

ABSTRACT

Abstract of thesis entitled "Three-dimensional measurement of posture and movements of the neck, shoulder and scapula" submitted by Judith Anne Gould for M.Phil at The Hong Kong Polytechnic University in October 2002.

Background and Purpose: Neck pain causes considerable inconvenience, discomfort and pain to the sufferer and costs workplaces dearly in terms of reduced productivity and absenteeism. Extrapolated to a societal level, neck pain represents a considerable burden on clinical practitioners, the outpatient health system, and the productivity of the economy as a whole. Postural re-education and restoration of motion of the neck, shoulder and scapula are commonly used by clinicians in the treatment of neck pain disorders, however there is little conclusive evidence that there is a relationship between neck pain, and altered posture and motion. More importantly, there is little normative data regarding posture and pattern of motion of the neck, shoulder and scapula available to compare to a symptomatic population. Therefore, the aims of this study were to examine the reliability of the FasTrak™, an electromagnetic tracking device, in establishing the position and motion of the neck, shoulder and scapula, to describe the three-dimensional movements of the neck, shoulder and scapula in asymptomatic subjects, to examine the differences between male and female subjects in the position and kinematics of the neck, shoulder and scapula, and to describe the movement relationship between the neck and the shoulder during functional tasks.

Subjects: Thirty-five asymptomatic subjects between the ages of 20 to 45 years were recruited from the Hong Kong Polytechnic University physiotherapy staff and students, physiotherapy colleagues and associates of the principal investigator.

Method: The study used the FasTrak™ electromagnetic system to measure postural angles, spinal curvature and three-dimensional kinematics of the neck, shoulder and scapula in an asymptomatic population. The postural angles included: the cranio-horizontal; cranio-vertebral; sagittal and coronal shoulder; ear, and eye horizontal angles. Spinal curvature angles included: the cervical spine lordosis and the upper and lower thoracic spine kyphosis. The maximal magnitude and patterns of movement of the physiological motions and functional tasks of the neck, shoulder, and scapula were also examined.

Results: The FasTrak™ system exhibited high reliability in repeated measure of all postural angles and spinal curvature (ICC(3,1), mean 0.97) and all kinematic motions of the neck, shoulder and scapula (ICC(3,1), mean 0.96). Statistical analysis revealed gender differences existed for the cranio-vertebral angle and neck extension. The results also showed side-to-side differences for shoulder sagittal and coronal postural angles and neck lateral flexion magnitude. The pattern of motion of the scapula through arm elevation was one of increasing upward rotation, posterior tilt and slight internal rotation. The accompanying planes of motion of the neck and shoulder displayed variation with regard to individual pattern and magnitude. The functional tasks investigated for the first time in this study revealed a consistent

pattern of motion of the neck and shoulder when reaching forward and reaching up. With regard to the reaching across task, a variety of different movement strategies were found to be used.

Conclusions: The results of this study support the use of the FasTrak™ as a reliable measuring tool of postural angles, spinal curvature and three-dimensional kinematic data of the neck, shoulder and scapula. It has also established important normative data for postural angles, spinal curvature, the maximal magnitude of range of motion and the pattern of accompanying planes of motion in physiological movements of the neck, shoulder and scapula. In addition, the study has provided new information regarding the movement relationship between the neck and shoulder during three functional tasks. The present study will form a useful basis for future research such as a comparative study of subjects with symptomatic neck pain and asymptomatic subjects. Furthermore, knowledge of the pathological patterns will help establish a scientifically based treatment protocol, which incorporates appropriate postural and movement re-education.