Journal of Bodywork & Movement Therapies (2014) 18, 519—525

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EXERCISE AND POSTURAL CONTROL

The effect of trunk coordination exercise on dynamic postural control using a Core Noodle

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Received 14 May 2013; received in revised form 26 November 2013; accepted 3 December 2013

KEYWORDS
Core exercise;
Dynamic segmental spinal stability;
Dynamic postural control;
Coordination exercise

Summary *Objective:* To investigate the influence of trunk coordination exercise on dynamic postural control relative to postural sway.
Method: The effects of trunk coordination exercises were examined using a Core Noodle for the postural sway in healthy students who were assigned to an exercise or control group. The independent variable was the extent of exposure to Core Noodle exercise, and the dependent variable was dynamic postural control. A stabilometer, which measures dynamic postural control, was used to evaluate the effectiveness of the exercises. In addition, center of gravity movements were assessed using a Gravicorder G-620 stabilometer in which the subject was asked to shift their center of gravity between 2 circles on a computer monitor. Pre- and post-intervention dynamic postural control was statistically evaluated between the exercise group and control group using the Mann—Whitney test. Finally, we investigated the application of these exercises for a stroke patient.
Results and conclusion: For post-intervention, the envelop area, mean length of the pathways between 2 circles, and the number of circles were significantly higher in the exercise group. Trunk coordination exercise performed Core Noodle may be used to enhance the dynamic postural balance of healthy young adults, and it can also be adapted for stroke patients.

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http://dx.doi.org/10.1016/j.jbmt.2013.12.005

Introduction

Maintaining posture requires coordination among global and local muscles. Trunk muscles can be classified as either global or local muscles based on their specific functions, i.e., torque production and transfer of the load directly between the thoracic cage and the pelvis by global muscles and segmental stabilization and more direct or indirect attachments to the lumbar vertebrae by local muscles (Bergmark, 1989; Stevens et al., 2007). The local musculature includes the transversus abdominis, multifidus, internal oblique, medial fibers of the external oblique, medial fibers of quadratus lumborum, deep fibers of psoas major, diaphragm, and pelvic floor muscles. The global musculature includes rectus abdominis, lateral fibers of external oblique, lateral fibers of quadratus lumborum, superficial fibers of psoas major, erector spinae, and iliocostalis (Faries and Greenwood, 2007).

In recent years, the actions of local muscles have been receiving greater recognition, and the influence of deep trunk muscles on core stability has gathered much attention. Facilitating coordinated global and local muscular activities promises improved balance and the ability to walk (Saito, 2006). Further, core exercise was showed to enhance trunk stabilization to improve upper extremity function (Miyake et al. also (2009, 2013).

Core and stabilization exercises affect deep muscles that are normally used only by athletes, however, these exercises can also be used for rehabilitation (Vleeming et al., 1995; McGill, 2001; Bliss and Teeple, 2005; Levine et al., 2007; Keays et al., 2008). For example, such exercises include the four-point kneeling position, bird dog, and side-bridge (Akuthota and Nadler, 2004; Stevens et al., 2007). These exercises were developed for healthy individuals, either young or old; frail elderly individuals or stroke patients with hemiplegia texperience difficulty in assuming these exercise positions (Miyake et al., 2009). Therefore, these exercises cannot always be used effectively in a clinical setting.

Recently, a trunk coordination exercise device known as the Core Noodle (Inc., Tokyo CORE-Y-001) was developed to facilitate action between global and local muscles (Fig. 1). Dynamic core exercises performed with the Core Noodle can potentially increase dynamic postural control, improve flexibility, regulate posture, and can have a general relaxing effect on the user. However, we are unaware of any credible literature the supports these assertions.

In this paper, we report 2 studies. The purposes of these studies was to investigate the influence of trunk coordination exercises on dynamic postural control relative to postural sway in healthy subjects, and to demonstrate their clinical efficacy and relationship with the ability to walk in one stroke patient.

Methodology

Study 1

Subjects and experimental protocol

Subjects

The participants of this study were forty-six healthy students without any central nervous system and orthopedic issues (24 men, 22 women, Age: mean, standard deviation 20.5, 0.6 years, Height: mean, standard deviation 164.3, 7.8 cm, Body weight: mean, standard deviation 54.8, 11.7 kg) from Kibi International University. They were assigned to two groups: the exercise group (10 men, 13 women) and the control group (14 men, 9 women). The exercise group performed a trunk coordination exercise using the Core Noodle, and the control group performed no core exercises. Consent for research was obtained from the subjects. The ethics committee of Kibi International University approved the study.

Experimental protocol

First, subjects stood on a stabilometer (Gravicorder G-620, Anima Co., Japan). We demonstrated the efficacy of trunk coordination exercises on dynamic postural control using a stabilometer. Subjects performed center of gravity movements so that their center of gravity was placed in 2 circles in a computer monitor. As a pre-test, we counted how many times each subject moved between circles within a specific time frame as our pre-test (Fig. 2). The circles count was used to evaluate dynamic postural control.

The exercise group performed trunk coordination exercises using the Core Noodle (Inc, Tokyo CORE-Y-001). We then demonstrated the efficacy of this exercise on dynamic postural control with a stabilometer. The control group

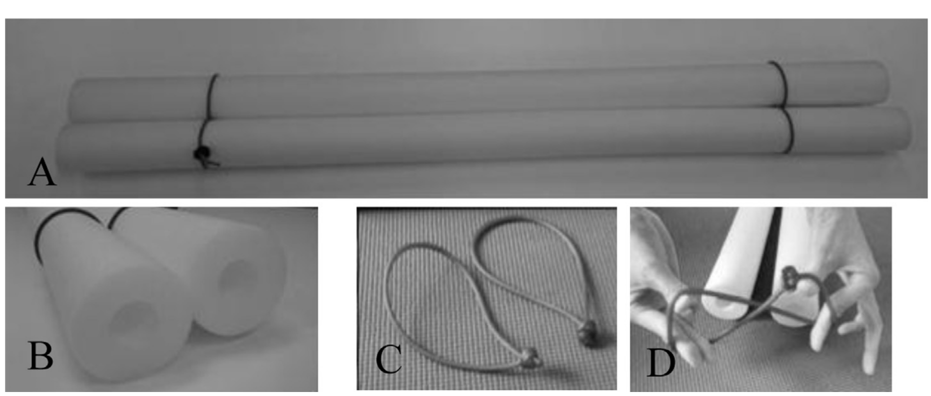

Figure 1 This is a set of the Core Noodle, 6 cm in diameter and 118 cm long (A, B). It is as elastic as hard polyurethane. Two noodles held together with the rubber bands (C, D).