Changes in Postural Sway After a Single Global Postural Reeducation Session in University Students: A Randomized Controlled Trial

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Abstract

Objective: The purpose of this study was to assess the effectiveness of a single session of global postural reeducation (GPR) in postural sway in young adult university students who use data visualization screens.

Methods: A randomized controlled trial with 2 parallel groups was performed. Sixty-four subjects were randomized in the experimental group (12 men and 20 women) who underwent the GPR session, and a control group (13 men and 19 women) that did not receive any intervention was included. Center of pressure (COP) was assessed using a stabilometric platform, with eyes open and eyes closed before, immediately after, 48 hours after, and 7 days after intervention in both groups.

Results: In the interaction of time and gender, statistically significant differences were found for the area covered by COP (P = .020) and for the standard deviation (SD) in the mediolateral axis (P = .035). Considering the complete interaction time, gender, and group, statistically significant differences were found (P = .015) for the anteroposterior rate covered by COP and the SD in the anteroposterior axis (P = .033). In eyes closed condition, the intersubject analysis showed statistically significant differences for the interaction between group and gender for the variable mediolateral SD (P = .043). Considering the interaction of time with group, statistically significant differences were found for full length covered by COP (P = .017).

Conclusions: Changes in postural sway were observed after a single GPR session, mainly at 48 hours, with different behaviors between men and women. (J Manipulative Physiol Ther 2017;xx:1-10)

Key Indexing Terms: *Postural Balance; Posture; Musculoskeletal Manipulations; Muscle Stretching Exercise*

Introduction

Computers, mobile devices, and tablets are omnipresent in modern society, especially in the world of young adults. The use of mobile devices increases the weight that the neck has to bear because of the forward head posture, which depends on the increased bending angle the head must be held at to view the screen.[1] This forward head posture has an effect on the longitudinal axis of the subject by moving it forward.[2] These changes in cervical alignment cause an increase in the stress on the neck muscles,[1] generating muscle fatigue and changes in postural control.[3,4] Individuals in a seated position in front of a computer increase their forward head posture by approximately 10%.[5] In this posture, the lower cervical vertebrae are flexed in a forward glide, and the upper cervical vertebrae are extended.[6,7] A high prevalence of low-level discomfort in legs, head and neck, back, and shoulders in relation to high exposure to data visualization screens (DVSs) was also reported by adolescents.[8]

In the sit-to-stand task, neck proprioception plays an important contribution in regulating postural control and movement patterns.[9] The neural control mechanisms involved in maintaining balance in the sitting and standing tasks are different. In the standing task, postural performance is worse,

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and more neuromuscular activity would be required to maintain balance. In the standing position, the time that balance can be maintained using passive joint stiffness and reflex modulation is briefer, and an intermittent control by means of central neuronal commands produces a greater anticipatory muscle torque.[10]

To evaluate the evolution of postural disorders, the measurement of center of pressure (COP) using a stabilometric platform allows for comparison among different subjects when performing the measurements under the same conditions every time.[11] The measurement of postural sway using COP can be used to detect improvements in postural balancing after proprioception training.[12] It is a tool to assess the effects of chronic lumbar pain[13] and to quantify possible changes in the musculoskeletal activity after treatment with a manual therapy.[14-16]

There are different manual techniques based on treating and balancing the muscle chains tensions that provoke the biomechanical alterations that affect spinal stability.[17-22] The global postural reeducation (GPR)[19,20,22-27] technique describes 2 main master chains, the anterior master chain and the posterior master chain, as well as other secondary chains. Souchard[26] suggested slow stretching of all muscle chains to correct the tendency in the seated position to shorten the anterior chain at the spine level and upper limbs and the posterior chain at the lower limbs. These chains can be lengthened using different groups of postures from GPR treatment. The inverse myotatic reflex[19] and Hooke's physics law and Young's module[2,26] applied to the muscle and tendon tissues justify the low-intensity stretching exercises to avoid tissue damage. Stretching is held for a prolonged time, thus allowing an increased elongation of the shortened muscles.[26]

It is common in clinical practice to perform manual therapy sessions at weekly intervals. We hypothesize that the musculoskeletal changes after a GPR session can be reflected in the displacement and the area covered by COP[27,28] along the interval of 1 week. In addition, we expect that there would be differences between men's and women's responses after the session. Therefore, the purpose of this study was to investigate these effects in university students who use DVSs to analyze how long the changes remain. The secondary aim was to assess potential differences by gender in COP behavior.

Methods

Design

A randomized controlled trial with 2 parallel groups (experimental and control) was designed. Written informed consent was obtained from the participants before data collection. The study was approved by the Miguel Hernández University (UMH) Research Ethics Committee (DPC-CLQ-001-12) and conformed to the Declaration of Helsinki. The study was registered in clinicaltrials.gov (NCT02175667).

Setting and Participants

The study was conducted between July and October of 2014 at the Miguel Hernandez University physiotherapy research center. The study population comprised healthy volunteer university students ranging from 19 to 35 years of age. Inclusion criteria to participate were being a university student and remaining seated or standing in front of a DVS (tablet, computer, and smartphone) for at least 4 hours a day. Exclusion criteria were participants who had been diagnosed with a severe comorbid disorder or who had undergone surgery in the 6 months prior to the recruitment. Those with some type of musculoskeletal injury or disability or who were scheduled to undertake physiotherapy treatment or training during the study period were also excluded.

Randomization and Interventions

Participants were recruited during June/July 2014 by a researcher who did not perform the intervention. To recruit the sample, we first obtained permission from professors teaching different courses at the Campus of Health Sciences of the Miguel Hernandez University to access the students in one of their classes. After a short presentation about the study's aims and having obtained the participants' cooperation, the volunteers were randomly assigned to the groups by the same researcher by uniform distribution (0,1) using Microsoft Excel 2013. All participants underwent a baseline postural sway measurement. Then, each subject of the experimental group was treated with GPR by an experienced physiotherapist to correct specific compensations in each muscle chain.[26,29] The procedure (45 minutes) consisted of 4 phases of treatment and 3 positions of GPR[26,29-32] (Fig 1) as follows:

First phase (5–6 min). Participant in supine position; physiotherapist begins with specific work of diaphragmatic breathing and soft cervical traction (stretching muscles involved in breathing).

Second phase (25 min). "Open hip angle with upper limbs in adduction" posture. Participant in supine position with upper limbs at 45° of abduction and flexed, abducted, and laterally rotated hips, with the soles of the feet touching each other to stretch the anterior muscle chain (diaphragm, pectoralis minor, scalene, sternocleidomastoid, intercostalis, iliopsoas, arm flexors, forearm pronators, and hand flexors). The pelvis is kept in retroversion with an initial traction of the sacrum, while the lumbar spine remains stabilized, and the lower limbs are extended as much as possible while maintaining the corrections. The physiotherapist stretches superior shoulder muscle chain (upper