

THE EFFECT OF DIFFERENT STANDING AND SITTING POSTURES ON TRUNK MUSCLE ACTIVITY IN A PAIN FREE POPULATION

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STUDY DESIGN

Normative, single group study design.

OBJECTIVES

This study was undertaken to determine if there was a difference in electromyographic activation of specific trunk muscles with the adoption of common postures in a pain free population.

SUMMARY OF BACKGROUND DATA

Clinical observations indicate prolonged passive postures such as slump sitting and sway standing can exacerbate pain in individuals with low back pain. It has been proposed that pain may arise from excessive compression and in-effective load sharing within the lumbo-pelvic region (Vleeming & Lee, 2000). Subjects with lumbo-pelvic pain who report pain in these postures often present with and inability to activate or sustain the activation of the lumbo-pelvic stabilizing musculature (lumbar multifidus, pelvic floor and deep abdominal wall muscles). It has also been shown that functional training of the lumbo-pelvic stabilizing muscles with a special emphasis on maintaining optimal postural alignment, resulted in reduced pain and disability and enhanced motor control patterns of these muscles (O'Sullivan 2000). This raises the question as to the relationship between different upright postures and patterns of activation of the lumbo-pelvic stabilizing muscles. To date, there is little empirical evidence to document this relationship.

METHODS

Subjects included 20 healthy adults, with equal representation of sex. Surface electromyography was used to measure activity in superficial lumbar multifidus, internal oblique, rectus abdominis, external oblique and thoracic erector spinae in four standardized standing and sitting postures. These postures were slump sitting vs erect sitting and sway standing vs erect standing (fig 1-4)

FIG 1: ERECT STANDING

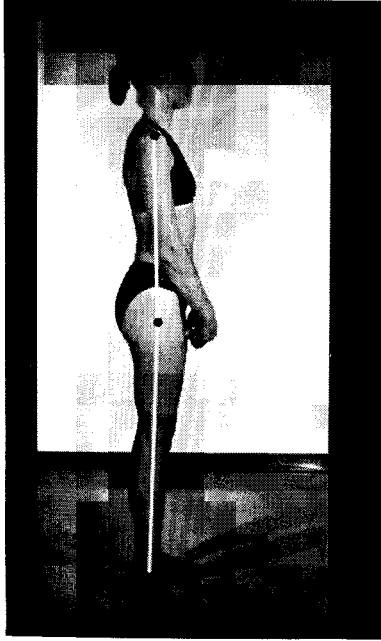


FIG 2: SWAY STANDING

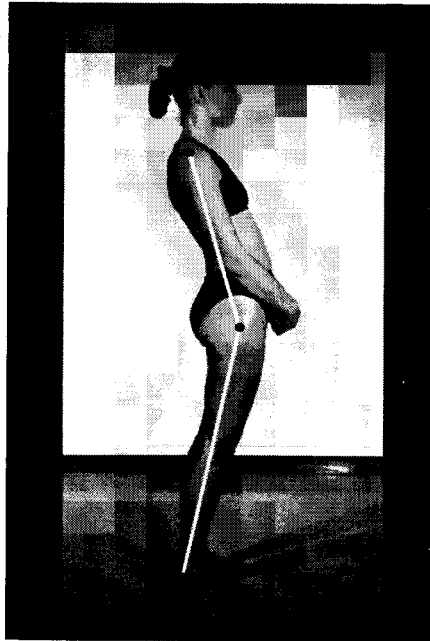


FIG 3: ERECT SITTING



FIG 4: SLUMP SITTING



Fig. 5: Surface EMG in Standing

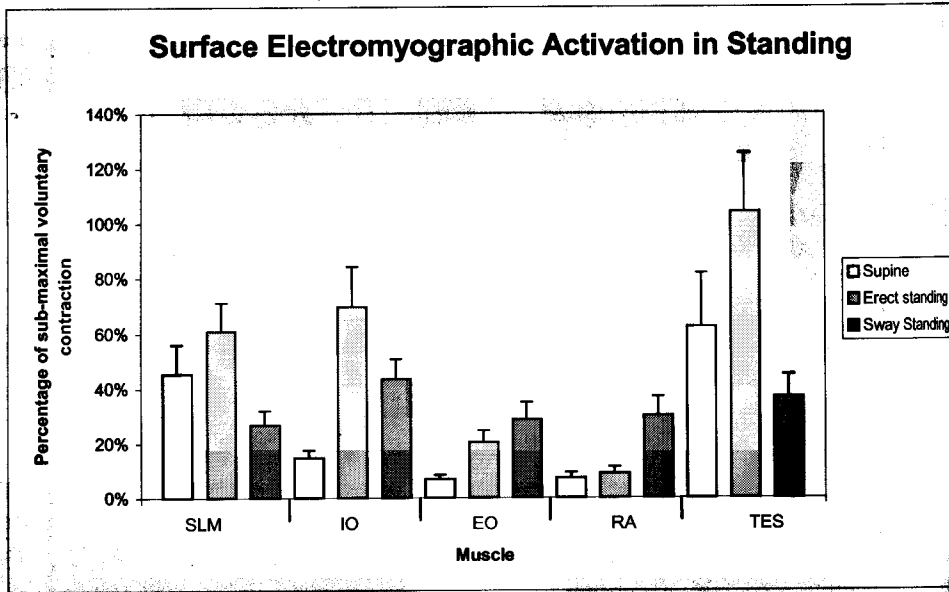
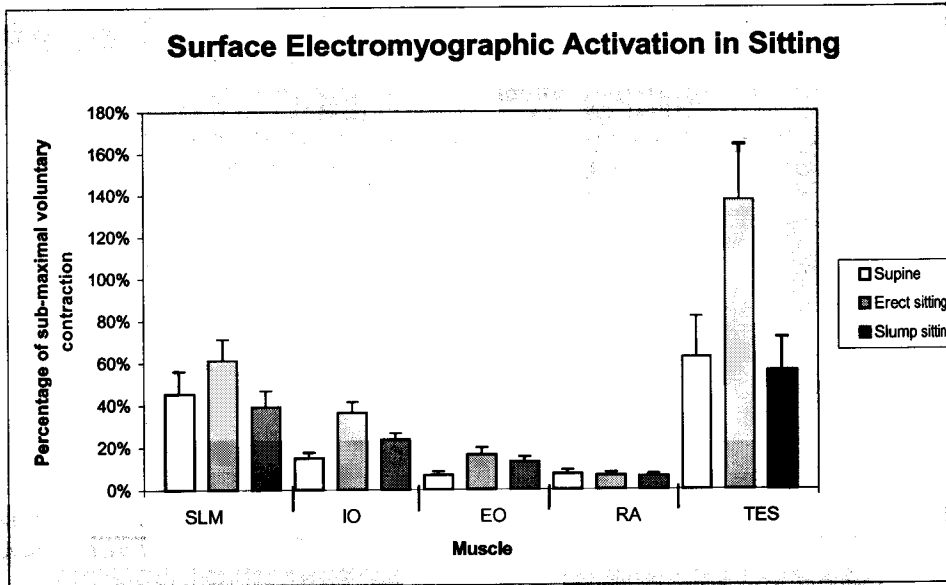


Fig. 6 Surface EMG in Sitting



RESULTS

Internal oblique, lumbar multifidus and thoracic erector spinae showed a significant decrease in activity in sway standing ($p=0.027$, $p=0.002$, $p=0.003$ respectively) and slump sitting ($p=0.007$, $p=0.012$, and $p=0.003$ respectively) as compared to erect postures. Rectus abdominis activity increased significantly in sway as compared to erect standing ($p=0.005$).

CONCLUSIONS

These findings clearly show a link between activity of the lumbo-pelvic postural stabilizing muscles and the maintenance of optimally aligned upright postures. These findings suggest a close relationship between the active and passive stabilizing systems, whereby the neural control system appears to adjust the levels of motor activity in the lumbo-pelvic stabilizing muscles depending on the reliance on the passive structures.

It may be hypothesized that individuals who habitually adopt passive postures for long periods, may de-activate and potentially de-condition the stabilizing muscles of the lumbo-pelvic region. Furthermore in the case of chronic lumbo-pelvic pain syndromes where the 'passive' structures are already sensitized, sustaining passive postures may result in ineffective load sharing on these painful structures, exacerbating pain. Conversely, the adoption of optimally aligned erect postures, which facilitate key lumbo-pelvic stabilizing muscles, may result in effective load sharing with the active system, reducing focal end range stress on the sensitized passive structures thereby reducing pain. These hypotheses are supported by Vleeming and Lee (2000) who proposed that altered emotional states are mirrored in changes in posture, leading to ineffective load-sharing with selective increased compression and tension in the spine and pelvis. The results of this study indicate that postural change leads to different muscle activation patterns and that forces transferred from spine to pelvis and legs will be altered.

Vleeming A, Lee D, Van Wingerden JP. Joint function: development of an integral model for diagnosis and treatment. Proceedings of the 2000 IFOMT meeting, Perth Australia