The Effects Of Virtual Reality Training And Body Weight Supported Treadmill Training Therapy On Children With Cerebral Palsy: A Single Subject Design Proposal

DOCTOR OF PHYSICAL THERAPY

Western Kentucky University, Doctor of Physical Therapy Program

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Introduction

Cerebral Palsy (CP) is the most common childhood disability. The most common impairments include difficulty with gait, standing balance, and postural stability. Physical therapy is often a keystone of intervention to improve function for these individuals. Several physical therapy interventions are utilized for CP such as gait training, neuromuscular reeducation for muscle training, and exercises aimed at strengthening muscles of the trunk. In addition to traditional physical therapy interventions for CP, virtual reality training (VRT) and body-weight supported treadmill training (BWSTT) are additional modalities that may be effective for individuals with CP. Both interventions have been researched and shown to be effective in decreasing the detrimental effects of CP. The purpose of our study is to examine the effects of virtual reality training (VRT) and body weight supported treadmill training (BWSTT) on the balance and gait parameters in children with cerebral palsy.

Methods

Two participants, aged 4-7 years, with a medical diagnosis of spastic cerebral palsy will be included in this two-standard deviation band method study. Each child will participate in 3 sessions per week for 6 weeks following an ABA or ACA protocol (Figure 1) with A being the baseline phase and B being the intervention phases. Each child will be assigned to either VRT or BWSTTat the first session. VRT will be administered using the Bertec Balance System (Figure 2) for 3, 6-minute trials with one minute rest in-between for a total of 20 minutes while standing on a moveable platform with a harness and tasked to shift weight to interact with virtual objects and/or avoid virtual obstacles. The BWSTT will be administered using the LiteGait Walkable (Figure 3) for 3, 6-minute trials with one minute rest in-between for a total of 20 minutes. Balance will be measured using the GMFM-88 sections D and E at each session. Gait parameters will be measured by the Zeno Walkway (Figure 4) at each session..

Inclusion Criteria

(1) Between the ages of 4 and 7
(2) Medical diagnosis of spastic Cerebral Palsy

Exclusion Criteria

(1) Hospitalization within the past month
(2) Diagnosis of an acute musculoskeletal condition in past 3 months
(3) Used Virtual Reality Training or Body-Weight Supported Treadmill Training for intervention in the past 2 weeks
(4) Height > 56 inches

Figure 2: Bertec Balance System for VRT

Figure 3: LiteGait for BWSTT

Results

A two-standard deviation band method will be used to analyze the results.

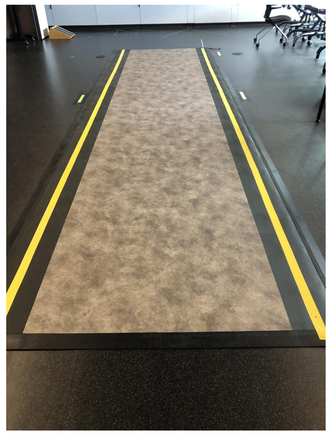

Figure 4: Zeno Walkway

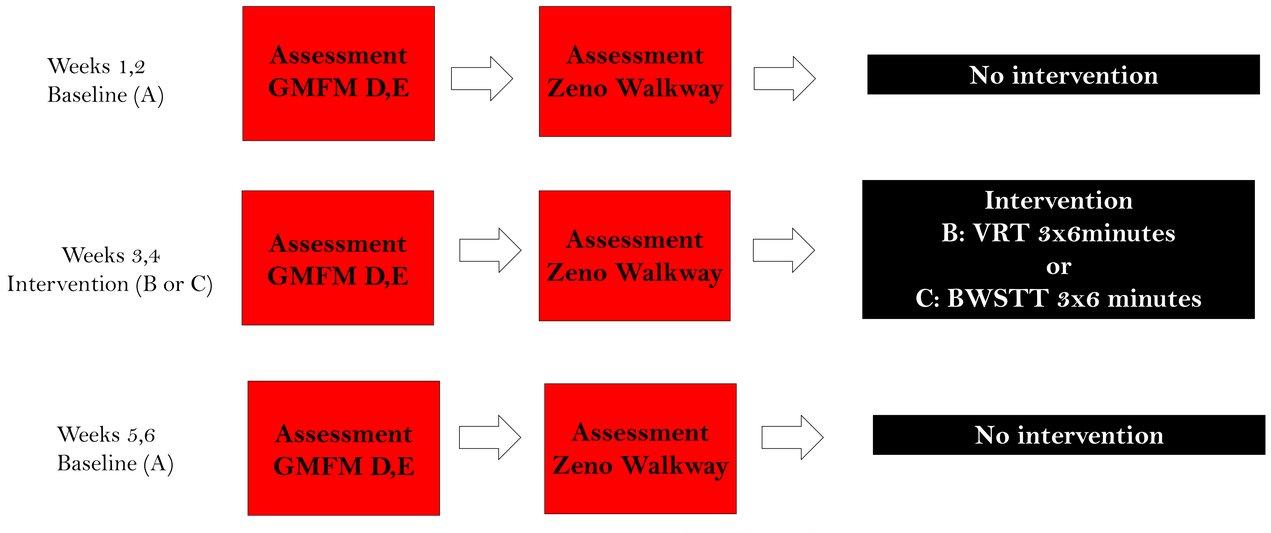

Figure 1: Study Protocol

Discussion

The use of VRT treatment using the Bertec Balance Advantage System is a relatively new treatment with few studies existing that observe the effects on children with Cerebral Palsy. BWSTT is a previously used treatment with supporting evidence for its use on improving balance and gait. This study will provide potential evidence confirming VRT as a viable treatment option for children with CP.

Clinical Application

Why is the study important?

- Limited research on the newly created Bertec Balance System
- Add new effective treatments to the physical treatment plan of children with Cerebral Palsy

References

1. Katusic A, Alimovic S, Mejaski-Bosnjak V. The effect of vibration therapy on spasticity and motor function in children with cerebral palsy: a randomized controlled trial. NeuroRehabilitation. 2013;32(1):1-8. doi:10.3233/NRE-130817
2. Lee BK, Chon SC. Effect of whole body vibration training on mobility in children with cerebral palsy: a randomized controlled experimenter-blinded study. Clinical Rehabilitation. 2013;27(7):599-607.
3. Liu C, Wang X, Chen R, Zhang J. The Effects of Virtual Reality Training on Balance, Gross Motor Function, and Daily Living Ability in Children With Cerebral Palsy: Systematic Review and Meta-analysis. JMIR Serious Games. 2022;10(4):e38972. doi:10.2196/38972
4. Swe NN, Sendhilnnathan S, van Den Berg M, Barr C. Over ground walking and body weight supported walking improve mobility equally in cerebral palsy: a randomised controlled trial. Clin Rehabil. 2015;29(11):1108-1116. doi:10.1177/0269215514566249