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PELVIC POSTURAL ASSESSMENT

Reliability of sagittal pelvic position assessments in standing, sitting and during hip flexion using palpation meter☆

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Summary The objective of this study was to investigate reliability of assessing sagittal pelvic position using the palpation meter (PALM) in healthy subjects while sitting, standing and while in different hip flexion angles in standing. Twenty healthy subjects were assessed two times by the same examiner, with a 48-h interval between test sessions. Reliability indices of PALM measures (intraclass correlation coefficient, ICC), standard error of measurement (SEM) and smallest detectable change (SDC) were calculated. ICC values showed excellent intra-rater reliability for measurements of sagittal pelvic position in standing and sitting position and for both standing hip flexion angles (ICC = .89–.96). SEM values ranged from .5° (hip flexion 90°) to 1.5° (sitting position). SDC values ranged from 1.5° (hip flexion 90°) to 4.0° (sitting position). The results of this study showed excellent intra-rater reliability for assessing sagittal pelvic position in standing, sitting and hip flexion in healthy subjects using the PALM.

Introduction

Assessment of pelvic position is commonly performed when evaluating patients with lumbosacral and lower extremity dysfunction (Krawiec et al., 2003; Sahrmann, 2001). Pelvic alignment represents an important mechanism for

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maintaining a good posture (During et al., 1985). There is some evidence that pelvic asymmetry is related to altered trunk motion and increased lumbar spine stress (Al-Eisa et al., 2006). Pelvic position can directly influence lumbar spine alignment (Endo et al., 2012), which is considered a risk factor in low back pain (Chaleat-Valayer et al., 2011; Dankaerts et al., 2006). Pelvic malalignment seems also related to anterior cruciate ligament injuries (Hertel et al., 2004).

The pelvic assessment is usually performed with the patient in a standing position. This can be done in several ways, including palpation of the anterior and posterior superior iliac spines, use of inclinometers and use of the palpation meter (PALM) (Freburger and Riddle, 1999; Gajdosik et al., 1985; Hagins et al., 1998; Herrington, 2011). Sitting position has become the most common posture in the workplace (Endo et al., 2012), and is referred to as an aggravating factor in low back and hip pain (Samora et al., 2011; Williams et al., 1991). Therefore, assessing pelvic posture in this position seems also important.

Pelvic behavior during hip flexion movement can also be related to low back pain (Roussel et al., 2009; Sahrmann, 2001). It is expected that the pelvis rotates posteriorly during hip flexion, thus increasing lumbar flexion (lumbopelvic rhythm) (Bohannon et al., 1985; Murray et al., 2002; Tully et al., 2002). However, increased posterior pelvic rotation (PPR) during hip flexion can cause excessive lumbar spine movement and increase lumbar spine stress (Sahrmann, 2001). For that reason, it may be useful to measure pelvic position in standing and in different hip flexion angles to assess lumbopelvic rhythm.

The reliability of different methods of assessing pelvic position in standing has been investigated in several studies (Gajdosik et al., 1985; Hagins et al., 1998; Herrington, 2011; Krawiec et al., 2003). The use of PALM is a reliable way to assess pelvic position in this posture (see Materials section for PALM description) (Hagins et al., 1998; Herrington, 2011; Krawiec et al., 2003). We are unaware of studies investigating the reliability of pelvic position assessment in sitting and standing hip flexion. The objective of this study was to investigate intra-rater reliability of assessing sagittal pelvic position in healthy subjects while sitting, standing and while in different hip flexion angles in standing (45° and 90°).

Methods

Subjects

Twenty healthy subjects (10 male and 10 female, mean age = 25.3 ± 4.3) participated in this study. A poster informing about the study was placed in the main building of the University and subjects volunteered to participate in the experiment (no payment or extra credit for class was given). Subjects had no orthopedic, rheumatologic or neurological disorders affecting the lumbar spine or the lower limbs. This project was approved by the Ethics Committee of the leading author's Institution, and all subjects signed the informed consent form.

Materials

The PALM device (Performance Attainment Associates, St. Paul Minnesota, USA — http://www.spineproducts.com) was used to assess sagittal pelvic position (Fig. 1). It consists of an inclinometer and two caliper arms. The bubble inclinometer is a semi-circular arc with one-degree gradations that range from 0° to 30° on either side of the midline. The device is held with both examiner's hands and the caliper tips are used to palpate the pelvic bony landmarks. The degree of deviation from horizontal is read from the inclinometer. The device costs approximately USD$200. A digital inclinometer (Dualer IQ, J Tech Medical Industries — Heber city, UT, USA) was used to control for hip flexion. Accuracy of this instrument has been described as ±1° (J Tech, 2005).

Procedure

The examiner was a Physical Therapy graduate student with little clinical experience and no previous experience in using the Palm device. The student was trained by the first author, who had 16 years of experience in orthopedic physical therapy and had been using the Palm in practice for 5 years. During the training period, the examiner had the opportunity to practice the measurements with 10 healthy subjects.

The subjects were in a standing position with their feet aligned with their shoulders and were asked to look at a fixed point ahead to control for posture sway. They kept their arms crossed over the chest while the examiner palpated the anterior superior iliac spines (ASIS) and posterior superior iliac spines (PSIS). The palpation procedure was done as described by Herrington (2011). After marking both anatomical landmarks, the examiner positioned the caliper tips of the PALM device against those marks and the angle of pelvic inclination was recorded (Fig. 2). This measurement was done in the dominant leg side of the subject. Positive degree values were related to anterior pelvic rotation (APR), while negative values were related to PPR. This procedure was done three times and the average value was used for statistical analyses.

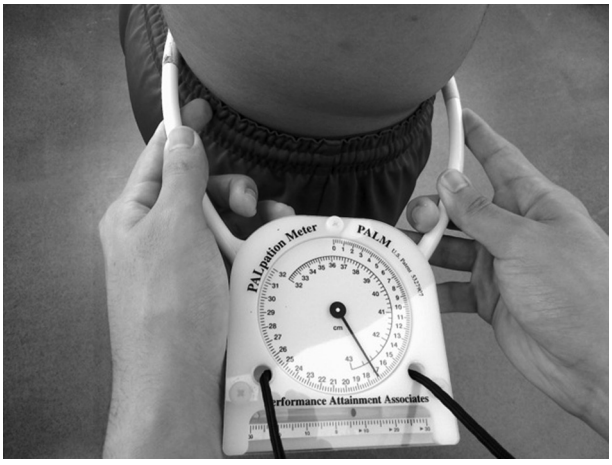

Figure 1 Sagittal pelvic position assessment using palpation meter (PALM).