Novel Physiotherapies

Patel et al., J Nov Physiother 2013, 3:2
http://dx.doi.org/10.4172/2165-7025.1000133

Research Article Open Access

# The Effects of Expert Instruction and Written Instruction Only on Balance Performance: A Randomized Control Trial

**Bijal Patel, Mike Garre, Christopher Owens S * and Brian H Edmunds**

*Department of Physical Medicine, Hampton University School of Science, Hampton,VA, USA*

## Abstract

**Background:** Home exercise instruction is a common treatment intervention employed by physical therapists. To the author's knowledge, no studies have assessed the effectiveness of one-on-one expert interaction versus written home exercise instruction on performance of a physical activity.

**Methods:** Thirty-five healthy men and women volunteered to participate. Subjects were randomly assigned to two intervention groups: expert instruction or written instruction only. Balance performance was measured before and after performance of home base balance training protocol. Balance performance was assessed using The Balance System Dynamic machine sway index measurements.

**Results:** Thirty-five subjects completed the study. The expert group consisted of 20 subjects and the non-expert group consisted of 15 subjects. There was no significant difference in balance performance between groups following performance of home base balance training protocol.

**Conclusions:** The results of this study suggest that written only home based balance protocol instruction in the form of a handout can provide the same outcome as expert instruction by a board certified neurologic specialist.

**Keywords:** Home exercise; Balance training

## Introduction

Physical therapists employ a wide range of treatments for neuromuscular dysfunction. Among these varied interventions is home exercise program instruction. Therapist use written, visual, and direct one-on-one verbal communication to instruct patients on home activities. The importance placed on patient education is illustrated by the mandatory inclusion of a teaching and learning component in the curriculum of accredited physical therapy programs in the United States [1]. According to Beard and Dodd an increased emphasis on patient responsibility has resulted in a greater emphasis on home based therapeutic interventions [2]. Identifying the most effective means of educating patients and providing exercise instruction is critical for physical therapists as well as other allied health practitioners.

Several authors have compared the outcomes of supervised in-clinic physical therapy with home based interventions [2-4]. Beard and Dodd reported no difference in outcomes between supervised physical therapy and home based program for patients recovering from anterior cruciate ligament reconstruction [2]. Similar results were reported by Asburn et al. with no significant difference between supervised and home based exercise for reduction of falls in Parkinson's patients. In this study, exercise outcomes (regardless of delivery method) were superior to no exercise intervention in this clinical trial [3]. Cohen et al. assessed treatment outcomes in a patient population consisting of patients with dysfunction of the vestibular system. No significant differences in function were found between supervised and home based intervention groups [4]. The preceding studies encompass three unique and separate areas of physical therapy interventions, and demonstrate similar outcomes for the delivery of care between supervised and home based physical therapy. Based on these findings determining the most effective means of delivering home based activities is clinically relevant.

To the authors' knowledge, no studies have assessed the effectiveness of one-on-one expert interaction versus written home exercise instruction on performance of a physical activity. Expert clinicians process information in a fundamentally different manner than non experts. The use of reflection-on-action, clinical decision making based on experience, has been identified as a critical difference between expert and novice physical therapists [5,6]. These enhanced clinical decision making skills are presumably the reason for better outcomes and patient satisfaction among expert clinicians [7].

The purpose of this study was to compare the effect of one-on-one expert instruction of a home based exercise protocol on balance performance to written instruction alone. We hypothesize that expert instruction by a board certified neurological specialist (NCS) for a home based exercise protocol would improve balance performance to a greater extent than written instruction alone. The choice of a home based balance training protocol were threefold: 1) the societal impact of falls. Falls are the leading cause of hospitalization and death in populations 65 and older [8]. 2) Balance training is a commonly performed physical therapy intervention and is one of the cornerstones of physical therapy practice. 3) Balance performance can be accurately and precisely assessed pre and post intervention.

## Methods

### Subjects

The study was a single-factor design, pretest-posttest, single blinded, randomized control trial. A sample of convenience was recruited from the University student population between June 11,

***Corresponding author:** Christopher Owens S, Hampton University School of Science, Doctor of Physical Therapy Progra, Hampton, VA, USA, 23668 (757) 727-5847 (O); (757) 728-6546(F); E-mail: stephen.owens@hamptonu.edu

**Received** March 24, 2013; **Accepted** April 05, 2013; **Published** April 07, 2013

**Citation:** Patel B, Garre M, Christopher Owens S, Edmunds BH (2013) The Effects of Expert Instruction and Written Instruction Only on Balance Performance: A Randomized Control Trial. J Nov Physiother 3: 133. doi:10.4172/2165-7025.1000133

2012 and July 20, 2012. All subjects completed informed consent as approved by the Hampton University Institutional Review Board.

Subjects were excluded for the following: history of lower extremity surgery, current vestibular diagnosis, peripheral neuropathy, pregnancy or use of an ambulatory assistive device.

### Procedures

The researchers assigned subjects randomly into either expert instruction or written instruction only groups by blinded selection of equally distributed numerical code (1=expert instruction, 2=written instruction only).

The home based balance training protocol (Appendix 1) was devised by investigator (BHE). The protocol was designed to encompass training strategies that would address the three primary components of the balance system (somatosensory, vestibular, and vision). Additionally, the authors felt that adherence to exercise routine would be enhanced by creating a protocol that could be performed in fifteen minutes or less with easy to follow instructions.

The expert instruction group received verbal and written instruction on a home based balance training protocol from investigator (BHE) a board certified neurological specialist (NCS) who, at the time of data collection, had twenty six years clinical experience as well as advance training in balance and vestibular disorders. Balance assessment and interventions are within the expected practice expertise of a NCS physical therapist [7]. The therapist providing expert instruction (BHE) was instructed to interact with each subject in the same manner that he would interact with a patient in a clinical setting being instructed on a home exercise program.

The written instruction only group was given a handout that described the home based balance training protocol. No other interaction or feedback was provided.

Balance performance was measured using The Balance System Dynamic machine assessed subjects' balance. The Balance System Dynamic machine was manufactured by CHATTANOOGA GROUP, Inc, Chattanooga, Tennessee. Evaluation protocol 1(eyes open, single leg dynamic, left/right) and protocol 2 (eyes closed, single leg dynamic, left/right) measured each subject's anterior-posterior sway index (SI). The sway index (SI) is a numeric value of the standard deviation of the time and distance (cm) the subject spent away from his or her center of balance. The lower the SI the better the balance performance outcome. Measurements were recorded before and after a four-week balance training protocol for both groups.

During balance assessment each subject was instructed to maintain single leg stance (eyes open or eyes closed) to the best of his or her ability without the use of upper extremity support. The researchers instructed the subjects to use upper extremity support only to prevent falling.

## Statistical Analysis

Descriptive statistics were compiled for subject's height, weight, Body Mass Index (BMI) and gender. Independent sample t-test was used for comparison of subject's height, weight, and BMI. Chi square analysis was used to determine if gender distribution was normal based on expected frequencies. The independent sample t-test was used to analyze the sway index change post home based balance training protocol performance for expert instruction group and written instruction only group. Statistical Package for Social Sciences (SPSS) was used to analyze the data. For all inferential statistics, an α level of .05 was used to determine statistical significance.

## Results

Forty-two participants were recruited from the University student population. Thirty-five participants completed the study (23 female, 12 male). Each subject was required to complete and turn in an exercise log that documented compliance with exercise protocol. Two participants were excluded due to unrelated ankle injuries sustained during the intervention phase of the research study. Three participants were unable to perform at least one part of the single-leg balance on the Balance System. These individuals required upper extremity support during testing. Two participants did not return compliance journals. One participant did not perform follow-up assessment (no reason provided). Twenty participants (12 female, 8 male) completed the study in the expert instruction group and 15 participants (11 female, 4 male) completed the study in the written instruction only group. The mean height was 1.71 m, weight 72.8 kg, and BMI 24.7. Subject's demographic information is summarized in tables 1 and 2.

As a result of incomplete data collection on seven subjects two separate analyses were performed. The first analysis included complete data from participants who were compliant with all aspects of the study including pre-test and post-test measures, and completion of home based balance training protocol log (23 female, 12 male). The second analysis comprised all subjects included in the initial randomization (21 expert instructions, 21 written instructions only).

The sway index (SI) change following home based balance training protocol for expert instruction were as follows: single leg stance, left eyes open (mean, 0.005; SD, 0.232), single leg stance left, eyes closed (mean, -0.217; SD, 0.897), single leg stance right, eyes open (mean, 0.069; SD, 0.307), and single leg stance right, eyes closed (mean, -0.069; SD, 1.194). Sway index (SI) change results following home based balance training protocol for written instruction only were as follows: single leg stance, left eyes open (mean, -0.001; SD, 0.255), single leg stance left, eyes closed (mean, -0.075; SD, 0.442), single leg stance right, eyes open (mean, 0.105; SD, 0.344), and single leg stance right, eyes closed (mean, -0.136; SD, 1.303). No significant

| | All Subjects (n=35) | Expert Instruction (n=20) | Written Instruction only (n=15) | *P* values* |
|---|---|---|---|---|
| Height (m) | 1.71 (0.09) | 1.72 (0.09) | 1.69 (0.09) | 0.257 |
| Weight (kg) | 72.8 (16.7) | 75.4 (16.6) | 69.3 (16.7) | 0.291 |
| BMI | 24.7 (4.02) | 25.1 (3.92) | 24.1 (4.20) | 0.451 |

**P* value based on independent sample t-test significance level <0.05

**Table 1:** Subject demographic information (mean [SD]).

| Gender | All Subjects (n=35) | Expert Instruction (n=20) | Written Instruction only (n=15) |
|---|---|---|---|
| Male | 12 | 8 | 4 |
| Female | 23 | 12 | 11 |

*Chi-Square value=0.411 not significant at P<0.05

**Table 2:** Subject gender information.

| | Expert instruction | Written instruction only | *P*-Value |
|---|---|---|---|
| **Single Leg (Left) Eyes Open Change*** | 0.005 (0.232) | -0.001 (0.255) | 0.951 |
| **Single Leg (Left) Eyes Closed Change*** | -0.217 (0.897) | -0.075 (0.442) | 0.444 |
| **Single Leg (Right) Eyes Open Change*** | 0.069 (0.307) | 0.105 (0.344) | 0.753 |
| **Single Leg (Right) Eyes Closed Change*** | -0.069 (1.194) | 0.136 (1.303) | 0.638 |

**P* value based on independent sample t-test significance level <0.05

**Table 3:** Change in sway index from pre training to post training (mean [SD]).

difference was found between groups for any test protocol. Findings are summarized in table 3.

For the second analysis, an intention to treat analysis was performed in which each subject was assigned either an improved balance performance or no improvement in balance performance outcome. Balance performance was considered improved if change in sway index calculation produced a negative value indicating a reduction of sway during assessment. Conversely, balance performance was considered unchanged if change in sway index calculation produced a value equal or greater than zero. Those individuals whose data was considered incomplete (see above) were assigned the no improvement in balance performance outcome [9]. A Chi-Square test of independence (α level of .05) was used to analyze the outcome of home based balance training protocol for expert instruction and written instruction only. There was no significant difference in outcome (improved balance performance or no improvement in balance performance ) between expert instruction and written instruction only for single leg stance left, eyes open (chi-square 0.121),eyes closed (chi-square 0.123), and single leg stance right, eyes open (chi-square 0.525), eyes closed (chi-square 0.064). Findings are summarized in tables 4 and 5.

## Discussion

This study sought to identify differences in delivery method of a single balance protocol. The two methods were expert instruction and written instruction only. The sway index (SI) assessed balance performance pre and post home based balance protocol intervention. No significant differences were found between groups. Sway index improved for the expert instruction group with eyes closed (both left and right), however these improvements were not statistically significant.

The critical differences that have been previously demonstrated between expert and novice physical therapists support the belief that there exist unique qualities in the interaction between experienced clinicians in their clients [5,6]. The positive impact of these unique qualities, though reported anecdotally, has lacked support in the current literature. Our findings, though limited to a small asymptomatic population, do not support a positive impact on performance following interaction with an expert in a related discipline. With increased demand placed on physical therapists in terms of patient volumes and productivity, time saving measures that allow clinicians to interact in alternative ways are vital.

| | Left lower extremity eyes open* | | Left lower extremity eyes closed** | |
|---|---|---|---|---|
| | Subjects balance performance improved | Subjects balance performance not improved | Subjects balance performance improved | Subjects balance performance not improved |
| Expert Instruction | 12 | 9 | 13 | 8 |
| Written Instruction only | 7 | 14 | 8 | 13 |

*Chi-Square value=0.121 not significant at $P<0.05$
**Chi-Square value=0.123 not significant at $P<0.05$

**Table 4:** Intention to treat analysis of balance performance outcome left lower extremity.

| | Right lower extremity eyes open* | | Right lower extremity eyes closed** | |
|---|---|---|---|---|
| | Subjects balance performance improved | Subjects balance performance not improved | Subjects balance performance improved | Subjects balance performance not improved |
| Expert Instruction | 9 | 12 | 14 | 7 |
| Written Instruction only | 7 | 14 | 8 | 13 |

*Chi-Square value=0.525 not significant at $P<0.05$
**Chi-Square value=0.064 not significant at $P<0.05$

**Table 5:** Intention to treat analysis of balance performance outcome right lower extremity.

According to Clemson et al. specific home exercise programs are effective for decreasing fall risk [10]. The home based balance training protocol that was selected for this study is similar to programs currently in use clinically, and can be distributed in a written format with minimal time and expertise. Robertson et al. concluded that a home exercise protocol, comparable to the one described in our study, significantly reduced falls in elderly populations [11].

## Limitations

A limitation to this study was the relatively small sample size. The convenience sampling method recruited young participants without musculoskeletal or vestibular pathologies. As a result, the findings may have been influenced by the ceiling effect because of the presumed high level of balance performance in this population [9].

A total of six subjects were lost to follow in the written instruction only group. Based on an intention to treat analysis, this lost data did not have an impact on balance performance outcome comparison between expert and written instruction only groups. However, it is not known why more subjects were unable to complete the entire study including balance assessment from this particular group.

No injuries occurred during home training or during balance assessment for either study group. Safety was a primary factor in performing this initial study on a healthy population prior to implementing this protocol on balance impaired individuals. Considering that several healthy subjects were unable to perform single limb stance without upper extremity support, the use of a safety harness during balance assessment may be beneficial in assuring safety in future clinical research investigations. Our study lays a foundation for future research that should incorporate a larger sample size of age and diagnosis appropriate patient populations.

## Conclusion

The results of this study suggest that written only home based balance protocol instruction in the form of a handout can provide the same outcome as expert instruction by a board certified neurologic specialist. This has potential benefit for both patients and non expert practitioners. The advantages to the patient are cost effectiveness and a time-efficient safe balance training protocol that can be readily performed at home. While clinicians can use these findings when determining how best to spend one-to-one client interaction time, this is of particular importance considering the increased demand placed on therapist's clinical productivity.

### References

1. American Physical Therapy Association (2004) Normative Model of Physical Therapist Professional Education. APTA.
2. Beard DJ, Dodd CA (1998) Home or supervised rehabilitation following anterior cruciate ligament reconstruction: a randomized controlled trial. J Orthop Sports Phys Ther 27: 134-143.
3. Ashburn A, Fazakarley L, Ballinger C, Pickering R, McLellan LD, Fitton C (2007) A randomised controlled trial of a home based exercise programme to reduce the risk of falling among people with Parkinson's disease. J Neurol Neurosurg Psychiatry 78: 678-684.

4. Cohen H, Kane-Wineland M, Miller LV, Hatfield CL (1995) Occupation and visual/vestibular interaction in vestibular rehabilitation. Otolaryngol Head Neck Surg 112: 526-532.
5. Wainwright SF, Shepard KF, Harman LB, Stephens J (2010) Novice and experienced physical therapist clinicians: a comparison of how reflection is used to inform the clinical decision-making process. Phys Ther 90: 75-88.
6. Wainwright SF, Shepard KF, Harman LB, Stephens J (2011) Factors that influence the clinical decision making of novice and experienced physical therapists. Phys Ther 91: 87-101.
7. Riolo L (1996) Skill differences in novice and expert clinicians in neurologic physical therapy. Neurol Rep 20: 60-63.
8. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web–based Injury Statistics Query and Reporting System (WISQARS).
9. Portney LG, Watkins MP (2009) Foundations of Clinical Research: Applications to Practice. 3rd ed. Pearson.
10. Clemson L, Singh MF, Bundy A, Cumming RG, Weissel E, et al. (2010) LiFE Pilot Study: A randomised trial of balance and strength training embedded in daily life activity to reduce falls in older adults. Aust Occup Ther J 57: 42-50.
11. Robertson MC, Campbell AJ, Gardner MM, Devlin N (2002) Preventing injuries in older people by preventing falls: a meta-analysis of individual-level data. J Am Geriatr Soc 50: 905-911.

**Citation:** Patel B, Garre M, Christopher Owens S, Edmunds BH (2013) The Effects of Expert Instruction and Written Instruction Only on Balance Performance: A Randomized Control Trial. J Nov Physiother 3: 133. doi:10.4172/2165-7025.1000133