

Changes in Pressure Pain Threshold of the Upper Trapezius, Levator Scapular and Rhomboid Muscles during Continuous Computer Work

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Abstract. [Purpose] This study investigated the changes in pressure pain threshold of the upper trapezius, levator scapular, and rhomboid muscles during continuous computer work. [Subjects] Fourteen males and females aged 26–32 years, were recruited. [Methods] A dolorimeter pressure algometer was used to measure the pressure pain threshold of the upper trapezius, levator scapular, and rhomboid muscles, respectively, before computer work and after 15 min, 30 min, and 60 min of computer work. [Results] The pressure pain threshold of the upper trapezius was significantly decreased after 15 min or more of computer work. The pressure pain threshold of the levator scapular was significantly decreased after computer work for 30 min and 60 min. The pressure pain threshold of the rhomboid muscle was significantly decreased after 60 min of computer work. [Conclusion] Continuous computer work could produce much more pain in the levator scapular and rhomboid muscle than the upper trapezius.

Key words: Computer worker, Pressure pain threshold, Rhomboid muscle

(This article was submitted Mar. 14, 2013, and was accepted Apr. 8, 2013)

INTRODUCTION

Prolonged sitting postures have been significantly implicated in the development of musculoskeletal problems during computer work¹⁾. Specifically, workers who continuously use computers had frequent work-related neck and shoulder problems²⁾. In a previous study, it was shown that computer workers had increased forward neck flexion, and the more forward neck flexion was observed in symptomatic persons³⁾. Forward head posture and thoracic kyphotic posture may gradually develop into a fixed postural habit when workers work at a computer⁴⁾. Increased forward neck and thoracic flexion and may increase the risk of work-related musculoskeletal problems by increasing the tension in the posture-stabilizing muscles and increasing the compressive forces on the articulations of the cervical and thoracic spine⁵⁾. This may be due to decreases in the average length of the muscle fibers, which contributes to the extensor torque of the cervical and thoracic spinal joints⁵⁾. It is difficult to identify a clear reason for neck and shoulder pain and impairments, and this can contribute to poor patient prognosis⁶⁾. Pressure algometers have been used to assess the effect of remedies for myofascial pain and to study changes in the PPT of root pain, headache, and reflex sympathetic dystrophy^{7, 8)}. Therefore, the present study investigated the changes in pressure pain threshold of the upper trapezius, levator scapular, and rhomboid muscles during continuous computer work.

SUBJECTS AND METHODS

Fourteen computer workers (6 males, 8 females) aged 26–32 years and with a mean height and weight of 173.6 ± 6.2 cm and 65.4 ± 6.2 kg, respectively, participated in this study. The subjects used computers for 6.2 ± 1.8 hours/day (mean \pm SD) as full-time workers. Subjects with conditions that might have affected the mobility of the cervical spine injury or with pain or neurologic deficits in the neck and upper extremities during the previous year were excluded from the study. All subjects performed computer work for an hour using the same computer workstation, in which the monitor was inclined backward by 20°, with their eyes 0.8 m from the monitor. To ensure that the hips and knees were flexed at 90°, an adjustable-height table and chair without a backrest were used to set the initial sitting posture. During the experimental period, all subjects performed selected keyboard typing work in the Korean version of the Hansoft program. A dolorimeter (Fabrication Enterprises, White Plains, NY, USA) pressure algometer was used to measure the pressure pain threshold of the upper trapezius, levator scapular and rhomboid muscles, respectively, before computer work and after 15 min, 30 min, and 60 min of computer work. The subjects were instructed before taking of measurements with the pressure algometer to say ‘ah!’ when they started to feel pain. Then, we applied pressure with the dolorimeter on the right side of the body to measure the pressure pain. The reliability of pressure pain threshold measurements was greater than 0.8. The Statistical Package for the Social Sciences (SPSS, Chicago, IL, USA) was used to perform one-way repeated measures

ANOVA to analyze the differences in pressure pain thresholds among before computer work and after 15 min, 30 min, and 60 min of computer work. Bonferroni's correction was performed *post hoc* to assess differences. The alpha level for statistical significance was set at 0.05.

RESULTS

The pressure pain threshold of the upper trapezius was 8.5 ± 2.1 lb before computer work, 7.5 ± 1.2 after 15 min of computer work, 7.3 ± 1.4 lb after 30 min of computer work, and 7.2 ± 1.5 lb after 60 min of computer work. The pressure pain threshold of the upper trapezius was significantly decreased after 15 min, 30 min, and 60 min of computer work compared with before computer work ($p < 0.05$). The pressure pain threshold of the levator scapular was 9.2 ± 1.9 lb before computer work, 9.0 ± 2.0 lb after 15 min of computer work, 7.6 ± 1.9 lb after 30 min of computer work, and 6.7 ± 1.5 lb after 60 min of computer work. The pressure pain threshold of the levator scapular was significantly decreased after 30 min and 60 min of computer work compared with before and after 15 min of computer work ($p < 0.05$). The pressure pain threshold of the rhomboid muscle was 8.3 ± 2.4 lb before computer work, 8.1 ± 2.0 lb after 15 min of computer work, 7.7 ± 2.7 lb after 30 min of computer work, and 6.1 ± 1.6 after 60 min of computer work. The pressure pain threshold of the rhomboid was significantly decreased after 60 min of computer work compared with before and after 15 min and 30 min of computer work ($p < 0.05$).

DISCUSSION

This study investigated the changes in pressure pain threshold of the upper trapezius, levator scapular, and rhomboid muscles during continuous computer work. The upper trapezius is known to be an important factor for shoulder pain associated with computer work⁹. This study showed that the pressure pain threshold of the upper trapezius was significantly decreased after 15 min or more of computer work. However, there were no significant differences between after 15 min and after 30 min or between the after 30 min and after 60 min. Finally, the pressure pain threshold of the upper trapezius was 7.2 ± 1.5 lb after 60 min of computer work. On the other hand, the pressure pain threshold of the levator scapular was significantly decreased after computer work for 30 min and 60 min. The pressure pain threshold of the levator scapular was 6.7 ± 1.5 lb after 60 min of computer work. The pressure pain threshold of the rhomboid muscle was also significantly decreased at after 60 min computer. Finally, the pressure

pain threshold of rhomboid was 6.1 ± 1.6 lb after 60 min of computer work. The pressure pain thresholds of the levator scapular and rhomboid muscles cause pain to be felt after 30 minutes or more of computer work. Also, the pressure pain thresholds of these muscles are very low. Generally, many clinicians are focusing on the upper trapezius for treatment of the shoulder pain in computer workers^{3, 4}. However, continuous computer work could produce much more pain in the levator scapular and rhomboid muscles than in the upper trapezius. In particular, the pain of the rhomboid muscle was experienced quite late in the experiment. Clinicians would fail to notice the rhomboid muscle pain of computer workers. Computer work requires continuous forward reaching of the arms and shoulders⁹. This posture could produce a continuous protracted and upward scapular posture^{9, 10}. So, the rhomboid muscle could be continuously under stress for overstretching, resulting in pain.

ACKNOWLEDGEMENT

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (No. 2012R1A1B4001058).

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