



Original article

Effects of external pelvic compression on trunk and hip muscle EMG activity during prone hip extension in females with chronic low back pain[☆]Ji-Won Kim^a, Oh-Yun Kwon^b, Tae-Ho Kim^c, Duk-Hyun An^d, Jae-seop Oh^{d,*}^a Department of Physical Therapy, NAMBU University, Gwangju, South Korea^b Department of Physical Therapy, YONSEI University, Wonju, South Korea^c Department of Physical Therapy, DAEGU University, Daegu, South Korea^d Department of Physical Therapy, College of Biomedical Science and Engineering, INJE University, 607 Obang-dong, Gimhae-si, Gyeongsangnam-do 621-749, South Korea

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ABSTRACT

Many studies have reported higher trunk and hip muscle activity in patients with chronic low back pain (CLBP). Increased trunk and hip muscle activity could contribute to pain. Previous studies have shown that external pelvic compression (EPC) decreased back and hip muscle activity during physical tasks.

In this study, we assessed the effects of EPC on the electromyography (EMG) activity of the latissimus dorsi (LD), erector spinae (ES), gluteus maximus (GM), and biceps femoris (BF) in a CLBP group and a healthy group during prone hip extension (PHE).

Forty female volunteers (20 non-specific CLBP, 20 healthy) were recruited. Surface EMG data were collected from the LD, ES, GM, and BF muscles during a PHE task. Normalized EMG values were analyzed by separate repeated-measures analysis of variance (ANOVA) for each muscle.

The normalized EMG activity in the left LD, bilateral ES, and right GM was significantly higher in the CLBP group than in the healthy group during PHE. In the CLBP group, the normalized EMG activity in the left LD, bilateral ES, and right GM was significantly lower with EPC than without ($p < 0.05$). This suggests that the application of EPC decreased trunk and hip extensor EMG activity in the CLBP group during PHE.

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1. Introduction

Low back pain (LBP) is a major medical problem and makes a considerable contribution to disability (Freburger et al., 2009; Macfarlane et al., 2012). The prevalence of LBP was threefold higher in females than males, and females were more likely to suffer functional impairment because of LBP (Croft et al., 1998; Biglarian et al., 2012). Females with chronic LBP (CLBP) show less back and hip muscle strength than healthy females (Nadler et al., 2000; Bayramoğlu et al., 2001). Back and hip muscle strengthening exercises are important to prevent and treat CLBP because muscle weakness is a risk factor for LBP (Lee et al., 1999; Nadler et al., 2000; Bayramoğlu et al., 2001).

Prone hip extension (PHE) is commonly used as a therapeutic exercise in patients with LBP to strengthen the trunk and hip extensors and lengthen the hip flexors. In the clinical setting, patients often perform exercises with difficulty due to increased pain and/or muscle weakness. A recent study showed higher trunk and hip muscle amplitudes in CLBP than in a healthy group during a PHE task (Arab et al., 2011). Although they did not measure spinal stability, the authors suggested the need for increased trunk and hip muscle activity to enhance trunk stability in the CLBP group (Arab et al., 2011). Many other studies have reported higher trunk muscle activity in patients with CLBP than in healthy subjects during various tasks, such as trunk bending and lifting tasks (Ambroz et al., 2000; Ferguson et al., 2004). It has been demonstrated that increased muscle activity is influenced by pain (Graven-Nielsen et al., 1997). Some researchers have suggested that increased trunk muscle activity could contribute to a vicious cycle of pain-spasm-pain and increase the load on the spine by co-contraction of the trunk muscles (Roland, 1986; Keir and MacDonell, 2004). Therefore, clinicians have emphasized reducing abnormally

[☆] The work should be attributed to Department of Physical Therapy, INJE University.

* Corresponding author.

E-mail addresses: raim00@hanmail.net (J.-W. Kim), kwonoy@yonsei.ac.kr (O.-Y. Kwon), ptkimth@daegu.ac.kr (T.-H. Kim), dhahn@inje.ac.kr (D.-H. An), ysrehab@inje.ac.kr (J.-s. Oh).