-on car

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Background

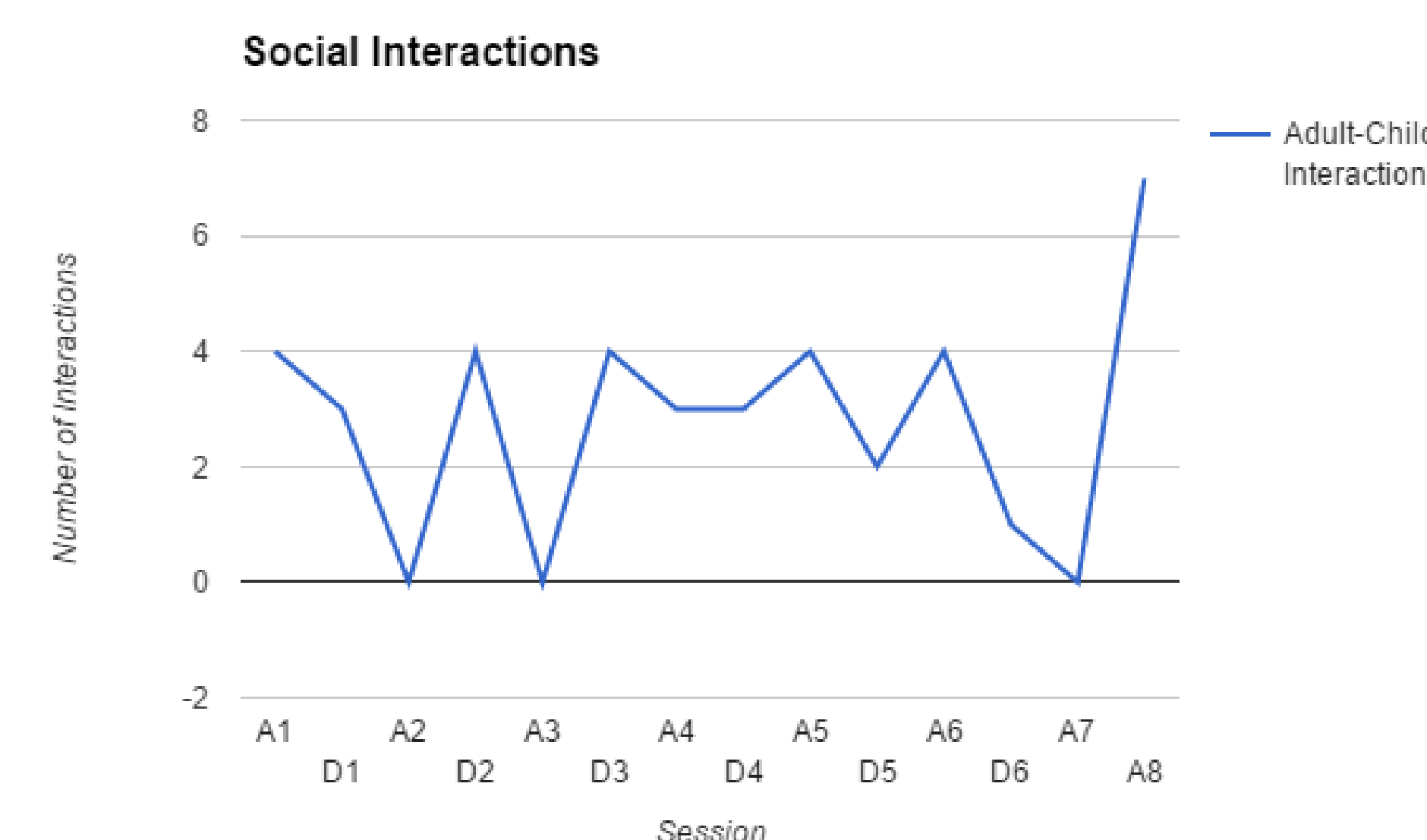
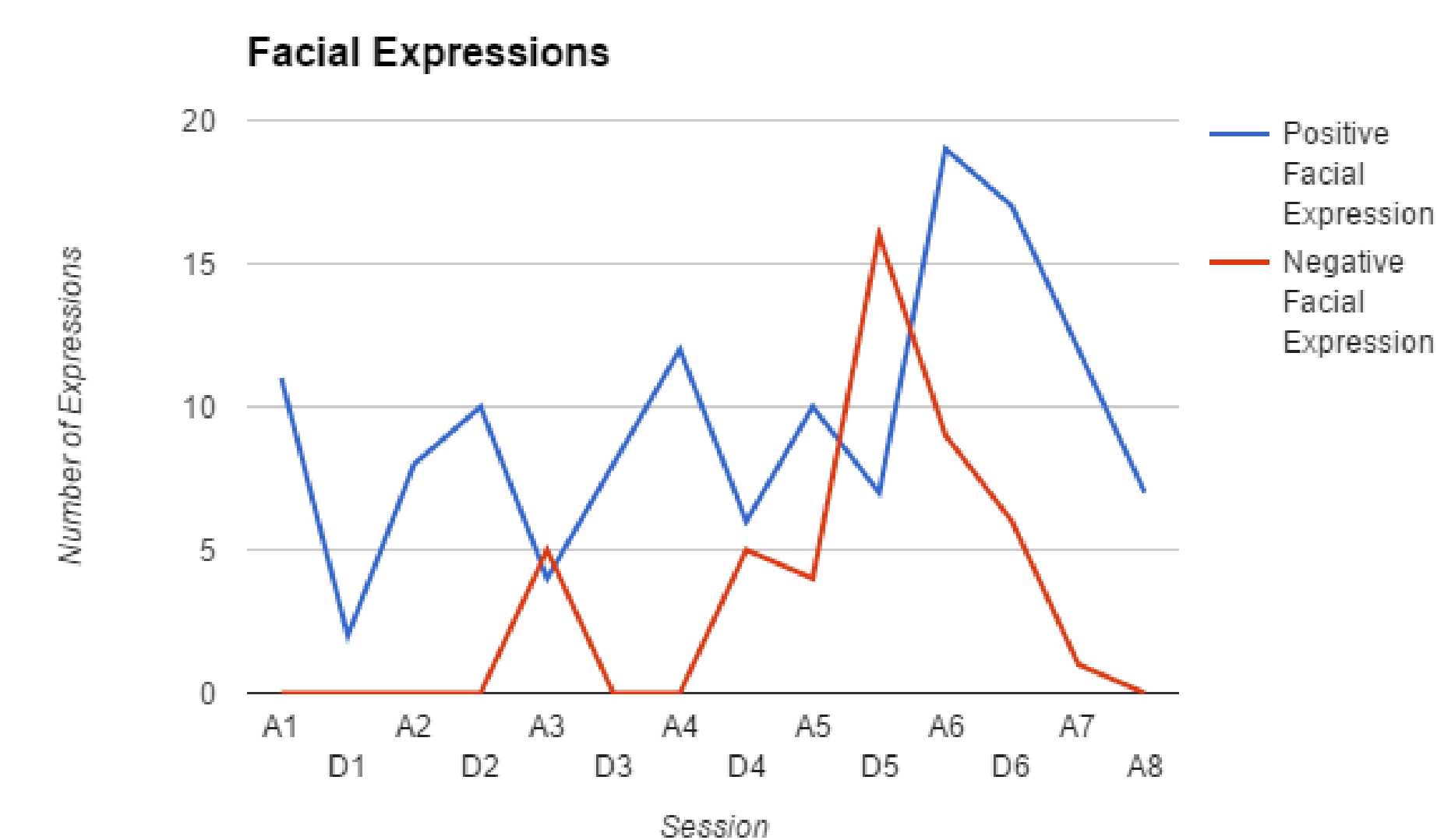
Self-directed mobility is a fundamental human right. Typically developing children engage in mobility for a majority of their day, but children with disabilities do not have the same opportunities. Children with disabilities are at a disadvantage and have a greater risk for developmental delays in physical and cognitive skills, along with decreases in social interactions with peers and adults (Feldner, Logan, & Galloway, 2015). Powered mobility devices, such as motorized wheelchairs, can promote self-directed mobility experiences for children with disabilities. Lynch, Agrawal, and Galloway (2009) validated that powered mobility devices can help children with disabilities as young as six months improve communication, cognitive abilities, as well as motor skills. Unfortunately, there are no commercially available powered mobility devices for children under the age of three (Logan et al., 2014). Yet, research over the past thirty years has shown direct benefits of use of powered mobility devices (Butler, 1983; Feldner et al., 2015). Ride-on toy cars (ROC) were mentioned as a potential powered mobility device as early as 1988. However, only recently have modified ROCs emerged as an alternative to standard powered mobility devices. Previous research has demonstrated the benefits of the use of modified ROCs for children with disabilities to increase independent exploration as well as physical and cognitive development (Logan et al., 2014). An innovative sit-to-stand version was developed and requires a child to stand up in order to activate the switch to encourage the physical skills of pulling from sit-to-stand, weight bearing, and balance (Feldner et al., 2015). The purpose of this case study is to examine modified ROC use by an infant with Down syndrome (DS) to encourage sitting, standing, and walking.

Methods

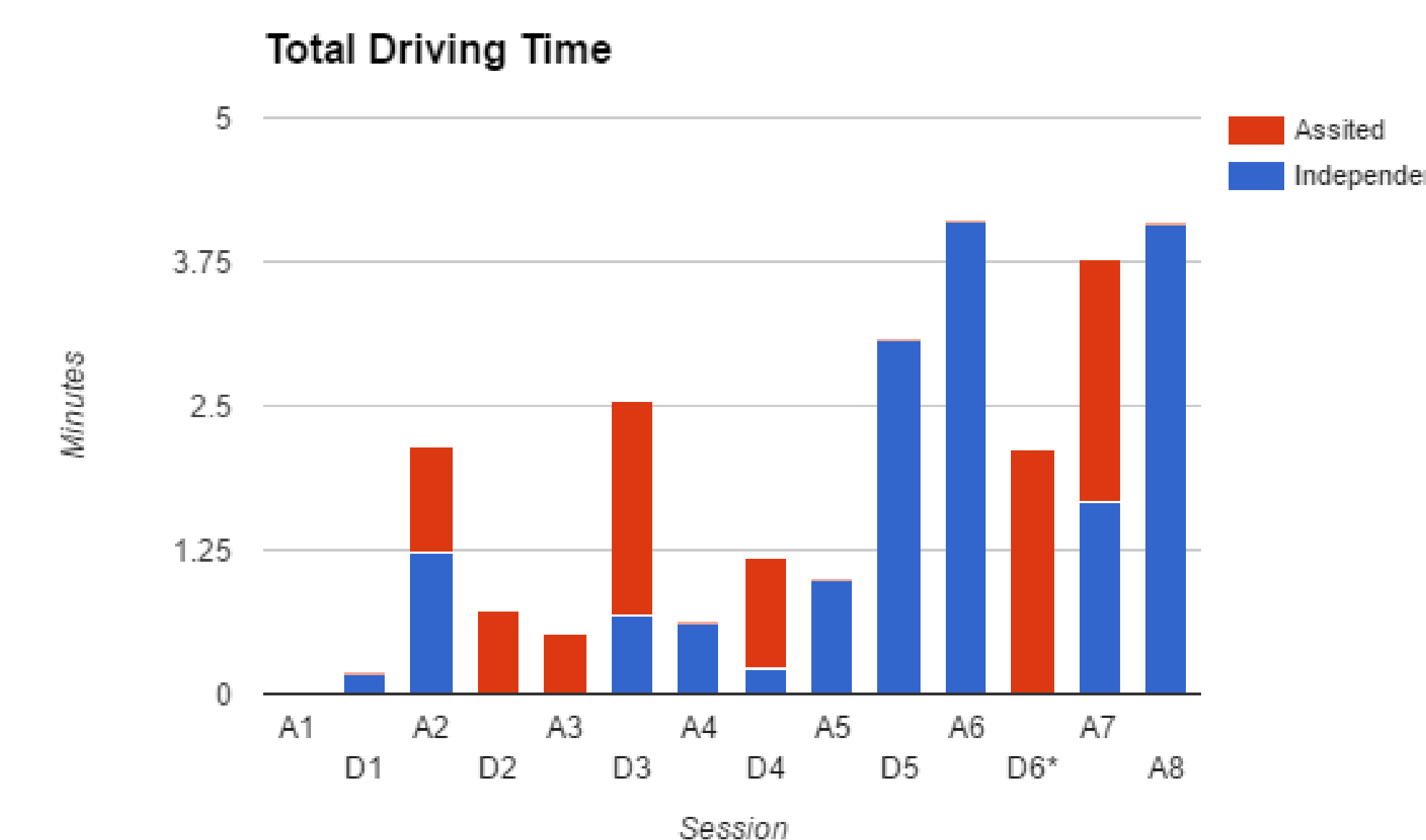
One infant (7 months) with DS participated in this study. She is referred to as Child A to protect her identity. Approval from the university Institutional Review Board and written parent/guardian consent was obtained prior to data collection. The study included 2 phases: Baseline (2-months) and Intervention (8-months). During baseline, Child A was provided bi-weekly driving sessions that lasted 10-minutes and were video recorded by a researcher. During the intervention, Child A was provided 20 minutes of driving at least five days per week and a researcher recorded bi-weekly 10-minute driving sessions. Driving sessions are labeled according to session number as well as whether a Bayley Scales of Development Assessment and Pediatric Evaluation of Disability Inventory Computer Adaptive Test were taken. Driving sessions where assessments were taken are labeled A and sessions when only video recording occurred are labeled D. Data coding was performed for each 10-minute video looking at behaviors such as facial expressions and social interactions. Data collection is still underway until 13 months of intervention has been reached.



Results



Results Continued



Results and Discussion

- Child A initially drove the car in the seated mode, but transitioned over time to use the standing mode (first occurrence at 3.5 months in the intervention period).
- Independent driving increased from 0% (baseline) to 41% (intervention) of total time.
- The frequency of positive and negative facial expressions increased and decreased, respectively from baseline to intervention. During sessions D4 and D5, spikes occur in the negative facial expressions. Child A drove the car inside during both sessions that may have caused a negative emotional response.
- Child A's social interactions with adults varies across the baseline and intervention periods. After further investigation, in all the sessions that have zero social interactions (A2, A3, A7), the adults in the room are not caught on film, thus eliminating any captured interactions.

Conclusion

Modified ROCs are an affordable and fun option for children with DS. They provide opportunities in social and physical growth and may help close the developmental gap between children with DS and typically developing children. Child A progressively increased their ability to drive the car and showed enjoyment through positive facial expressions while driving outside and exploring the world around them. This project illuminates the possibility of using modified ROCs as a rehabilitation technology for children with DS due to the increase in the physical skills needed for pulling from sit-to-stand. This information could be useful for future clinicians working with children with DS. This project will continue to examine the effect of use of the modified ROC while in standing mode, such as how this may affect the onset of Child A's independent walking.

References

1. Butler, C., Okamoto, G. A., & McKay, T. M. (1983). Powered mobility for very young disabled children. *Dev Med Child Neurol.*, 25, 472-474.
2. Feldner, H. A., Logan, S. W., & Galloway, J. C. (2015). Why the time is right for a radical paradigm shift in early powered mobility: The role of powered mobility technology devices, policy and stakeholders. *Disability and Rehabilitation: Assistive Technology*, 11(2). Retrieved from <http://www.tandfonline.com>
3. Logan, S. W., Huang, H., Stahlin, K., & Galloway, J. C. (2014). Modified ride-on car for mobility and socialization: Single-case study of an infant with down syndrome. *Pediatric Physical Therapy*, 26, 418-426.
4. Lynch, A., Ryu, J. C., Agrawal, S., & Galloway, J. C. (2009). Power mobility training for a 7-month-old infant with spina bifida. *Pediatric Physical Therapy*, 21(4), 399-406.

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