



Different horse's paces during hippotherapy on spatio-temporal parameters of gait in children with bilateral spastic cerebral palsy: A feasibility study



Fabiane Nunes Antunes^a, Alexandre Severo do Pinho^{b,c}, Ana Francisca Rozin Kleiner^d, Ana Paula Salazar^{b,c,e}, Giovana Duarte Eltz^a, Alcyr Alves de Oliveira Junior^a, Fernanda Cechetti^a, Manuela Galli^{d,f}, Aline Souza Pagnussat^{a,b,c,*}

^a Rehabilitation Sciences Graduate Program, Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSA), Brazil

^b Health Sciences Graduate Program, Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSA), Brazil

^c Movement Analysis and Neurological Rehabilitation Laboratory, Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSA), Brazil

^d Department of Electronics, Information and Bioengineering, Politecnico di Milano, Italy

^e Scholarship fellow of Technical and Industrial, Development of Fundação de Amparo à Pesquisa do Rio Grande do Sul (Fapergs)—Foundation for Research Support of Rio Grande do Sul, Brazil

^f Motion analysis Lab, IRCCS San Raffaele Pisana, Rome, Italy

ARTICLE INFO

Article history:

Received 26 January 2016

Received in revised form 19 July 2016

Accepted 31 July 2016

Number of reviews completed is 2

Keywords:

Rehabilitation

Physiotherapy

Ecological evaluation

Equine-assisted therapy

Accelerometer

ABSTRACT

Hippotherapy is often carried out for the rehabilitation of children with Cerebral Palsy (CP), with the horse riding at a walking pace. This study aimed to explore the immediate effects of a hippotherapy protocol using a walk-trot pace on spatio-temporal gait parameters and muscle tone in children with Bilateral Spastic CP (BS-CP). Ten children diagnosed with BS-CP and 10 healthy aged-matched children (reference group) took part in this study. The children with BS-CP underwent two sessions of hippotherapy for one week of washout between them. Two protocols (lasting 30 min) were applied on separate days: Protocol 1: the horse's pace was a walking pace; and Protocol 2: the horse's pace was a walk-trot pace. Children from the reference group were not subjected to treatment. A wireless inertial measurement unit measured gait spatio-temporal parameters before and after each session. The Modified Ashworth Scale was applied for muscle tone measurement of hip adductors. The participants underwent the gait assessment on a path with surface irregularities (ecological context). The comparisons between BS-CP and the reference group found differences in all spatio-temporal parameters, except for gait velocity. Within-group analysis of children with BS-CP showed that the swing phase did not change after the walk pace and after the walk-trot pace. The percentage of rolling phase and double support improved after the walk-trot. The spasticity of the hip adductors was significantly reduced as an immediate result of both protocols, but this decrease was more evident after the walk-trot. The walk-trot protocol is feasible and is able to induce an immediate effect that improves the gait spatio-temporal parameters and the hip adductors spasticity.

© 2016 Elsevier Ltd. All rights reserved.

* Corresponding author at: Programa de Pós-Graduação em Ciências da Reabilitação, Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSA, 245, Sarmento Leite Street, Porto Alegre, RS, Zip code: 90050–170, Brazil.

E-mail addresses: alinespagnussat@gmail.com, alinesp@ufcsa.edu.br (A.S. Pagnussat).

1. Introduction

Equine-assisted therapies and activities (AHA I, 2016; Angsupaisal et al., 2015) are currently popular and have been suggested as one option in the rehabilitation of children with cerebral palsy (CP). The rationale behind hippotherapy is that the rhythmic movement may provide an afferent stimulus that is able to reduce spasticity and encourage alignment and posture control in children (Zadnikar & Kastrin, 2011). Some studies have been conducted in recent years to examine the immediate and long-term effects of hippotherapy in children with spastic CP in terms of muscular activity (McGibbon, Benda, Duncan, & Silkwood-Sherer, 2009), functional ability, postural control (Shurtleff, Standeven, & Engsborg, 2009; Shurtleff & Engsborg, 2010), quality of life and health (Davis et al., 2009), gross motor function (Drnach, O'Brien, & Kreger, 2010; Champagne, Corriveau, & Dugas, 2016) and gait parameters (McGee & Reese, 2009; Kwon et al., 2011).

Even though the majority of these studies have demonstrated benefits, the results are insufficient to evidence significant benefits in the rehabilitation of children with spastic CP (Tseng, Chen, & Tam, 2013). Inconclusive evidence of effectiveness may be caused by the heterogeneity in the therapies applied and the partial overlap in services delivered (Angsupaisal et al., 2015). The variations are reflected in past and present terminology. In the past, therapies were categorized as “hippotherapy” or “horseback riding therapy” (AHA I, 2016; Sterba, 2007). Therefore, the American Hippotherapy Association recently updated the standard terminology to describe these 2 basic forms: (1) hippotherapy, implying that a therapist (physiotherapist, occupational therapist or speech therapist) uses the purposeful manipulation of equine movement or the environment of the horse (or both) to create desired therapeutic goals, and (2) adaptive riding (the previous term was horseback riding), implying recreational horseback riding lessons adapted for children with disabilities. The difference is as follows: hippotherapy sessions are one-to-one sessions between a therapist and a child, whereas adaptive riding is provided in the form of group training, with a maximum of 5–6 children per group (Angsupaisal et al., 2015; Davis et al., 2009). A systematic review and meta-analysis of these 2 basic forms revealed that hippotherapy has been better investigated than adaptive riding (Tseng et al., 2013).

The BS-CP is an updated term that covers the previous terms di- or tetraplegia or –paresis (Krageloh-Mann & Cans, 2009). Children with BS-CP are characterized by joint kinematic alterations that lead to walking with reduced step length, velocity and cadence (Rodda, Graham, Carson, Galea, & Wolfe, 2004; Roberts, Stewart, & Freeman, 2015). Furthermore, muscle spasticity and contractures are among factors responsible for several gait abnormalities (e.g., spasticity of hip adductors with scissoring and contracture of rectus femoris and stiff knee gait) (Rodda et al., 2004). The achievement of independent and effective walking based on non-invasive rehabilitation strategies (Grazziotin Dos Santos et al., 2014; Simon Ade, do Pinho, Graziotin Dos Santos, & Pagnussat Ade, 2014) is often the goal of therapeutic intervention for children with CP, and with this objective in mind, hippotherapy has been used (AHA I, 2016).

To the best of our knowledge, no study has used a quantitative ecological approach to investigate the immediate effects of hippotherapy when the horse is ridden at a walk-trot pace on spatiotemporal gait parameters. The environment is a strong determinant of functional mobility in children with CP and may act as a barrier to and/or facilitator of mobility and performance (Kleiner et al., 2015b). Since independent mobility is important for activity and participation, the need to assess the gait parameters in a real context (an ecological approach) is imperative (Rodby-Bousquet & Hagglund, 2012; Kleiner et al., 2015a). Recently, wireless inertial measurement units (IMU) have been developed for the assessment of spatial-temporal gait parameters in an unobstructed environment outdoors, thereby overcoming the typical limitations of measurements in indoor laboratory settings (Kleiner et al., 2015b; Tao, Liu, Zheng, & Feng, 2012). Based on this approach, to evaluate the gait of children with BS-CP pre- and post-hippotherapy, the IMU was used in our study to quantify the treatment outcomes.

Based on our clinical experience, we hypothesized that the walk-trot protocol would be able to reduce the spasticity of the hip adductors and improve spatio-temporal gait parameters. Thus, the aim of this study was to explore the feasibility of conducting a crossover trial using hippotherapy with the horse moving at a walk-trot pace for the rehabilitation of children with BS-CP. According to this background, this study investigated the effects of two different hippotherapy protocols (walk and walk-trot) on spatio-temporal gait parameters and on the spasticity of the hip adductors of children with BS-CP.

2. Methods

A feasibility study of a crossover trial was conducted between August 2014–2015 at EQUUS-CIAPE Rehabilitation Center of Porto Alegre, Rio Grande do Sul, Brazil. The Institutional Ethics in Research Committee (Universidade Federal de Ciências da Saúde de Porto Alegre) approved this research under protocol n° 879.125/2014. Written informed consent was obtained from the parents and/or guardians of the children prior to their enrollment in this study, which was conducted in compliance with the current revision of the Declaration of Helsinki and the Good Clinical Practice Guidelines.

2.1. Participants

For this research, 25 children with BS-CP aged between 5 and 15 years old were assessed for eligibility and 10 were selected according to the following inclusion criteria: (a) they were able to walk with or without walking aids along a 5-m-long pathway, and (b) they could function at the Gross Motor Function Classification System (GMFCS) level I–III. The GMFCS describes the movement ability of children with CP in a range from I to V. In this study, only children who could function at GMFCS level I–III were included: level I involves walking without limitations but with some difficulty in speed,

Download English Version:

<https://daneshyari.com/en/article/6848332>

Download Persian Version:

<https://daneshyari.com/article/6848332>

[Daneshyari.com](https://daneshyari.com)