

Upper Extremity Musculoskeletal Disorders among Computer Users

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Aim: The aim of this study was to determine whether upper extremity musculoskeletal disorders are more prevalent in intense computer users and the relation between cumulative hours of computer use and symptoms.

Materials and Methods: The study group included 100 bank workers, who worked more than 6 h per day for at least 2 years on a video display unit and were recruited through convenience sampling. Sixty-five age and sex matched healthy subjects who worked not more than 2 h on computer keyboards for office work constituted the control group.

Results: There were no significant differences between groups when the age and sex of the participants were considered. The results suggest a high prevalence of musculoskeletal disorders of the upper extremities among intensive computer users. The differences were statistically significant except in neck range of motion and left cubital tunnel syndrome. As the time spent on video display unit increased, there is a tendency in occurrence of symptoms, but only in carpal tunnel syndrome the relation is significant.

Conclusions: The findings showed that cumulative computer use time increased the risk of musculoskeletal disorders in the upper extremities. As the duration of job increased, the risk for carpal tunnel syndrome significantly increased. Further studies with the inclusion of a larger number of cases and potential risk factors would help clarify the role of variables in the aetiology of work-related neck and upper limb disorders.

Key Words: Computers, upper extremity, musculoskeletal system

Bilgisayar Kullananlarda Üst Ekstremitte Kas-İskelet Sistemi Sorunları

Amaç: Bilgisayar kullananlarda üst ekstremitte kas-iskelet sistemi sorunlarının sıklığını ve bilgisayar ile çalışma süresinin semptomlarla ilişkisini araştırmak.

Yöntem ve Gereç: İki yıldan daha fazla sürede ve günde en az altı saat süreyle bilgisayar uçbiriminde çalışan 100 banka çalışanı çalışma grubunu oluşturdu. İşyerinde bilgisayar uçbiriminde çalışmayan ve günde en çok 2 saat bilgisayar başında kalan yaş ve cinsiyet eşleştirilmiş 65 kişi ise kontrol grubunu oluşturdu.

Bulgular: Gruplar arasında yaş ve cinsiyet açısından fark bulunmadı. Araştırması yapılan tüm kas-iskelet sistemi bulguları çalışma grubunda daha fazla olduğu gözlemlendi. Boyun hareketlerindeki kısıtlanma ve sol kubital tunel sendromu dışındaki tüm bulgulardaki fark istatistiksel anlamlıydı. Bilgisayar uçbiriminde çalışan grupta çalışma süresinin uzaması semptomların görülme sıklığını artırırken, yalnızca karpal tünel sendromunda bu artış anlamlı bulundu.

Sonuç: Yoğun bilgisayar kullananlarda üst ekstremitte kas-iskelet sistemi hastalıklarının görülme sıklığı artmıştır. Çalışma süresinin uzaması ile karpal tünel sendromu gelişme riski arasında ilişki bulunmuştur. Bu konuda geniş olgu sayılı ve risk etmenlerinin kapsayan çalışmalara gereksinim vardır.

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Anahtar Sözcükler: Bilgisayar, üst ekstremitte, kas-iskelet sistemi

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Introduction

Increased use of personal computers has focused our attention on work-related neck and upper limb disorders (WRNULD) (1-3). The direct and indirect costs of chronic disability to the injured workers, his or her family, employers, and society are enormous. Results of epidemiological studies investigating computer use period (hours keying per day) and WRNULD have not been entirely consistent (4). Common to all of these injuries is a history of prolonged repetitive use of the upper extremities in an intense, forceful, and often an awkward fashion. The condition is usually associated with either specific

soft tissue inflammation, such as tenosynovitis, or a specific nerve entrapment, such as carpal tunnel syndrome (3,5).

The identification of factors that predict chronic disability may also shed light on why some workers develop chronic disability, and thus guide the development of intervention strategies that may prevent this process from occurring (6,7).

The aim of this study is to investigate the prevalence of WRNULD in computer users and its relationship between hours of computer use and symptoms.

Introduction

Methods

The study included 100 right-handed office workers who worked at a video display unit (VDU) in a bank through convenience sampling. The subjects worked a minimum of 6 h per day on a VDU for at least 2 years. The control group included 65 office workers who did not work on a VDU, but did personal work on computers for about 2 h per day. All subjects were examined by the same blinded physician from the Department of Physical Medicine and Rehabilitation. Individuals who had an operation in the relevant regions, a history of fall or accident, or any coexistent disease that might cause soft tissue pain (rheumatoid arthritis, neuritis, diabetes, etc.) were excluded from the study. The standardized clinical examination protocol for the neck and upper extremities consisted of neck range of motion and Spurling tests for cervical degenerative diseases, Yergason and Speed tests for bicipital tendinitis, an epicondyle stretch test for lateral epicondylitis, cubital tunnel test for cubital tunnel syndrome, Finkelstein’s test for de Quervain’s tenosynovitis and Tinel and Phalen tests for carpal tunnel syndrome. The Spurling test was performed by extending and rotating the neck, and then applying downward pressure on the hand (8). The Yergason test was considered positive when the elbow was flexed to 90 degrees and when the forearm pronated against resistance evoked pain in the area of the bicipital groove. The pain in bicipital groove during resistive shoulder flexion with the patient’s elbow extended and the forearm supinated indicated Speed test positivity (9). The pain induced by resistive extension of the wrist suggested lateral epicondylitis. When sustained elbow flexion combined with gentle digital pressure on the cubital

tunnel causes paresthesia and pain, the cubital tunnel sign was considered to be positive (10). Finkelstein’s test was performed by stabilizing the forearm and instructing the subject to make a fist with the thumb tucked inside the other fingers. Pain proximal to the thumb on ulnar deviation was highly indicative of de Quervain’s tenosynovitis (11). The Tinel test was performed with percussion over the palmer aspect of the wrist. The test was considered positive if the subject reported tingling or pain in the distribution of the median nerve (12). The Phalen test was performed by maintaining maximal voluntary wrist flexion for a period of 1 min (13). Positive results of the Tinel and Phalen tests were considered as an indication of carpal tunnel syndrome.

Statistical analyses: A statistical analysis was conducted by SPSS statistical software v.13.0. An independent Student’s t-test was performed to determine whether the time spent on VDU had an effect on symptoms. Chi-square test was used to compare demographic and clinical data.

Results

All patients were Caucasian origin and there was no sex or age difference between the 2 groups. Sociodemographic data of the participants are provided in Table 1. The prevalences of the upper extremity disorders in the study group and control group are shown in Table 2. All soft tissue disorders were more prevalent in the study group compared to control group. Also all disorders were more common in the right side in both groups. The neck range of motion and left cubital tunnel tests were more in intense computer user group but the differences were not statistically significant (P = 0.067 and P = 0.0792).

Table 1. Demographic data of participants.

	*6 h	2 h	P** value
Age	38.6 ± 7.3	38.2 ± 6.5	0.769
Gender	59 m-41 f	34 m-31 f	0.798

* Groups classified according to average time spent on a VDU during a day
 ** P > 0.05

Table 2. Number of positive test results in upper extremity.

Tests	No. of subjects (R*)		No. of subjects (L**)	
	Study gr.	Control gr.	Study gr.	Control gr.
Neck range of motion	15% (15)	5%(3)	11%(11)	5%(3)
Spurling	21% (21)	9%(6)	8%(8)	3%(2)
Yergason and Speed	8% (8)	3%(2)	4%(4)	3%(2)
Epicondyle stretch	26%(26)	12%(8)	7%(7)	5%(3)
Cubital tunnel	13%(13)	2%(1)	3%(2)	-
Finkelstein's	22%(22)	2%(1)	5%(5)	-
Tinel and Phalen	28%(28)	6%(4)	11%(11)	5%(3)

*R indicates right arm and **L indicates left arm

We also determined a positive correlation between cumulative computer use time and incidence of carpal tunnel syndrome. The correlation P values between tests and cumulative computer use time is shown in Table 3.

Discussion

Many workers and researchers regard upper body pain as a work related problem of computer users (6,15,16). They also determined that intense keyboard use increased the risk of upper extremity musculoskeletal symptoms. A large British national survey found that keyboard use for more than 4 h per day increased the risk of wrist/hand and shoulder symptoms, but not neck and elbow symptoms (17). The findings of our study are similar but we did not find any differences in neck range of motion and cubital tunnel syndrome but there was an increase in lateral epicondylitis in elbow. This can be explained that neck injuries and cubital tunnel syndrome may be caused by a variety of conditions other than computer use; hence the difference between groups is not significant. In most studies, the diagnosis of disorders was made by a simple questionnaire, we believe that the clinical diagnosis of WRNULD in the study to be very reliable, as it included a detailed history and physical examination, with exclusion of other conditions that could justify the symptoms in the upper limb (18,19).

We only showed a significant association between carpal tunnel syndrome and cumulative time of computer use. In accordance with our results, Jensen at al. reported that the duration of computer use was not associated with neck symptoms but hand/wrist symptoms (20).

Thomsen found that repetitive work is associated with CTS, but the differences was too low to perform analysis (21). The proposed mechanism for this relationship is regional compression or stretching of the median nerve by repetitive hand-finger loading on nerve structure and function (22). Some investigators reported that women had a higher risk of WRNULD, which is explained by the differences in the effect of exposure to work related physical and psychosocial risk factors; we determined no gender difference in the distribution of all disorders (18,23,24).

Individuals with prolonged keyboard use experience upper extremity soft tissue disorders. Further studies with the inclusion of a larger number of cases and potential risk factors would help clarify the role of variables in the aetiology of WRNULD.

Table 3. The correlation P values between tests and cumulative computer use time in the study group.

Tests	P values	
	Right arm	Left arm
Neck range of motion	0.639	0.714
Spurling	0.783	0.624
Yergason and Speed	0.640	0.754
Epicondyle stretch	0.720	0.785
Cubital tunnel	0.680	0.656
Finkelstein's	0.387	0.364
Tinel and Phalen	0.044	0.915

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