

FEASIBILITY OF GROUP KICKBOXING TO IMPROVE BALANCE AND GAIT IN PATIENTS WITH MULTIPLE SCLEROSIS

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INTRODUCTION

Multiple Sclerosis (MS) affects an estimated 200,000 individuals in the US, causing gait and balance impairments from the earliest stages of the disease [1,2]. Martin et al. found that compared to healthy controls, MS patients with minimal impairment walked with reduced speed and stride length and performed poorer on the functional reach task using to measure balance, even those exhibiting no pyramidal signs [2]. Impairment of balance and gait contribute to the higher prevalence of falls in this population, reducing quality of life [3].

Research efforts have sought to identify effective interventions that can reduce functional impairment in patients with multiple sclerosis. For example, it has been found that a tailored balance rehabilitation program improved patient's performance on clinical balance tests [4]. Kickboxing appeals as a possible intervention due to the required movements, coordination, and weight shifts that are required, as well as the ability to work with groups of patients at one time. However, there is very limited work to determine whether a kickboxing program is feasible for this population and whether it may prove helpful in improving gait and posture.

The aim of this pilot study was to determine if clinical measures of gait and balance, as well as posturography measures improved based on participation in kickboxing. A secondary aim was to determine the feasibility of training five individuals at once and make recommendations for future adaptation of such a program.

METHODS

Five subjects (mean age: 57 ± 11 , mean Expanded Disability Status Scale: 3.2 ± 2.5 , 1 male and 4 females) participated in this pilot study. Prior to

beginning kickboxing training, all subjects completed a series of clinical tests, including: Timed Up & Go, Berg Balance Scale, Dynamic Gait Index, and Ten Meter Walk Test. Subjects also completed the Activities of Balance Confidence Scale (ABC). Postural sway data was also collected for all subjects using a force-measuring platform. Subjects completed static balance trials: Eyes Open, Flat Surface; Eyes Closed, Flat Surface; Eyes Open, Foam Surface; Eyes Closed, Foam Surface. Center of pressure was collected for 30 seconds at 1000 Hz. Anterior-Posterior and Medial-Lateral Sway Range was calculated for each trial. Subjects also completed at least two trials of the Limits of Stability task.

Subjects then participated in an eight week kickboxing training led by a certified kickboxing instructor. The group training was held twice a week for 60 minutes each time. During participation all subjects wore harnesses anchored into the ceiling. The kickboxing exercises increased in difficulty throughout the eight weeks and required coordinated movements as well as balance to stand on one leg, while kicking with the other.

At the completion of the program, all subjects repeated the series of tests that they had done prior to participation. To analyze the effectiveness of the intervention, Minimal Clinically Important Difference (MCID) values for the associated tests were used.

RESULTS AND DISCUSSION

The most notable improvement post-training was for the Dynamic Gait Index task. All subjects improved after completion of the kickboxing program. Results are shown in Figure 1. The MCID for the Dynamic Gait Index task, where the maximum possible score is 24 points, is reported to

be 3 points [5]. Three subjects had a change of 2 and one had a change of 4 points, suggesting meaningful improvement. It is felt that the kickboxing program improved the Dynamic Gait Index scores because participants demonstrated improvements in the tasks that were similar to those experienced during kickboxing such as rotational movement between head and trunk, pivot turning and single leg stance.

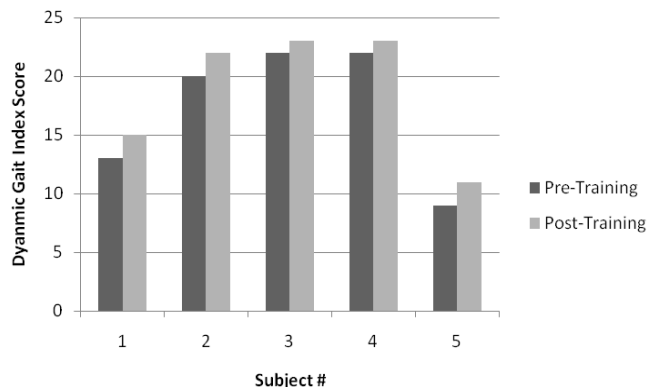


Figure 1. Changes in Dynamic Gait Index Score

Improvement in the Berg Balance Scale was also observed. Two subjects improved by 5 points, nearing the MCID value of a change of 6 points [6]. Another subject improved by 4 points. The two subjects with the highest starting scores did not improve additionally, however this is likely due to a ceiling effect (maximum score 56). Figure 2 shows these results. Similar to the Dynamic Gait Index, it is felt that the kickboxing program improved the Berg Balance Scale scores because participants showed the most consistent improvement in the categories requiring single leg stance, narrow base of support and alternate stepping and turning which are routinely challenged during kickboxing.

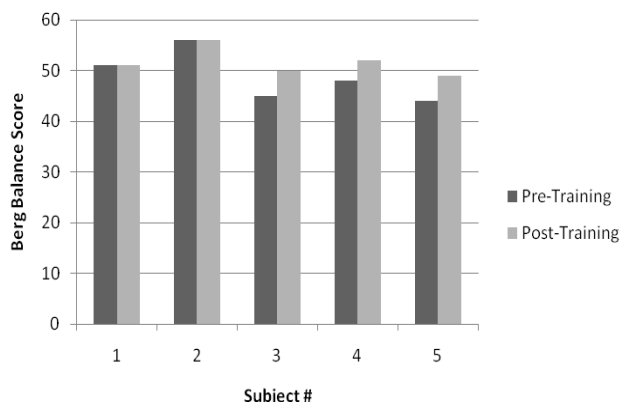


Figure 2. Changes in Berg Balance Scale Score

Interestingly, despite these functional improvements, subjects did not generally express increased balance confidence according to the ABC. In fact, three subjects reported lower scores after the participation in the kickboxing training. This may be because kickboxing challenged the subjects more than typical activities, and as such they better recognized their own imbalance. Future research will be needed to examine this disconnect and how to prevent it in the future.

Posturography results demonstrated that subjects tended to exhibit increased postural sway during quiet standing in the anterior-posterior and medial-lateral directions, and decreased ranges during the limits of stability task. It is possible that these decreased limits of stability ranges, where subjects lean as far in each direction as they feel they can without losing balance, were tied to the decreased balance confidence observed.

Though more work is needed to better quantify the effectiveness of kickboxing training, this pilot study suggests that this innovative intervention has potential. The general trend of improvement in the clinical tests suggests that this may be effective in improving balance and gait. Subjective feedback also demonstrated that subjects enjoyed the experience and camaraderie of participating in a group setting. The use of multiple overhead harnesses was important in providing stability to subjects during training and allowed one trainer to work with multiple participants. Currently a follow-up study is underway to examine the effects of kickboxing at a larger-scale.

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