Effects of computer exposure and upper limb musculoskeletal symptoms on different computer users

Wei-Hsien Hong[1*], Hsieh-Ching Chen[2], Hsin-Chieh Wu[3], Ya-Hsiu Hsu[3]

[1]*Department of Sports Medicine, China Medical University, No.91, Hsueh-Shih Road, Taichung, 40402, Taiwan*

[2]*Department of Industrial Engineering and Management, National Taipei University of Technology, No.1, Sec. 3, Zhongxiao E. Rd., Taipei, 10608, Taiwan*

[3]*Department of Industrial Engineering and Management, Chaoyang University of Technology, No.168, Jifeng E. Rd, Wufeng District, Taichung, 41349, Taiwan*

Abstract

The purpose of this study was to compare the computer exposure and forearm musculoskeletal symptoms among three computer-use groups by an external logger for recording computer input activities. Thirty-eight participants were recruited in this study and divided into three groups: 12 computer-document processors, 12 computer-aided design (CAD) draftsmen, and 14 online gamers. Computer use of each participant was recorded for 10 consecutive days. Questionnaire survey was conducted to collect musculoskeletal complaints in participants' upper limbs right after data collection period. Quantitative parameters computed using recorded data were daily dynamic duration and static duration, daily keystrokes, mouse clicks, wheel scrolling counts, mouse movement and dragged distance, average typing and clicking rates, and average time holding down keys and mouse buttons. Experimental results show online gamers have an average operation period of 8.11 hr/day, document processors 3.74 hr/days, and CAD draftsmen 4.74 hr/days. The online gamers have significantly higher keyboard activities than typical keyboard users, document processors, and higher mouse activities than the typical mouse users, CAD draftsmen. However, musculoskeletal complaint in their upper limbs is not greater than that of document processors and CAD draftsmen. This study demonstrates that online gamers exhibit similar input pattern as document processors. There exists a complicate relationship between cumulative hazards and computer uses. Experimental results derived from onsite measurements indicate that computer use duration alone cannot accurately represent the workloads of various computer tasks. Adequate tools are needed for quantifying user computer exposure and providing detailed information for various computer tasks. Future study should further collect long-term data of computer exposure and investigate effects of personal factors such as age and gender.

Keywords：Computer exposure, Online game, Computer input, External logger

*Corresponding author: E-mail: whhong@mail.cmu.edu.tw; Tel: 886-4-22053366 ext.7603; Fax: 886-4-22061724