CHAPTER I

INTRODUCTION

1.1 Background and rationale

Low back pain (LBP) is a common problem that occurs in general population. One year prevalence of LBP was found ranged from 40.5 percent to 64 percent (Barrero et al., 2006; Ihlebaek et al., 2006). Approximately 60 percent to 80 percent of population reported LBP once in their life time (Ihlebaek et al., 2006; Manchikanti, 2000). One hypothesis for the development of LBP is that there is a dysfunction in the control of abdominal and back muscles (Hides et al., 2001; O'Sullivan et al., 1997; Panjabi, 2003; Richardson and Jull, 1995). The muscles that locate deep and closed to the spine are found to lose their ability to function as the stabilizers. These muscles are the transversus abdominis (TrA/IO), internal abdominal oblique (IO) (lower fibers), and lumbar multifidus (deep fibers). In order to treat and prevent LBP, specific stabilization exercises for training these stabilizers have been proposed.

Abdominal hollowing (AH) is one type of the specific stabilization exercises that is widely used in patients suffering from LBP (Goldby et al., 2006; Hides et al., 2001; O'Sullivan et al., 1997; Rasmussen-Barr et al., 2003; Shaughnessy and Caulfield, 2004). Briefly, the AH is performed by gently pull the navel in and up while not allowing any movement at the spine, rib, and pelvis (Norris, 1995; O'Sullivan, 2000; Richardson and Jull, 1995). The lumbar spine is kept in neutral position. This aims to activate TrA, IO (lower fibers), and lumbar multifidus (deep fibers) in isolation from the rectus abdominis (RA) and external abdominal oblique (EO) which lie superficially.

To learn how to perform AH, it is recommended that a patient with LBP should start performing AH in the position that facilitates the co-contraction of the deep abdominal and back muscles. Once the patient can master AH, the starting position of AH is

indicated to be progressed. Four positions are suggested empirically by clinicians for performing the AH. These positions are crook lying (O'Sullivan, 2000), prone lying (O'Sullivan, 2000; Richardson and Jull, 1995), four-point kneeling (Norris, 2001; O'Sullivan, 2000; Richardson and Jull, 1995), and wall support standing (Norris, 2001). However, there is no report on the comparisons of the abdominal muscle activity during AH among all these four positions.

1.2 Objective

The objective of this study was to investigate electromyographic activity of RA, EO, and TrA/IO during AH in four starting positions: i.e. crook lying, prone lying, four-point kneeling, and wall support standing.

1.3 Specific objectives

(1) To determine whether there was any significant difference in the EMG activity among the three abdominal muscles in each starting position

(2) To determine whether there was any significant difference in the EMG activity of each muscle among four different starting positions

(3) To determine whether there was any difference in frequencies of inhibition and isolation of three abdominal muscles in four starting positions

1.4 Hypothesis

(1) There would be statistically significant differences in the EMG activity of three abdominal muscles in each starting position

(2) There would be statistically significant differences in the EMG activity of each muscle among four different starting positions

(3) There would be differences in the EMG activity of frequencies of inhibition and isolation of three abdominal muscles in four starting positions

1.5 Scope of the study

This study was carried out in healthy population without history of LBP. Thirty-two participants aged between 20-30 years, with skinfold thickness at abdominal and supra-iliac areas less than 20 millimeters participated in this study (Neumann and Gill, 2002). All participants had never practiced AH. They were excluded if they had had history of LBP and any abnormalities of the spinal column or abdominal regions such as fracture, surgery, burn, and cancer.

1.6 Brief method

Participants included in this study gave written informed consent prior to participate in the study (Appendix A). They were taught to perform AH in four positions following the randomized order of the starting positions. Researcher attached surface electrodes on the skin overlying the three abdominal muscles (RA, EO, and TrA/IO). Maximal voluntary contraction (MVC) was measured by instructing the participants to maximally hold the specific positions for five seconds and rest two minutes between trials to prevent muscle fatigue (Ng et al., 2002a). After participants performed the MVC, they performed AH in four positions in the same order as their training session. Electromyographic data of four positions were compared.

1.7 Advantage of the study

This study would be helpful in both research and clinic that relate to the management of LBP. It would provide evidence for selection of the suitable starting position for performing AH for rehabilitation of patients with LBP.