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國立成功大學九十五學年度碩士班招生考試試題

編號：F 511　系所：物理治療學系甲組、乙組、丙組、丁組　科目：英文文獻評析

本試題是否可以使用計算機：□可使用，☑不可使用　（請命題老師勾選）

1. Please answer the following questions according to the abstract on this page. (Getchell N, Whitall J. J Exp Child Psychol. 2003 Jun; 85(2):120-40.)

Question 1) Please use your words to describe the purpose of the study. (10%)
Question 2) What conclusions will you draw based on this abstract? (10%)

How do children coordinate simultaneous upper and lower extremity tasks? The development of dual motor task coordination. Getchell N, Whitall J., J Exp Child Psychol. 2003 Jun; 85(2):120-40.

When performing simultaneous clapping with walking or galloping, adults adopt coupled, consistent and stable dual motor task coordination; do developmental trends in this coordination exist? In this study, we measured and compared coupling characteristics, consistency across trials and variability of phasing in 4-, 6-, 8-, and 10-year-olds (n=44) as they also performed the same dual motor task. For walk/clap, children adopted specific coupling patterns like adults by 8 years and with the same consistency by 10 years. Across age, children became less variable in clap and step movements separately and as coupled together. In the gallop/clap, children did not resemble adults in coupling patterns by 10 years but all measures were becoming more consistent across age. We discuss dual motor task coordination as a function of age and task complexity using a "dynamic" perspective within a developmental context.

（背面仍有題目,請繼續作答）

2. Please answer the following questions according to the abstract on this page. (Schenk, P., Klipstein, A., Spillmann, S., Stroyer, J., Laubli, T., Eur J Appl Physiol. 2006 Jan; 96(2): 146-56.

Question 1) What factors should be all considered when evaluating lifting capacity? (15%)
Question 2) According to this abstract, what are the contributions of the study? (15%)

The role of back muscle endurance, maximum force, balance and trunk rotation control regarding lifting capacity. Schenk, P., Klipstein, A., Spillmann, S., Stroyer, J., Laubli, T., Eur J Appl Physiol. 2006 Jan; 96(2): 146-56.

Evaluation of lifting capacity is widely used as a reliable instrument in order to evaluate maximal and safe lifting capacity. This is of importance in regard to planning rehabilitation programs and determining working ability. The aim of this study was to investigate the influence of basic functions on the lifting capacity measured by the progressive isoinertial lifting evaluation (PILE) and the functional capacity evaluation (FCE) tests in a lower (floor to waist) and an upper (waist to shoulder) setting and compare the two test constructs. Seventy-four female subjects without acute low back pain underwent an examination of their lifting capacities and the following basic functions: (1) strength and endurance of trunk muscles, (2) cardiovascular endurance, (3) trunk mobility and (4) coordination ability. A linear regression model was used to predict lifting capacity by means of the above-mentioned basic functions, where the F statistics of the variables had to be significant at the 0.05 level to remain in the model. Maximal force in flexion showed significant influence on the lifting capacity in both the PILE and the FCE in the lower, as well as in the upper, lifting task. Furthermore, there was a significant influence of cardiovascular endurance on the lower PILE and also of endurance in trunk flexion on the lower FCE. Additional inclusion of individual factors (age, height, weight, body mass index) into the regression model showed a highly significant association between body height and all lifting tasks. The r (2) of the original model used was 0.19/0.18 in the lower/upper FCE and 0.35/0.26 in the lower/upper PILE. The model r (2) increased after inclusion of these individual factors to between 0.3 and 0.4. The fact that only a limited part of the variance in the lifting capacities can be explained by the basic functions analyzed in this study confirms the assumption that factors not related to the basic functions studied, such as lifting technique and motor control, may have a strong influence on lifting capacity. These results give evidence to suggest the inclusion of an evaluation of lifting capacity in clinical practice. Furthermore, they raise questions about the predictive value of strength and endurance tests in regard to lifting capacity and work ability.

3. Please answer the following questions based on the attached article. You may not need to read the whole article for answering the questions. (**Lumbopelvic kinematics and trunk muscle activity during sitting on stable and unstable surfaces.** O'Sullivan, P., Dankaerts, W., Burnett A., et al., J Orthop Sports Phys Ther. 2006 Jan; 36(1):19-25.)

Question 1) What are the research questions of the study? (10%)

Question 2) Greater spinal movement was observed in the unstable surface condition in this study. However, no electromyographic (EMG) amplitude or variance differences were detected between seating conditions. What is (are) the possible reason(s) that led to these results? (10%)

Question 3) What are the gender differences found in this study? (10%)

Question 4) What are the possible ways to make this study better for answering the research questions? (20%)

（背面仍有題目,請繼續作答）

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Lumbopelvic Kinematics and Trunk Muscle Activity During Sitting on Stable and Unstable Surfaces

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Study Design: A single-group comparative study.

Objectives: To compare lumbopelvic kinematics and muscle activation patterns while sitting on stable and unstable surfaces.

Background: Unstable surfaces are commonly used during the rehabilitation of certain low back pain disorders. The benefits postulated are increased muscle activity and facilitation of sustainable midrange positions via neuromuscular control. The use of unstable sitting devices in the workplace is controversial, as the postulated increase in muscle activity is thought to lead to a muscle fatigue/pain response. However, little evidence exists for or against the ability of these devices to alleviate or prevent spinal pain.

Methods and Measures: This study included 26 healthy adults (14 male, 12 female). Fastrak 3-dimensional motion analysis detected lumbar curvature, pelvic tilt, and postural sway during sitting on a stable and unstable surface over 5-minute periods. Surface electromyography was used to measure activity in the superficial lumbar multifidus, transverse fibers of internal oblique, and iliocostalis lumborum pars thoracis.

Results: Spinal postures were similar for sitting on a stable and unstable surface. Significant increases in postural sway were detected ($P = .013$) in 3 dimensions of movement during sitting on an unstable surface. Gender differences were noted. No EMG amplitude or variance differences were detected between seating conditions.

Conclusions: Preliminary data show that sitting on unstable surfaces induces greater spinal motion, but does not significantly alter the lumbosacral posture nor the amount of activity in the superficial trunk muscles under investigation. *J Orthop Sports Phys Ther 2006;36:19-25.*

Key Words: *ergonomics, lumbar spine, postural sway, posture, trunk muscles*

Sitting, and especially prolonged sitting, is considered to be a risk factor in the development of low back pain (LBP)[6] and it is believed that it can contribute to the exacerbation of existing LBP.[48] This becomes increasingly relevant as more of the population acquires a sedentary lifestyle. Despite considerable research into optimising ergonomic sitting practices,[22,23,40-46] the incidence of LBP remains high.[15]

The proposed negative effects of prolonged sitting include compromised disc nutrition and static loading of spinal structures secondary to a lack of spinal movement.[20] Slumped postures result in increased disc pressure and tension on the posterior passive structures,[12] whereas hyperlordotic sitting has the potential to induce muscle fatigue and increase loading of the spinal structures via compressive forces generated by the extensor muscles. From a clinical perspective many patients with LBP report sitting as an aggravating factor.[39,48]

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The protocol for this study was approved by The Human Research Ethics Committee, Curtin University of Technology, Perth, Australia.

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While the concept of an ideal sitting posture has been considered since before 1884,[19] with several models analyzed,[5,40,43,44,46] no consensus exists regarding optimal alignment and how it is best facilitated. Some of the factors said to influence postures in sitting include spinal alignment,[24,50] thigh-to-trunk angle, muscle activity while seated,[38] trunk-to-thigh angle,[9,50] and knee position.[38] The influence of arm position has also been recognized.[37]

The majority of literature pertaining to sitting has focused upon chair type and seatback alignment, and their effects on kinematics and muscle activity. Ergonomic guidelines advocate the use of spinal support to decrease the effort of sitting and prevent fatigue of the trunk muscles and discomfort,[5,19,33,46] a concept which has changed little since 1975.[19] This concept is based on the assumption that prolonged muscle contraction, even of low magnitude, may cause LBP via a muscle fatigue or pain mechanism.[5,11,12] Backrests are thought to provide support for postural alignment reducing static muscle activity[5,21]; however, backrests may also reduce spinal motion and thereby compromise disc nutrition.[12,20,23,33]

Clinicians frequently incorporate unstable sitting devices such as gym balls and air filled cushions (eg, SitFit) into the rehabilitation of perceived postural and motor control deficits in clients inclusive of those with LBP.[17,25,28,35] There is, however, a paucity of literature that investigates the effects of sitting on unstable sitting devices in subjects with LBP. It has been postulated that the stimulation provided by an unstable surface facilitates activation of the spinal stabilizing muscles around a neutral spine position by continuous fine postural adjustments.[17]

Furthermore, gender postural differences have been documented, with women reported to have greater lumbar lordosis in standing[18] and greater cervical flexion in sitting.[10] To our knowledge, gender differences for lumbopelvic posture have not been investigated in sitting. Spinal posture has also been reported to change over time, with one study reporting large postural adjustments[44] and another study reporting flexion creep with spinal loading into flexion.[11]

TABLE. Descriptive data (mean ± SD) for participants in this study.

	Male and Female (n = 26)	Male (n = 12)	Female (n = 14)
Age (y)	31.3 (13.3)	37.2 (14.7)	25.3 (8.8)
Mass (kg)	69.3 (12.0)	77.1 (8.7)	60.9 (9.3)
Height (cm)	171.5 (10.1)	177.1 (0.1)	166.6 (0.1)
Height sitting (cm)	88.8 (4.9)	90.2 (4.8)	87.5 (4.1)

Clearly there is significant controversy regarding what constitutes an ideal sitting posture and many factors need to be considered. At present there is insufficient evidence in the literature to determine whether sitting on an unstable surface results in altered spinal kinematics or trunk muscle activity. Therefore, the primary aim of this study was to compare the effects of sitting on stable and unstable surfaces on spinal posture, postural sway, and trunk muscle activity. A secondary aim was to determine the effects of gender and time.

METHODS

Subjects

Twenty-six volunteers (12 males, 14 females) were recruited from the Perth metropolitan area. Mean ± SD body mass, standing heights, and sitting heights were 69.3 ± 12 kg, 171.5 ± 10.1 cm, and 88.8 ± 4.9 cm, respectively (Table).

Participants were excluded if they had a body mass index of greater than 28 kg/m^2 to ensure for quality of the surface EMG as body fat causes impedance to surface EMG signals. Subjects were also excluded if they had a history of LBP or leg pain over the previous 2 years or had received previous postural education. The Human Research Ethics Committee, Curtin University of Technology, Perth approved the study and written informed consent was gained from each participant.

Experimental Protocol

Participants completed sitting on stable and unstable surface trials in randomized order, while synchronized spinal kinematics and surface EMG of the trunk muscles were collected over a 5-minute period. A 10-minute standing interval was provided between trials. The stable surface trial consisted of participants sitting on an adjustable stool with no backrest, while in the unstable surface condition participants sat on the same stool but with a SitFit (Sissel Products, Bad Durkheim, Germany) placed on top of the stool surface. The SitFit is an air-filled cushion 15 cm in diameter and 5 cm thick. During testing the height of the stool was adjusted to ensure that the participants' hips and knees were at 90°. The feet were positioned shoulder width apart with hands resting on the thighs. In both trials participants viewed a laptop computer screen displaying a movie set at eye level, and 1.5 m in front of the participants in an attempt to distract them from postural monitoring. Subjects were asked to sit comfortably as they normally would. No other instructions were given to participants, as the aim was to determine how people would naturally sit with the influence of the different seating conditions. Figure 1 shows the experimental set up for the stable surface sitting condition.

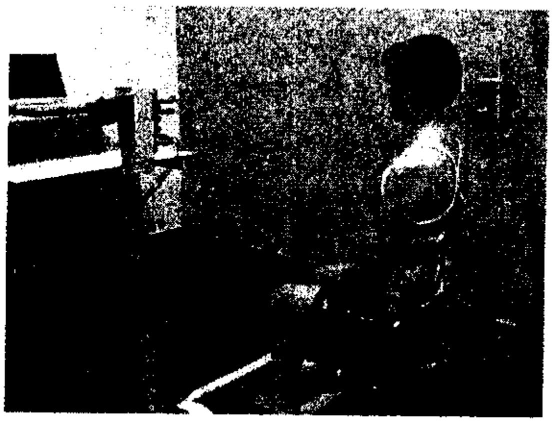

FIGURE 1. Experimental set-up for the stable sitting surface condition.

Data Collection

Three-dimensional (3-D) spinal kinematic data were recorded at 25 Hz using the 3Space Fastrak (Polhemus Navigation Science Division, Kaiser Aerospace, VT). The Fastrak system is a noninvasive electromagnetic device that measures the position and orientation of points in space. This apparatus has been shown to be both reliable and valid for measurement of lumbar spine movement with an accuracy of 0.2°.[31] The device's sensors were placed on the skin over the spinous processes of T12 and S2, using double-sided tape.

Surface EMG was collected with 2 Octopus Cable telemetric systems (Bortec Electronics Inc, Calgary, Canada). The EMG system bandwidth was 10 to 500 Hz, with a common-mode rejection ratio of greater than 115 dB at 60 Hz. All raw myoelectric signals were preamplified and amplified with an overall gain of 2000. Data were collected using a customized software program written in LabVIEW V6.1 (National Instruments, Austin, TX). Six channels of EMG data were sampled at a frequency of 1000 Hz. Pairs of self-adhesive disposable Ag/AgCl electrodes (3M Red Dot; 3M Health Care Products, London, UK) were placed parallel to the muscle fibers.

Three pairs of trunk muscles were investigated and their electrode placement was as follows: left and right transverse fibers of internal oblique (IO), 1 cm medial to the anterior superior iliac spine[27]; left and right superficial lumbar multifidus (SLM), L5 level and aligned parallel to a line connecting the posterior superior iliac spine and L1-2 interspinous space[16]; and left and right iliocostalis lumborum pars thoracis (ICLT), level of L1 spinous process midway between the midline and the lateral aspect of the participant's body.[15]

Common earth electrodes were placed over the right iliac crest. Excess body hair was removed and the area debraded, then cleaned with an alcohol swab. Skin impedance was tested using an impedance meter and less than 5 KΩ was considered acceptable.

Prior to data collection, submaximal voluntary isometric contractions (sMVICs) were performed for the purpose of amplitude normalization.[14] sMVICs have been considered more sensitive in detecting small changes in low levels of muscle activity.[3,29,36] sMVICs were generated for the abdominal muscles using the double leg raise movement due to its high reliability.[3,30] The participants were placed in supine, lying with hips flexed at 45° and knees at 90°. The participants raised both legs 1 cm off the supporting surface for 3 seconds. sMVICs for SLM and ICLT were performed with participants in prone, lying with knees bent at 90°, and participants were asked to lift both knees 5 cm from the horizontal surface for 3 seconds. Three trials of each normalization method were performed and the maximum value for each muscle for each contraction was used for analysis.[15]

Data Management

Three kinematic variables were analyzed in this study. Pelvic tilt was defined as the inclination of the sacrum relative to the vertical. For this variable, a positive angle indicated a posterior pelvic tilt, while a negative angle indicated an anterior pelvic tilt. Lumbar curvature was defined as the acute angle between 2 intersecting lines, one from T12 and one from S2, with lumbar curvature negative values increasing with lordosis. Average pelvic tilt and lumbar curvature were calculated for each minute to detect postural changes over time. Finally, postural sway was measured in the transverse plane as the translational displacement of T12 with respect to S2. Total mediolateral (ML) and anterior-posterior (AP) displacement were calculated to quantify cumulative postural sway over the full 5 minutes data collection period.

Prior to processing the raw EMG data a customized quality control program in conjunction with visual inspection was used on all channels to detect and eliminate possible contamination of EMG signal by heartbeat and other artifacts. The raw data were then demeaned, full-wave rectified, and band-pass filtered (4 Hz and 400 Hz), generating a linear envelope. The average level of activation for each channel was calculated for each minute over the 5-minute period. An evaluation of the variability in muscle activity using the standard deviation of the exposure variation analysis[26] matrix was conducted.

Statistical Analysis

SPSS statistical analysis software, Version 11.0 (SPSS Inc, Chicago, IL) was used to analyze the data. The primary aim of comparing stable and unstable sitting surfaces was tested concurrently with the secondary effects of gender (for posture, postural sway, and

EMG), time (for posture and EMG), and side (for EMG). Three-way mixed-model analyses of variance (ANOVAs) with contrasts were used to test the effects of surface condition, gender, and time for pelvic tilt and lumbar curvature. Two-way mixed-model ANOVAs were used to test the effects of condition and gender for sway measures. Mixed-model ANOVAs were used to test the effects of surface condition (stable, unstable), gender (male, female), time (minutes 1, 2, 3, 4, 5), and side (left, right) for EMG amplitude. Paired *t* tests were used to compare the exposure variation analysis matrix standard deviation of each muscle to test for differences between surface conditions. A critical alpha probability level of .05 was used. All results are reported as the mean ± SD unless otherwise stated.

RESULTS

Lumbar Curvature and Pelvic Tilt

There were no significant 2- or 3-way interactions between surface condition, gender, and time for lumbar curvature or pelvic tilt. Figure 2 shows the main effect of surface condition on lumbar curvature and pelvic tilt.

There was no significant difference in lumbar curvature between sitting on an unstable and stable surface ($F_{1,24} = 1.3$, $P = .264$). Females had a greater amount ($F_{1,24} = 5.0$, $P = .034$) of lumbar lordosis (−7.8° ± 3.6°) compared to the males (3.6° ± 3.6°). Lumbar curvature (lordosis) decreased over time for all subjects ($F_{4,96} = 4.7$, $P = .016$), with repeated pairwise contrasts showing a significant difference ($F_{1,24} = 6.75$, $P = .016$) between minute 1 (−3.1° ± 13.5°) and minute 2 (−2.4° ± 14.0°), then no significant differences between subsequent minutes ($F_{1,24} =$ 0.21, 3.28, 0.42; $P =$ .652, .083, .523, respectively).

There was no significant difference in pelvic tilt (Figure 2) between sitting on an unstable and stable surface ($F_{1,24} = 6.6$, $P = .523$). Females displayed greater ($F_{1,24} = 10.7$, $P = .003$) anterior pelvic tilt (−10.6° ± 3.2°) than males (4.0° ± 3.2°). Pelvic tilt did change over time ($F_{4,96} = 2.8$, $P = .030$), with repeated pairwise contrasts showing a significant difference ($F_{1,24} = 8.03$, $P = .001$) between minute 1 (−4.0° ± 13.3°) and minute 2 (−3.4° ± 13.5°), then no significant differences between subsequent minutes ($F_{1,24} =$ 0.29, 2.45, <0.01; $P =$ .598, .130, .967, respectively)

Postural Sway

There was no interaction effect of surface condition and gender on postural sway. Subjects had a greater amount ($F_{1,24} = 7.1$, $P = .013$) of postural sway as measured by mean total displacement while sitting on an unstable surface (166.7 ± 9.8 cm) when compared to sitting on a stable surface (142.9 ± 7.0 cm). Furthermore, this was observed in both the ML ($F_{1,24} = 6.6$, $P = .017$) and AP ($F_{1,24} = 8.3$, $P = .008$) directions. Figure 3 shows the main effect of surface condition on postural sway. Females (169.9 ± 10.3 cm) showed more postural sway than males (139.7 ± 10.3 cm) in total displacement ($F_{1,24} = 4.3$, $P = .048$) and in the ML direction ($F_{1,24} = 4.6$, $P = .043$), but not in the AP direction ($F_{1,24} = 2.7$, $P = .115$).

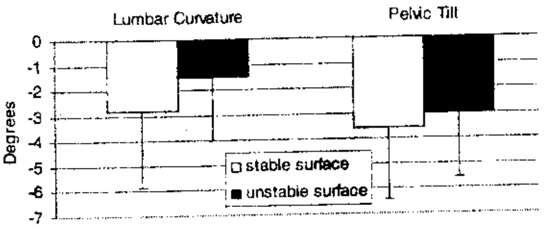

FIGURE 2. Effect ($F_{1,24} = 6.6$, $P = .523$) of sitting surface condition on lumbar curvature and pelvic tilt (mean ± SD). Negative values for lumbar curvature indicate a lordotic spine. Negative values for pelvic tilt indicate anterior pelvic tilt.

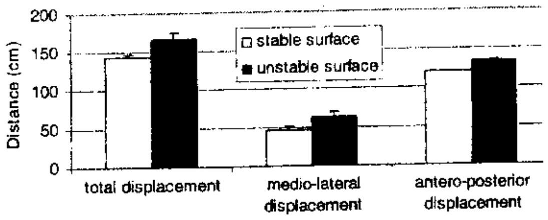

FIGURE 3. Significant effect of sitting surface condition on postural sway (mean ± SD) for total displacement ($F_{1,24} = 7.1$, $P = .013$) and sway in the mediolateral ($F_{1,24} = 6.6$, $P = .017$) and anteroposterior ($F_{1,24} = 8.3$, $P = .008$) directions using the displacement distance travelled of T12 relative to S2.

Electromyography

There were no significant interaction effects of condition, gender, time, or side for any muscle. There was no significant effect of sitting surface condition for the activity level of ICLT ($P = .645$), SLM ($P = .375$), or IO ($P = .431$). Figure 4 shows the main effect of sitting surface condition on trunk muscle activity. Females showed greater ($F_{1,22} = 7.5$, $P = .012$) ICLT activity (53.4% ± 5.4%) than males (33.2% ± 5.0%), but were equal to males for SLM ($P = .343$) and IO ($P = .671$). There was no significant main effect for time or side.

There was no significant difference in variation in muscle activity between surface conditions for SLM ($P = .343$), ICLT ($P = .652$), and IO ($P = .232$) muscles, based on the exposure variation analysis matrix standard deviation, indicating that sitting surface condition did not result in greater phasic motor activity in the muscles measured.

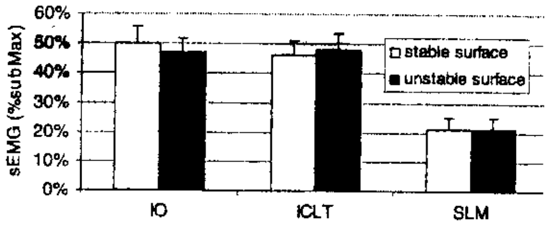

FIGURE 4. Effect of sitting surface condition on trunk muscle EMG activity. Mean ± SD of internal oblique (IO) (P = .431), iliocostalis lumborum pars thoracis (ICLT) (P = .645), and superficial lumbar multifidus (SLM) (P = .375) normalized to sMVIC over 5 minutes.

DISCUSSION

The results of this study indicate that during sitting, small 3-D movements of the lumbar spine occur, which corroborates previous observations.[8,44] The unstable sitting surface condition induced an increase in total amount of movement of T12 relative to S2 when compared to the stable sitting condition. The cumulative distance travelled was greater in the AP direction than in the ML direction, which reflects the lumbar spine's natural propensity for sagittal plane movement. These small 3-D movements may represent small postural adjustments for maintenance of the upright sitting position. An unstable sitting surface induces greater excursion during the subjects' natural spinal movements in 3 dimensions of movement when sitting.

There was no difference in lumbar curvature or pelvic tilt between the stable or unstable surface conditions. However, women had their lumbar spine in a greater amount of lordosis than did the male subjects. These findings are consistent with previous reports of greater lumbar lordosis in females in standing posture.[18,32] This gender difference was also associated with higher levels of trunk muscle activity in the ICLT muscles in women.

A small movement towards increased spinal flexion was observed in both conditions over the 5-minute sitting period. This movement towards flexion while sitting may represent a response to gravitational loading on the lumbopelvic region. This pattern was not associated with a change in superficial trunk muscle activity over the 5-minute period. Time-based postural adjustments have been reported previously in loaded flexion during rowing,[11,34] but to our knowledge have not been reported in sitting. Postural corrections have been previously reported in the literature and are thought to depend on lumbopelvic alignment.[44] Vergara and colleagues[44] measured AP lumbopelvic movement with subjects in supported and unsupported sitting. They noted that, on average, healthy subjects who used a backrest for less than 50% of the time while sitting exert a major change in lumbar curvature (>5°) on average every 3 to 4 minutes. Vergara[44] considered that the large postural corrections were due to discomfort secondary to static lumbopelvic postures. Small movements, referred to as micromovements by Vergara,[44] were also noted in the AP direction and were recorded with a greater frequency in the fully supported backrest group. In the current study, no postural corrections greater than 5° were observed and no participant reported discomfort. To the authors' knowledge no study has reported the small movements of spinal sitting posture in 3 dimensions of movement as observed in this study.

It is interesting to note that greater spinal movement (as measured by postural sway in this study) was observed in the unstable surface condition, in spite of no observed difference in trunk muscle activity or variance being observed between the surface conditions. It is logical that sitting on an unstable surface facilitates greater postural sway than when sitting on a stable surface, although determining the exact reason for this was outside the scope of this study. It may be that deeper postural muscles or other muscles not measured in the study are involved in controlling these fine postural adjustments. These findings do not support clinical assertions that sitting on an unstable surface facilitates activation of the trunk-stabilizing muscles that were measured in this study (IO, SLM, and ICLT). Furthermore, these findings do not support assumptions that an unstable sitting surface results in a greater workload for trunk muscles. However, these assertions may be true for other muscles not measured in the study, such as the deep spinal stabilizing muscles. Further research is warranted to investigate these issues in other postural stabilizing muscles of the lumbopelvic region.

The clinical implications of unstable surface sitting from this study are potentially 2-fold. First, sitting on an unstable surface has the potential to enhance lumbar spinal motion without increasing the muscle demand in the superficial trunk muscles measured in this study. Many studies have highlighted the benefits of spinal movement, which benefits include increased disc nutrition by enhanced fluid exchange and solute transport[20] and prevention of spinal shrinkage, and therefore a reduction of disc compression.[4,42,43,47]

Second, the negative effects on the lumbar spine due to sustained flexion loading are abundantly documented in the literature (eg, increased intradiscal pressure, loss of disc height, and reduced fluid flow).[1,2] The graduated movement of the spine towards lumbar flexion and posterior pelvic tilt in unsupported sitting is of concern due to the known increases in intradiscal pressure and passive structure loading associated with these postures. A further potential problem may be secondary muscle fatigue associated with unsupported sitting, although there is little evidence to support this assertion.

An Australian government health and safety authority[49] recently posted guidelines cautioning the use of gym balls over prolonged periods, stating that the constant facilitation of muscle activity potentially causes LBP. While direct comparisons between sitting on a gym ball and a SitFit should be made cautiously, both are unstable surfaces. In the current study, sitting on an unstable surface did not facilitate increased superficial trunk muscle activity; therefore, the belief that sitting on an unstable surface significantly increases trunk muscle activity remains unsubstantiated. At present, correlations between muscle fatigue and pain remain purely speculative and little evidence exists to suggest that sustained trunk muscle activity specifically causes LBP.[7]

Limitations

The authors acknowledge a number of limitations in this study. The set-up used in this study does not reflect typical office practice and therefore the results of this study cannot be directly extrapolated to the office setting. No backrest was used in this research, which is different to usual office seating. Studies are warranted to identify kinematic and trunk muscle EMG patterns over more prolonged periods and involving different office tasks. In addition, no formal instruction was provided on how participants should sit and this may warrant investigation.

Furthermore, studies are required to determine the relationship between different seating devices and LBP discomfort in both clinical and nonclinical populations before recommendations regarding unstable seating can be made.

CONCLUSION

No differences in lumbar curvature or pelvic tilt were detected when comparing sitting on a stable versus an unstable surface. However, increased spinal movement in 3 dimensions was identified when sitting on an unstable surface. Contrary to common belief, no increase in superficial trunk muscle activity was observed when sitting on the unstable surface. The results of this study should be interpreted in light of the study limitations and cannot be directly extrapolated to seated occupations.

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