

摘 要

以往研究顯示，攜帶型個人電腦在肌肉骨骼不適之危害可能高於傳統之桌上型電腦，而平板電腦為攜帶型個人電腦的一種，從人因工程角度來看，以其在 1.4 到 1.95Kg 之重量，若要以一手支撐，另一手操作，則明顯存在易造成肌肉骨骼不適之問題。因此本研究以醫師巡房作業為例，假設在一可能之操作時間與內容之條件下，於實驗室中，模擬醫師巡房之作業設計進行實驗。本研究以醫學院大學部的學生為受測者，採男女生各半，共 30 人，利用肌電儀、動作分析儀量測受試者動態肌肉負荷與姿勢並以主觀問卷評估主觀身體肌肉骨骼不適，以了解使用平板電腦時之肌肉負荷狀況與姿勢。

由肌電圖的數據可發現，使用平板電腦時，性別與平板電腦的重量均會對肌肉負荷產生顯著影響，女性負荷明顯高於男性，尤其在負責平板電腦支撐之左手二頭肌和屈腕肌與右手之使用數位筆之屈指淺肌是負荷最重之肌肉群。其最大肌力負荷百分比(%MVC)，女性二頭肌可高達 11.85，女性屈腕肌達 8.81。而在兩種平板電腦重量(輕 1.36kg 重 1.9kg)上，在左手所測的肌肉群上，重的比輕的來的大，尤其是屈腕肌群，更為明顯。若配合主觀肌肉不適問卷，可觀察到在左手上臂與手肘的不適比其他部位來的高，這和肌電圖之結果相符，推估主要在使用平板電腦時，影響的部位在左手的上臂與左手肘。此外由動作分析儀結果，可觀

察到平板電腦使用時，頸部彎曲的角度與視角比 VDT 作業時來的大，這可能造成危害與不適的增加。

市售的平板電腦雖然其使用介面相當方便，但在目前之重量下，若要以一手握持，一手輸入之方式來操作，由於在左斜方肌與屈指肌群之 %MVC 值高達 10.74 和 11.91，其明顯高於一般 VDT 作業，且使用時其頸部角度過度彎曲、視角過大，在連續使用的時間應不宜太長。未來上平板電腦的設計必須要再減輕平板電腦本身的重量，或者增加輔助支撐的背帶來減輕肌肉的負荷。

關鍵字：平板電腦、工作相關肌肉骨骼不適、肌電圖、偏好姿勢

Abstract

Laptops PC have been in widespread use in the past decade. Stewart (1997) has reported that the prevalence rates of musculoskeletal disorders associated with laptops were even higher than traditional desktop PC. Tablet PC is one kind of portable PC. From ergonomic viewpoint, the users who hold the tablet PC with weight between 1.4 kg to 1.95 kg and without supporting are obviously in high risk of static sustaining posture. Therefore, the current study will evaluate the tablet PC in the laboratory by employing a simulated physician's ward inspection task.

A tablet PC with two kinds of weight (1.4 kg and 1.95kg while keyboard attached) and one desktop PC as the control were evaluated in the present study. Thirty students (15 males and 15 females) from one medical university participated voluntarily. EMG and motion analyzer were employed to assess the dynamic muscular loads and posture settings. Besides, a questionnaire was used to evaluate the subjective discomfort after each session of experiment. A mix design multiple factorial analysis of variance with repeated measures was employed. Gender was treated as between subject factor. Types of PC, ways of holding tablet PC (vertical screen and horizontal screen), and sessions of experiment were treated as within subject factors.

The results of EMG data showed that different genders and weights of Tablet PC resulted in significantly differences. The average %MVC values for female are significantly higher than males'. The %MVC value for female on the muscle biceps brachii (11.85) and the flexor carpi (8.81) of the left hand which responded for holding the tablet PC and the muscle flexor digitorum superficialis of right hand for handling digit pen were found as the highest ones. Besides, significantly higher %MVC values were also found while utilizing tablet PC with larger weight compared with the lighter condition especially on the muscle flexor carpi of left hand. As for the evaluation of

subjective discomfort, left hand (including upper and forearm) that holding the tablet PC was rated as the severe discomfort body part which may be attributed to the weight of tablet PC. Furthermore, larger forwards bending neck angles and viewing angles which exceeded the general recommended 15-30 degree were also reported.

The user interface is quite user-friendly for the tablet PC. However, for the current employed tablet PC which weights 1.4 to 1.95kg, the muscular loads were obviously higher compared with using general VDT task for using desktop PC. Besides, larger forwards bending neck angles and viewing angles were also found. Therefore, limited continuous using time is recommended for the experiment tablet PC Besides, the major inputting icons and buttons are suggested to be set up on the top of tablet PC which will reduce over upper arm abduction and muscular load.

Key words : Tablet PC、 Work-related Musculoskeletal Disorders、
Electromyogram, Preferred Posture