



## Original article

## Dynamic and functional balance tasks in subjects with persistent whiplash: A pilot trial

Raina Stokell, Annie Yu, Katrina Williams, Julia Treleaven\*

*The Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane 4072, Australia*

## ARTICLE INFO

## Article history:

Received 2 August 2010  
 Received in revised form  
 24 January 2011  
 Accepted 31 January 2011

## Keywords:

Balance  
 Functional  
 Whiplash  
 Neck pain

## ABSTRACT

Disturbances in static balance have been demonstrated in subjects with persistent whiplash. Some also report loss of balance and falls. These disturbances may contribute to difficulties in dynamic tasks. The aim of this study was to determine whether subjects with whiplash had deficits in dynamic and functional balance tasks when compared to a healthy control group.

Twenty subjects with persistent pain following a whiplash injury and twenty healthy controls were assessed in single leg stance with eyes open and closed, the step test, Fukuda stepping test, tandem walk on a firm and soft surface, Singleton test with eyes open and closed, a stair walking test and the timed 10 m walk with and without head movement.

Subjects with whiplash demonstrated significant deficits ( $p < 0.01$ ) in single leg stance with eyes closed, the step test, tandem walk on a firm and soft surface, stair walking and the timed 10 m walk with and without head movement when compared to the control subjects.

Specific assessment and rehabilitation directed towards improving these deficits may need to be considered in the management of patients with persistent whiplash if these results are confirmed in a larger cohort.  
 Crown Copyright © 2011 Published by Elsevier Ltd. All rights reserved.

## 1. Introduction

Static balance tests using posturography and force plates have been used to identify and evaluate postural stability in subjects with persistent whiplash (Michaelson et al., 2003; Treleaven et al., 2005; Field et al., 2008) and postural stability deficits in various stance and visual conditions have been found in these patients (Treleaven et al., 2005; Field et al., 2008;). Subjects with persistent whiplash also commonly report dizziness and or unsteadiness (70%) and complain of episodes of loss of standing balance (48%) and of actual falls (21%) (Treleaven et al., 2003). Subjects who report these symptoms have also demonstrated greater deficits in static standing balance when compared to those who don't report these symptoms (Treleaven et al., 2005). It is thought that these symptoms are a direct result of the cervical injury although vestibular damage is also possible (Treleaven et al., 2006, 2008).

The disturbances in static standing balance seen in patients with trauma induced persistent neck pain, may contribute to consequent difficulties in the completion of dynamic and functional balance tasks but to date there has only been one other study to look at some functional and dynamic measures and they demonstrated altered trunk angular velocity and sway angle during the tests in

a whiplash compared to a control group (Sjöström et al., 2003). Simple and easy to conduct dynamic and functional balance tests using clinical measures with minimal equipment are thought to more adequately evaluate performance on the types of tasks in which falls may potentially occur (Hill et al., 1996).

Such clinical measures of dynamic and functional tests have been used in the assessment of balance in subjects with neurological and vestibular conditions and recently some tests have been measured in an elderly population with neck pain, where the dynamic balance measures were found to be impaired in addition to force plate evaluations of static balance (Poole et al., 2008). The findings suggested that neck pain in the elderly contributes to disturbance in balance and gait parameters over and above that which occurs with normal ageing (Poole et al., 2008). Specifically, a slower self-selected gait speed and cadence when walking with side to side head turning, and a significantly longer gait cycle duration when walking both without and with head turns was observed when compared to healthy control subjects (Poole et al., 2008). Dynamic balance deficits have also been found in subjects with unilateral vestibular loss in the step test, tandem walk and Dynamic Gait Index (LowChoy et al., 2006).

The aim of this pilot study was to determine whether postural stability differed between subjects with persistent whiplash and healthy controls in selected clinical dynamic and functional balance measures.

\* Corresponding author.

E-mail address: [j.treleaven@uq.edu.au](mailto:j.treleaven@uq.edu.au) (J. Treleaven).

## 2. Methods

### 2.1. Subjects

Participants in this study included 20 subjects with persistent neck pain associated with whiplash recruited from past research participants and eligible patients attending the Whiplash Research Unit in the Division of Physiotherapy at The University of Queensland. The whiplash subjects were also sought through advertising in the community. To be included, potential participants were at least three months post injury and still suffering from pain and disability with a Neck Disability Index (NDI) (Vernon, 1996) score of at least 10 out of 100. Exclusion criteria included cervical fracture or dislocation, a reported period of unconsciousness, post-traumatic amnesia or concurrent head injury with the whiplash injury, known or suspected vestibular pathology such as benign paroxysmal positional vertigo, a history of dizziness prior to the whiplash injury, neurological deficits, lower limb problems, and additional medical problems that might affect performance. A physical therapist screened all subjects for inclusion and exclusion criteria. It is impossible to rule out vestibular pathology even if all gold standard tests are performed and are negative, however any participant with a positive test or suspected vestibular pathology – guided by the patient signs and symptoms was excluded.

Control subjects included 20 healthy participants with no history of whiplash, neck pain, headache or dizziness and were recruited from volunteers who responded to advertising in the community and on the university campus.

The sample size calculation was based on the difference between narrow stance eyes closed balance test determined from idiopathic neck pain and asymptomatic control subjects. Fifteen participants per group were required to detect a 0.2 difference in total energy between the subjects (80% power  $\alpha = 0.05$ ) (Field et al., 2008).

Ethical clearance for this study was granted from the Medical Ethics Committee of The University of Queensland and all participants provided informed written consent.

### 2.2. Measures

Questionnaires were administered to collect demographic data and information related to the history of the neck injury. Standard questionnaires were used to profile both the self-reported neck disability using the neck disability index (NDI), (Vernon, 1996) and dizziness using the short form Dizziness Handicap Inventory (DHI<sub>sf</sub>) (Tesio et al., 1999).

Seven different clinical tests of balance were used, as listed below. All tests apart from the 2 min stair test, are standard clinical tests that are commonly used in the clinical setting and reliability and repeatability have previously been established (Bohannon et al., 1984; Hill et al., 1996; Bohannon, 1997; Bonnani and Newton, 1998; Herdman, 2000). Prior to testing, each test was verified for correct technique and standard procedure by a clinical professional in the area of neurological, ageing and balance. The testing environment and the assessor remained constant throughout the testing period and for all participants. An assistant was also on hand to record data and provide assistance if necessary. Standardised instructions were given to each subject for each test. The assessor and assistant were not blinded to the subject groups.

- *Single leg stance* was performed by standing on each leg, with eyes open and then eyes closed for 30 s (Bohannon et al., 1984). A stopwatch was used to time the number of seconds that the subject could maintain the stance without losing balance. Performance was considered normal when the subject maintained balance for 30 s (LowChoy et al., 2006).

- *Step test* (Hill et al., 1996) was performed for both legs, standing 10 cm away from the block 7.5 cm high. Subjects were asked to step the whole foot on and off the block as many times as possible in 15 s. The number of times one foot was completely placed onto the block was recorded.
- *Fukuda stepping test* (Bonnani and Newton, 1998) was performed on a marked starting position, and involved marching on the spot for 60 steps, with knees up to hip level, arms held out in front and with the eyes closed. The end position was marked for each participant, and the distance travelled for each foot and the total angle turned was measured with a tape measure and goniometer respectively. Performance has previously been considered normal when the participant travelled less than 1 m forward and rotated less than 45° (LowChoy et al., 2006).
- *Tandem walk test* (Herdman, 2000) was performed using two lines of tape 5 cm thick on a firm surface, 10 cm apart. Participants walked heel-to-toe for 15 steps forwards as fast as possible with the objective to stay within the tape lines. The time taken to walk the middle 10 steps out of the total 15 steps was recorded (LowChoy et al., 2006). This was repeated with the participants walking backwards heel-to-toe and the time taken for the middle 10 steps was recorded. The tandem walk test was also performed on a foam balance beam, and the time taken to walk heel-to-toe for five steps forwards, as well as five steps backwards, was recorded. The number of steps outside the marked lines, and off the foam beam, was noted.
- *Singleton test* was performed with the participants instructed to walk at their normal pace, and when cued, to turn as quickly as they could to face the same direction, and stop and bring their feet together. A demonstration was given to all participants. This was performed with the turn in both an anti and clockwise direction. The test was then repeated with eyes closed at the end of the turn as the feet were brought together to stop. The same examiner recorded in accordance with the following scoring system for each subject: 0) no sway or step, 1) sway but no step, 2) step/s but regained balance, and 3) loss of balance and the need to be caught (Herdman, 2000).
- *Stair walking test* was performed with a flight of ten steps with a rail available. The participants were asked to walk up and down the flight of 10 stairs, one step at a time, as many times as possible in 2 min. The number of stairs was recorded, and any use of the rail was noted.
- *Timed 10 m walk* (Bohannon, 1997) was performed with a 14 m distance, with the middle 10 m distance marked with tape. The subjects were instructed to walk as fast as they could safely. The time and the number of steps taken for the participant to walk the middle 10 m were recorded. This test was repeated with horizontal head movements (Herdman, 2000), and then with vertical head movements. The movements were practised, and the amount of movement was shown, to each participant before the test (LowChoy et al., 2006).

### 2.3. Procedure

Participants performed the physical assessment during one visit to the Whiplash Research Unit at the University of Queensland. The order of the tests was as outlined above and remained the same for each participant with the purpose of preventing pain and or dizziness exacerbation. Subjects were given rest periods between tests if needed. In the event of dizziness exacerbation, participants were asked to rest until this subsided.

Download English Version:

<https://daneshyari.com/en/article/2625397>

Download Persian Version:

<https://daneshyari.com/article/2625397>

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