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Treadmill Training for Infants with Down Syndrome: A Case Study

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Background & Purpose

Children with down syndrome (DS) typically have significant developmental motor and intellectual delays resulting in the inability to keep up with their peers (Palisano et al., 2001). Therefore, early intervention targeting onset of walking for children with DS may have a positive impact for the emergence of skills impacting all parts of a child's life. Previous studies have shown that treadmill training (TT) 5 times per week, 8 minutes per day is effective on the development of independent step taking in infants with DS (Ulrich et al., 2001). The purpose of this case study was to examine if a 16-week in-home, 2 times per week, 20 minute per session TT protocol is also effective for onset of walking.

Case Description & Methods

The child was a 20-month-old boy with DS. He was recruited from an early intervention center and was required to be able to sit independently and non-ambulatory for participation in this study. He was hospitalized from birth to seven months and had surgery to repair an esophageal atresia at 5 months old and is currently G-tube fed. The parents were instructed via Zoom on how to safely hold their child over the treadmill and how to make adjustments if the child was not taking steps. Modifications to the original protocol were allowed throughout the case study to support completion of the 40 minutes per week. The child was assessed at baseline, 8 weeks, and 16 weeks of intervention for changes in the Gross Motor Function Measure (GMFM) sections D & E, amount of steps taken in 5 minutes, and the amount of rest time required in 5 minutes. Secondary outcome measures included the functional mobility scale (FMS), the TT log that the family filled out weekly, and weekly questionnaire responses.

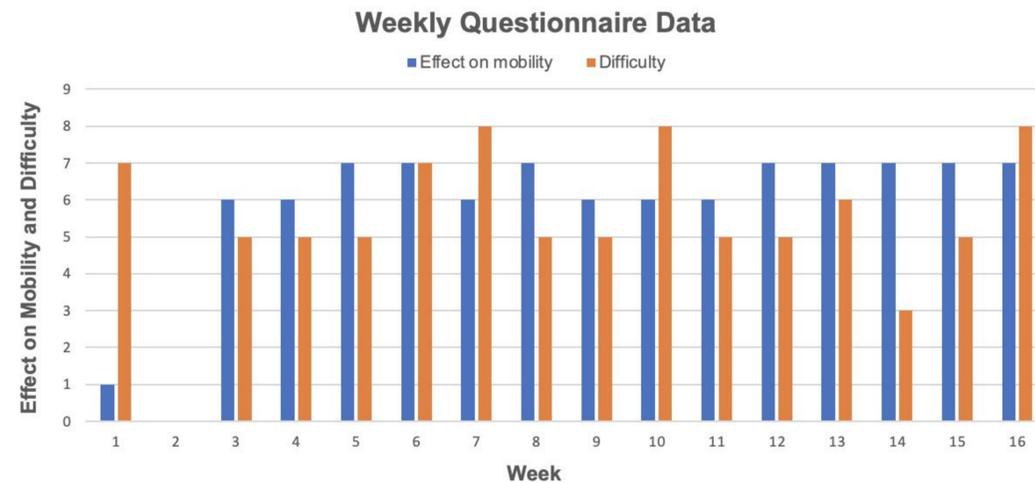


Chart 1. Y-axis; zero represents no effect on mobility and manageable adherence, and ten represents a large effect on mobility and difficult adherence. Note that week two contains no data as there was no meeting due to a holiday.



Chart 2. Amount of time, in minutes, spent on the treadmill each week.

Outcomes

Outcome Measure	Baseline	8 Weeks	16 Weeks
GMFM Section D	3	4	3
GMFM Section E	3	4	4
Step Count - alternating	7	8	12
Step Count- in a row	3	3	3
Step Count - single step	6	6	2
Break number & time	Six breaks; 87s	Five breaks; 46s	Three breaks; 21s

Table 1. Data at baseline, 8 weeks and 16 weeks from GMFM sections D & E, step count and number/time of breaks



Figure 1. Child on treadmill during week 6 of the intervention, with use of support bars.

Discussion

Based on our research, this is the first case study examining TT in an infant with DS who had an esophageal atresia repair and utilizes a feeding tube. Results indicated unsubstantial improvements for the GMFM and step count, however a decrease in number and length of breaks was observed. However, this finding could also be explained by an increase in the mother's endurance, who was the primary person supporting the child over the treadmill. Weekly data from the family suggests that while they believed the TT had a positive impact on their child's mobility, they consistently rated high levels of difficulty in completing the full amount of weekly TT. Despite lack of objective results, the participant's current physical therapist reported observing improvements in crawling speed, stair navigation, environmental exploration and cognitive development. Possible factors contributing to lack of observed results include:

- the child's extensive medical history
- limited time of the case study
- poor adherence to TT protocol

Conclusion

The parents report and protocol modifications indicate that two 20-minute sessions may be more difficult to complete than 40 minutes spread out across five days. Further research is needed to examine the optimal dosage of home-based TT in terms of effectiveness in walking onset and feasibility for adherence.