IMPROVING THE MOBILITY AND POSTURAL BALANCE OF INDIVIDUALS WITH MULTIPLE SCLEROSIS

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INTRODUCTION

Multiple sclerosis (MS) is a demyelinating disease that affects about 570,000 individuals in the United States [1]. These individuals are often faced with muscular impairments that have devastating effects on their mobility and standing postural balance. Traditionally, clinicians have discouraged individuals with MS from participating in exercise programs or intensive physical therapy because it was thought that these types of activities would exacerbate the MS symptoms [2]. However, this notion has been challenged by numerous studies that have shown that exercise and physical therapy does not aggravate the symptoms and can result in postural balance and mobility improvements [3-5]. Outcomes from our recent investigation have shown that an intensive neuro-physical therapy can result in substantial improvements in the mobility and postural balance of individuals with MS [4]. Our protocol was different from prior clinical trials in that it was performed twice-a-day, five days a week. This immersive therapeutic protocol was directed at igniting beneficial neuroplastic changes through a massed practice paradigm that constantly challenged the patient’s movements. Exemplar individualized challenging exercises included standing on foam with feet close together and eyes closed, walking sideways on a treadmill, or walking overground while stepping over obstacles. Although the initial outcomes appeared to be quite successful, it is currently unknown if the clinically relevant changes were related to the therapeutic dosage or the novel therapeutic paradigm. The purpose of this study was to test the therapeutic outcomes of our prior study by comparing it with the mobility and postural balance outcomes for a cohort of individuals with MS who participated in an exercise based training protocol that was conducted at the same therapeutic dosage.

METHODS

Twenty-four adults with relapsing-remitting or secondary progressive MS participated in this investigation (Mean Age: 53.5 ± 1.8 years). The subjects were assigned to either the Therapeutic Challenge Group (TCG) or the Exercise Group (EG). All subjects completed a battery of biomechanical testing before and after the 6-weeks of training. Postural control was measured based on the composite score from the Sensory Organization Test (SOT) (NeuroCom® International, Clackamas OR), where a higher score indicated a lower amount of postural sway. The preferred walking pace spatiotemporal kinematics were measured with a GAITRite® system (CIR Systems Inc., Sparta, NJ). Two walking trials were completed and averaged together for analyses.

Both groups completed their training five consecutive days each week, two times each day, over a 6-week period. The initial two weeks were completed on the UNMC campus under close supervision of a licensed physical therapist (HR, KGV, or BC). The TCG completed the same training that was conducted in our initial investigation [4]. For this group, each session consisted of 5 minutes of movements isolating the control of joints, 20 minutes of challenging postural balance training and 20 minutes of challenging gait training. The EG completed 15 minutes of strength/flexibility exercises, 15 minutes of postural balance exercises, and 15 minutes of treadmill walking. This group focused more on completing the assigned exercises rather than learning new
motor control strategies. After the initial two weeks of therapy, both groups completed the remaining four weeks of their training at home and were monitored through weekly phone contact from one of the treating therapists. Separate repeated measures ANOVAs (group x Pre/Post Assessment) were used to evaluate the differences in the treatment effects of the respective groups.

RESULTS AND DISCUSSION

For the SOT measures, we found a significant Pre/Post main effect, which indicated that all of the patients reduced their postural sway after the therapy (p<0.001; Fig. 1A). However, we did not find a significant group main effect or an interaction (p>0.05), indicating that the postural sway improvements were equivocal for the two treatment groups. We also found a significant Pre/Post main effect for walking speed (p=0.007; Fig. 1B), indicating that all of the patients walked faster after participating in the therapy. Yet, we did not find a significant group main effect or an interaction (p>0.05), indicating that the walking speed improvements were the same for the two groups. There additionally was a significant Pre/Post main effect for the step length (p=0.001; Fig. 1C), suggesting that all the patients improved their walking speed after therapy by using a longer step length. There was not a significant group main effect or interaction for the step length (p>0.05), once again indicating that there were no differences between the two treatment groups. Lastly, there were no significant differences for the step width or the cadences for both the main effects and interactions (p>0.05).

Our results show that a high dosage of physical therapy over a 6-week period can result in clinically relevant improvements in the mobility and postural balance of individuals with MS. On the other hand, our results also indicated that there were no differences for any of the outcome variables between the respective treatment groups. This suggests that the therapeutic gains in postural balance and mobility were more likely related to the high therapeutic dosage rather than the type of therapy implemented. Potentially, an intensive mass-practice of a motor task may be an important treatment parameter for promoting clinically relevant improvements in the mobility and posture of individuals with MS. The training conducted with the TCG was guided by the challenge point framework, which states that beneficial changes in motor learning can be augmented by altering the task difficulty. It is possible that there were no differences between the two treatment strategies because a high dosage of activity was sufficient for the patient to work above their challenge point. Alternatively, we suspect that having the patient perform the training at home may be the reason the TCG group did not perform better than the EG. Our rationale is that the patients in the TCG may have not known how to reliably exceed their challenge point without the therapist’s daily guidance. Effectively, the TCG home training program may have been relatively similar to the home program of the EG.

Figure 1: A) SOT composite scores, B) velocity, and C) step length for both therapy groups combined before and after the 6-weeks of therapy.

REFERENCES