Focus of attention in individuals post-stroke

Focus of attention effects on motor performance and learning in individuals post stroke during seated lateral weight shifting: A feasibility study

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Protocol

Study design

This was a two phase feasibility study exploring appropriate management, setting, participants including inclusion and exclusion criteria, attrition rates, protocol, and retention. Outcome data for each stage were collected during baseline, acquisition, short-term, and long-term retention. The study was approved by the Institutional Review Board at both Western Carolina University, reference number 949671-4, and Mission Health Systems, reference number 1124795-3. Minimal exertion during the activity was the only potential harm for this study. All participants provided written informed consent prior to data collection. There were no outside funding sources.

Study Participants

During Phase I, participants with history of a chronic stroke (>6 months) and ability to sit statically without physical assistance were eligible for the study. Individuals with severe hemineglect (star cancellation test <44/54) or inability to follow multistep commands were excluded. There were no issues with these criteria during the first phase, so the same criteria were used to recruit participants with acute stroke in an inpatient rehabilitation setting for Phase II. Unfortunately, some qualified participants were unable to complete the task so throughout the study exclusion criteria was modified to individuals with orthopedic issues that limited their ability to weight shift including severe hip or back pain, individuals with other neurologic conditions such as dementia, and individuals with contraversive pushing.

* BodiTrak. Model BT1526-8578. Vista Medical Ltd 55 henlow Bay Unit #3, Winnipeg, MC R3Y 1G4
† iPad. Apple Inc. 1 Apple Park Way Cupertino, CA 95014
‡ Body Align Pro. serial number 86300861. Motion Unlimited Corporation California. 4362 Modoc Road Unit B Santa Barbara CA 93110.

Investigators

Although the principal investigators were both faculty members at Western Carolina University, one of which was a licensed physical therapist, the other investigators were student physical therapists. During Phase I, each investigator filled one of three roles during data collection for the entire phase: script reading, computer management, or patient guarding. Lack of cross-training created difficulty in data collection, therefore in Phase II investigators were trained for all roles. Different student groups conducted each phase of the feasibility study and were trained primarily by the previous student group. Inconsistencies with both instruction and data collection persisted suggesting changes in investigator training are necessary prior to a randomized controlled study.

Setting

Phase I was conducted with individuals with a chronic stroke in two different outpatient clinics. Findings from this phase showed no significant differences between the focus of attention groups. These findings along with previous findings in the chronic stroke population in other studies[12,10,11] suggest there may be more significant differences seen in those with acute stroke. Muckel and Merholz were able to show differences in performance in focus of attention in those with acute stroke during a similar weight shifting task.[15] Based on these findings, Phase II was conducted in the inpatient rehabilitation setting.

Recruitment and retention

Twelve adults with chronic stroke (mean age 61.4 $\pm$ 13.8 years; 6 months to 13 years post-unilateral stroke) with good trunk control (Function in Sitting Test mean score 51 $\pm$ 2.9/56) were recruited for Phase I. Recruitment of participants was primarily from

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outpatient settings, local physical therapy clinics or physician offices, located in a rural area, thus the sample size was limited.

To allow for recruitment of a larger sample than in Phase I, Phase II was conducted in an inpatient setting. Participants were recruited via staff physical and occupational therapists at the facility. Twenty-six adults post-acute stroke (mean age 61.8±17, 1-10 weeks post unilateral stroke), with good trunk control (Function in Sitting Test mean score 51.3±4.4 out of 56) were recruited.

Randomization and blinding

During Phase I, stratified randomization was used based on gender. Results from a 2013 study showed significant differences between gender during focus of attention trials suggesting the potential need for randomization based on gender.[18] Group allocation was randomly selected for the first male and first female participants. Each following participant was alternately placed in either the internal or external focus of attention group. During Phase II, gender-based stratification was not used, to explore whether the intervention groups would naturally be comparable based on gender, age, BMI, and Function in Sitting Test scores. Instead, a blocked randomization with a random number generator (blocks of 10) was used to determine the order of focus group allocation. A blinded statistician and a graduate assistant performed the random number generation and placed the group assignments into separate envelopes, which were then sealed. Group assignment remained in sealed envelopes until after baseline measurements were completed. The participants and statistician were blinded for both phases of the feasibility study.

Procedures

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During Phase I, individuals in both groups sat unsupported on a hi-lo mat table which was adjusted so participants were sitting at 90 degrees hip and knee flexion with feet shoulder width apart. Tape marks were used to mark initial set up ensuring standardized positioning for each trial. Following baseline trials, all participants watched the same instructional video describing lateral weight shifting. The instructions included correct mechanics that should be used when weight shifting laterally with focus on correct form needed for the movement.

Testing included baseline, acquisition, short term retention (5 minutes later), and long-term retention (7-10 days later). Participants performed three trials of seated weight shifting to each side at all timepoints. During acquisition, the internal focus group was instructed to "shift your weight as much as possible towards your right or left hip without using your arms". The external focus group sat with targets one arm length away at shoulder height and were instructed to "shift your body weight as much as possible towards the blue/orange target without using your arms." During baseline and retention trials, adults were instructed to "lean as far as you can to the right/left without using your arms." During Phase II, the protocol was similar except 6 trials were performed for acquisition to potentially improve motor learning, which was not significant in Phase I per retention data. Other changes to the protocol included allowing participants to move their feet when weight-shifting. Instructions were also revised. The external focus group was told to "move your shoulder as close to the blue/orange target as possible", while the internal focus group was told to "shift your body weight as much as possible towards your right/left hip without using your arms." These instructions were too dissimilar and had

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participants thinking about different body areas, shoulder as opposed to hip. The external focus instructions were also mixed since the shoulder was mentioned.

Outcome measures

A 32X32 array BodiTrak* pressure mat with an 18.125 in x 18.125 in sensing area (1,024 sensors) was used to measure lateral excursion of center of pressure during each trial for both phases. The pressure mat has a 200 mmHg calibration range and up to 150 Hz sampling frame rate. During Phase II, a 9.5" X 7.31" X 0.37" 4th generation iPad†, with a 9.7-inch retina display, was used to record videos of each trial. The iPad has a 1080p HD video and 1.2 MP photo camera with autofocus and a 2.4 aperture with video stabilization. From this footage, shoulder alignment was measured during seated lateral weight shifting using the Body Align Pro app‡, trademarked on Nov. 28, 2014. Markers were placed at the acromion bilaterally. Each trial was recorded, and snap shots of the furthest lateral weight shift were uploaded into the software. The software then allowed angles to be drawn using a line from acromion to acromion compared to a horizontal plumb line (see Figure 1). This measurement was used to evaluate the participants ability to move their trunk in accordance with the instructions given, keeping their shoulders parallel to the horizontal. Validity and reliability tests are currently being conducted for this measurement method.

Insert Figure 1.

Data analyses

To summarize participant characteristics, descriptive data included means and standard deviations for continuous variables and counts for categorical variables. Percentages were reported to specify whether recruitment and retention goals were met based on power analysis. For Phase I, a 2 (group) X 4 (time) repeated measures mixed model ANOVA was

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used to examine the whether the demonstration, instructions, and set up differentiated between focus of attention groups at the different timepoints of the study. Phase II utilized both a 2 (group) X 3 (time) and 2 (group) X 4 (time) mixed model ANOVA to analyze the relationship of focus of attention on performance during the different timepoints. Data including long term retention trials were examined separately due to high attrition rates. If the sphericity assumption was violated, Huynh-Feldt (H-F) and Greenhouse Geisser (G-G) corrections were used to correct the degrees of freedom to report F values. When the overall model was significant, the post hoc pairwise comparison was used, with a Bonferroni correction, to examine differences between every two timepoints in each group. Adverse events would be counted as any falls or health issues requiring medical attention such as a cardiac event.

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