Research in Developmental Disabilities 61 (2017) 172–180

Contents lists available at ScienceDirect

Research in Developmental Disabilities

The use of modified ride-on cars to maximize mobility and improve socialization-a group design

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ARTICLE INFO

Article history:
Received 12 September 2016
Received in revised form
13 December 2016
Accepted 2 January 2017
Available online 10 January 2017

Keywords:
Modified ride-on cars
Young children with disabilities
Mobility
Socialization
Parenting stress level

ABSTRACT

Aim: To examine the effects of ride-on car (ROC) training versus conventional therapy on mobility and social function in young children with disabilities in a hospital-based environment.
Methods and procedures: Twenty young children with disabilities, aged 1–3 years, were recruited. The treatment group (n = 10) received ROC training of 2 h/session, 2 sessions/week for a total of 9 weeks in the hospital environment. The control group (n = 10) received conventional therapy alone. Assessments included the Chinese version of the Pediatric Evaluation of Disability Inventory and the Parenting Stress Index.
Outcomes and results: After a 9-week intervention, the treatment group showed improvements in mobility and social function, whereas the control group showed improvements in social function alone. Four children in the treatment group had clinically meaningful changes in mobility and 3 in social function, as compared to 2 and 1, respectively, in the control group.
Conclusions and implications: This is the first group study that demonstrated the potential benefits of ROC training on mobility and social function in young children with disabilities in the hospital environment. Future studies should include a larger sample size to detect any differences between ROC training and conventional therapy.

What this paper adds

Locomotion plays a critical role in a child's overall development. Encouraging options for independent mobility is extremely important, particularly for young children with disabilities. This two-group pretest-posttest study design provided evidence for the use of a modified ride-on toy car (ROC) to enhance mobility and socialization for young children with disabilities. Furthermore, the caregivers of the ROC training group reported less stress after the 9-week intervention. These promising results demonstrate the potential use of a modified ROC as part of an early power training program in the hospital environment to improve mobility and social function among young children with disabilities.

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http://dx.doi.org/10.1016/j.ridd.2017.01.002
0891-4222/

1. Introduction

Independent mobility is believed to be essential for perceptual-motor and social skill development (Campos et al., 2000; Gibson, 1988; Kopp, 2011). For infants and children, independent control of their environment through mobility is particularly important for development. Reaching, touching, exploring, and interacting actively with indoor and outdoor environments are beneficial for psychological development in infants/children with typical development (TD), particularly for developmental changes in social understanding, spatial cognitive, and emotions (Campos et al., 2000; Gibson & Pick, 2000; Kermoian & Campos, 1988; Uchiyama et al., 2008). When infants gain the ability to move around their environments independently, this self-produced locomotion assists in constructing their social world by offering interactions with a wider variety of objects and people, as well as opportunities to consolidate attachment and social referencing skills (Anderson et al., 2013; Campos et al., 2000). Infants' and children's exploratory experience, social behaviors, and locomotor status are functionally related (Anderson et al., 2013; Gibson, 1988; Lobo & Galloway, 2008).

Children with disabilities have more limited opportunities to explore their environment; therefore, they are considered at risk for secondary impairments, such as cognitive, spatial-perceptual, and social-emotional delays (Anderson et al., 2013; Tefft, Guerette, & Furumasu, 1999). For children who have mobility impairments, assistive devices such as walkers, wheelchairs, or power mobility devices (PMDs) offer a means of independent exploration, locomotion, and play (Butler, Okamoto, & McKay, 1983,1984; Deitz, Swinth, & White, 2002). Evidence supports that independent mobility through power mobility training might improve different skills in children with disabilities, including spatial awareness skills, eye-hand coordination, visual-perceptual skills, spontaneous vocalizations, initiation of contact with others, motivation to explore, and increased ability to interact meaningfully with peers (Butler, 1986; Butler, Okamoto, & McKay, 1984; Deitz et al., 2002; Henderson, Skelton, & Rosenbaum, 2008; Jones, McEwen, & Hansen, 2003; Lynch, Ryu, Agrawal, & Galloway, 2009). Many caregivers expressed that children had increased personal control, independence, and opportunities to participate in age-appropriate, meaningful activities after undergoing power mobility training (Kenyon et al., 2016; Livingstone & Field, 2015; Ragonesi & Galloway, 2012). Moreover, caregivers might have a lower perceived stress level at the time of PMD delivery, in addition to increased satisfaction with their child's social and play skills at the end of training (Livingstone & Field, 2015).

Power mobility training for young children with mobility impairments (younger than 3 years) has not been investigated extensively (Guerette, Tefft, & Furumasu, 2005; Livingstone & Field, 2014). However, studies showed that early power mobility training was feasible for 7-month-old infants and 13-month-old children with mobility impairments (Logan, Huang, Stahlin, & Galloway, 2014; Lynch et al., 2009). In combining research evidence and expert opinion, Livingstone and Paleg's (2014, p. 6) Delphi study results suggested that "it is possible for infants with disabilities to have augmented mobility experiences as early as 8 months of age", which translates to a practical consideration of power mobility training for young children. However, previous results showed that certain mobility device characteristics may limit use at home or at playground, including size, weight, and aesthetics (Berry, McLaurin, & Sparling, 1996; Ragonesi, Chen, Agrawal, & Galloway, 2010). Professionals and caregivers may still consider the use of early PMDs as a last resort due to fear of preventing children from wanting to walk, as well as safety concerns (Wiart & Darrah, 2002). Moreover, some family and environmental factors may influence the application of early power mobility training, e.g., parents' perceptions, sibling/peer interactions, community accessibility, and neighborhood amenities (Hadders-Algra, 2011; Kenney, 2012; Rousseau-Harrison & Rochette, 2012). PMD application for very young children should be incorporated into a program that considers child-related (e.g., functional capabilities, motivation, and initiative), environmental (e.g., appropriate space to explore), and family factors (e.g., emotional support and interaction strategies) (Livingstone & Field, 2015; Livingstone & Paleg, 2014; Sonday & Gretschel, 2016).

Providing new device options for early power mobility training that addresses the above mentioned environmental limitations is crucial (Feldner, Logan, & Galloway, 2015). Recent publications (Huang and Galloway, 2012; Huang, Ragonesi, Stoner, Peffley, & Galloway, 2014; Logan, Feldner, Galloway, & Huang, 2016; Logan et al., 2014) regarding the use of modified ride-on cars (ROCs) as PMDs introduced an alternative way to provide early power mobility training in young children with mobility impairments. Previous case studies have determined the feasibility of a modified ROC as an alternative for early PMD and as a training tool for improving children's independent mobility, socialization, and family's perception of children's capabilities (Huang et al., 2014; Logan et al., 2016; Logan et al., 2014). The results demonstrated that the use of modified ROCs at home or in a facility might provide a readily available, fun method for families and therapists to help young children with disabilities within the first three years of life. In addition, the early power training program involved the children's caregivers, which might provide emotional support, improve their perceptions of children's improve caregivers' perceptions of children's abilities, and decrease their parenting stress levels.capabilities, and decrease the caregivers' parenting stress levels (Livingstone & Field, 2015; Tefft, Guerette, & Furumasu, 2011).

To improve the level of evidence related to the use of ROCs in this field, this study focused on examining the ROC training effects by applying a two-group experimental design. However, because people in Northern Taiwan seldom live in private or semi-detached houses due to limited land area in the country, we considered the possibility of applying ROC training in a hospital environment, which would provide the appropriate amount of space for children to explore. The general aim was to examine ROC training effects in a hospital-based environment in young children with disabilities aged 1–3 years. The specific aims were to examine: 1) the effects of ROC training on mobility and social function in young children with disabilities and compare these effects with those in the control group (i.e., the conventional therapy); 2) the effects of ROC training on caregivers' perceived stress level in the treatment group and compare these effects with those among caregivers in the control group. The hypotheses were: 1) young children with disabilities would have significantly improved