Gait & Posture 64 (2018) 147–151

Contents lists available at ScienceDirect

Gait & Posture

journal homepage: www.elsevier.com/locate/gaitpost

Full length article

Gender differences in postural control in people with nonspecific chronic low back pain

Buse Ozcan Kahraman[a], Turhan Kahraman[b,*], Orhan Kalemci[c], Yesim Salik Sengul[a]

[a] School of Physical Therapy and Rehabilitation, Dokuz Eylul University, Izmir, Turkey
[b] Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Izmir Katip Celebi University, Izmir, Turkey
[c] Department of Neurosurgery, Faculty of Medicine, Dokuz Eylul University, Izmir, Turkey

ARTICLE INFO

Keywords:
Low back pain
Static
Dynamic
Postural control
Gender

ABSTRACT

Background: Many studies have reported that there are several differences between genders which may result in altered neuromuscular control. Although the existing evidence suggests that low back pain (LBP) affects the ability to control posture, there is little evidence the gender differences in postural control in people with nonspecific chronic LBP.

Research question: Are there any gender differences in postural control and correlations between postural control, pain, disability, and fear of movement in people with nonspecific chronic LBP?

Methods: Static and dynamic postural control were evaluated using a computerized postural control assessment tool including assessments for limits of stability (LOS), unilateral stance, and modified clinical test of sensory interaction on balance. Pain intensity and fear of movement were assessed using a visual analogue scale and the Tampa Scale of Kinesiophobia, respectively.

Results: This cross-sectional study included 51 people (25 females and 26 males) with nonspecific chronic LBP. Mean reaction time in the LOS test was significantly less in male participants compared with females when adjusted for pain intensity and disability level, $F(1,45) = 4.596$, $p = .037$, $\eta p^2 = 0.093$. There was no significant difference in the remaining LOS variables as well as unilateral stance, and modified clinical test of sensory interaction on balance variables between the genders ($p > .05$). Many correlations were observed between the LOS variables, pain intensity, and Tampa Scale of Kinesiophobia score in female participants ($p < .05$). The Tampa Scale of Kinesiophobia score was also correlated with the movement velocity and endpoint excursion in the LOS test in the male participants ($p < .05$).

Significance: This study suggests that there is no difference in most of the static and dynamic postural control variables between females and males; however, higher fear of movement, and pain intensity during activity are more associated with impaired dynamic balance in females with nonspecific chronic LBP.

1. Introduction

Low back pain (LBP) is one of the most common musculoskeletal disorders and also one of the main causes of absence in the workplace which is an important socio-economic problem [1]. Nonspecific LBP is considered as a result of articular and/or muscular imbalances of the lumbo-pelvic complex. The nonspecific chronic LBP (CLBP) is an important class in the different classifications of LBP for which there is no satisfactory treatment [1].

The existing evidence suggests that the LBP affects the ability to control posture [2]. Several factors associated with LBP may affect postural control. Recently, the importance of motor control deficits such as impaired postural control and information processing capabilities of the central nervous system has been emphasized in nonspecific CLBP [3–5]. While age is a major determinant for balance, LBP might account for up to 9% of the variance in balance [6]. Any functional activity requires to maintain both static and dynamic postural balance [7]. In people with CLBP, the level of postural control may decrease to the extent that performing activities of daily living gets worse with the chronic nature of the LBP, especially with aging [7,8]. It is known that CLBP is seen more common in females [9,10] and a study showed that there was a correlation between the severity of LBP and related disability and poor postural control in females [11]. However, we have not found any study about impaired postural control leading to CLBP in males with LBP. Responses of postural control leading to LBP are complicated and its reasons have not been explained in the

* Corresponding author.
E-mail address: turhan.kahraman@yahoo.com (T. Kahraman).

https://doi.org/10.1016/j.gaitpost.2018.06.026
Received 11 June 2017; Received in revised form 9 February 2018; Accepted 11 June 2018

literature [5,12,13]. Most of the studies have not taken into consideration the homogeneity in the gender and noticed to gender differences in postural control. Thus, understanding the effects of gender in people with LBP on postural control will guide to the researchers in this field. Moreover, pain intensity was found to correlate with magnitude of postural sway in people with nonspecific LBP [14]. Reason for the chronicity of the condition in people with LBP is thought to be decreased physical activity level and presence of fear of movement [15].

There are several differences between genders in terms of proprioception, electromyographic activities, postural stability, and strength characteristics which may result in altered neuromuscular control which increases the risk of anterior cruciate ligament injuries in female athletes [16]. Imbalances in strength, timing of activation, and recruitment patterns of the lower extremity muscles are more commonly seen in female athletes [17]. Most of the evidence about the neuromuscular differences between male and females comes from the lower extremity studies on athletes and little is known about the postural stability in people with LBP [16,17]. Although there is a strong gender difference in the prevalence and severity of many chronic pain conditions, the gender differences in the studies have often been subtle in magnitude and sometimes absent [18]. Moreover, the Consensus Working Group of the Sex, Gender, and Pain Special Interest Group of the International Association for the Study of Pain recommends that "all pain researchers consider testing their hypotheses in both sexes, or if restricted by practical considerations, only in females" [18]. However, since most of the studies have included both male and female participants, little is known about the gender differences in postural control in people with nonspecific CLBP. Because chronic pain depends on multifactorial reasons such as gender and different behavior types, the comparison of postural control in females and males with nonspecific CLBP will guide understanding the gender effect on the association between LBP and postural control [12]. Therefore, the present study aimed to examine the gender differences in postural control as well as its correlations with pain, disability, and fear of movement in people with nonspecific CLBP. We specifically hypothesized that females with nonspecific CLBP would have impaired postural control compared with male counterparts and this impairment would be more associated with pain, disability, and fear of movement in females than males.

2. Methods

2.1. Participants

The participants aging between 18 and 65 years old were recruited from Neurosurgery Department, Dokuz Eylul University Hospital, Izmir, Turkey. The quota sampling method, which aimed an equal representation of both genders, was used in selecting the participants. The people with nonspecific CLBP (pain duration > 3 months, pain occurring primarily in the back without signs of a serious underlying condition such as cancer, infection, or cauda equina syndrome, spinal stenosis or radiculopathy, or another specific spinal cause such as vertebral compression fracture or ankylosing spondylitis) diagnosed by a neurosurgeon were included in the study [19]. The exclusion criteria included the followings: reported disorders other than LBP (such as neurological, psychiatric, or cardiovascular disorders), musculoskeletal disorders such as ankle sprain and knee pain affecting gait, current pregnancy, medication affecting postural control (e.g. anti-depressants), and physiotherapy received in the last 6 months.

The minimum required sample size for a two-tailed hypothesis was calculated based on 0.05 probability level, 0.80 effect size, and 0.80 statistical power level by G*Power Software (ver. 3.1.9.2) and the calculation revealed that as least 25 participants had to be included in each group.

This study was approved by the Ethics Committee of Dokuz Eylul University in accordance with the Helsinki Declaration. Informed consent was obtained from all participants for being included in the study.

2.2. Measurements

The demographic and clinical data of the participants were recorded. The participants reported the intensity of LBP in rest and activity with a 10-cm long line visual analog scale (VAS) where zero represented 'no pain' and 10 represented 'unbearable pain'.

Disability level due to the nonspecific CLBP was measured by Oswestry Disability Index (ODI) using its Turkish version which was considered as valid and reliable [20]. The ODI consists of 10 items with six statements addressing different aspects of function [21]. Each item is scored from zero to five, with higher values representing greater disability. The total score is expressed as a percentage. The Turkish version of the Tampa Scale of Kinesiophobia (TSK), which was found as valid and reliable in patients with neck or LBP, was used to assess the fear of movement [22]. The TSK includes 17 items to assess the subjective rating of fear of movement addressed the pain and intensity of symptoms [23]. Each item is scored using a four-point Likert scale ranging from one (strongly disagree) to four (strongly agree). The range of scores are from at least 17 points and maximum 68 points where the higher scores indicate an increasing degree of fear of movement.

The static and dynamic postural control were measured by the NeuroCom Balance Master System (NeuroCom System Version 8.1.0, B 100718, 1989–2004, NeuroCom® International Inc., USA). The NeuroCom Balance Master System is a computerized device imitating the daily activities and measuring the static and dynamic postural control abilities. The limits of stability (LOS) was used to determine the dynamic postural control, whereas the unilateral stance (US) in the eyes open and eyes closed conditions and modified clinical test of sensory interaction on balance (mCTSIB) were used to determine the static postural control. The mCTSIB provides objective evidence of sensory dysfunction. Postural sway velocity (i.e. mean center of gravity sway velocity) was measured under four conditions which were eyes open and closed on firm surface, and eyes open and closed on unstable surface. The individual's speed of movement from the center of pressure (the point at which the pressure of the body over the soles of the feet would be if it were concentrated in one spot [24]) in degrees per second was quantified. The US test was used to measure the postural sway velocity (°/sn) while the subject was standing on either the right or left foot in the eyes open and closed conditions. In the LOS test, the participants started to stand still on the force platform at the center point determined. The participants were asked to arrive in a linear fashion seen on the computer screen in front-back, left-right and including eight preset targets at 45-degree increments by sliding the center of gravity the fastest. Reaction time (in seconds), movement velocity (°/s), endpoint excursion (percentage), maximum excursion (percentage), and directional control (percentage) were reported for this study. The US test has very high to moderate test-retest reliability, the LOS test has high to low test-retest reliability, and mCTSIB has moderate to little test-retest reliability in patients with nonspecific LBP [25]. Since it has been found that among different center of pressure parameters, mean total velocity in all conditions of postural difficulty have high to very high test-retest reliability, only the postural sway velocities for the US test and mCTSIB were reported in this study [26].

2.3. Statistical analysis

Demographic and clinical characteristics were presented as median, interquartile range, or number for both group since they did not follow the normal distribution pattern examined using the Shapiro-Wilk test and histograms. The Mann-Whitney *U* test was used to compare ages, BMI, VAS rest, VAS activity, ODI, and TSK. A one-way Analysis of Covariance (ANCOVA) was done to compare the postural control variables of females and males whilst controlling for pain intensity and