Review (Derleme)

Health Effects of Using Visual Display Terminal

Görsel Ekran Terminali Kullanmanın Sağlığa Etkileri

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Özet

Ekranlı cihazların kullanımı dünyada yaygın olarak kullanılan bir ofis aracıdır. Görsel Ekran Terminali (GET) olarak da bilinir. GET kullanımı, yüksek düzeyde dikkat ve konsantrasyon ihtiyacı ve sürekli oturarak çalışma nedeniyle sağlık tehlikelerine neden olur. Sırt ağrısı, üst ekstremite bozuklukları, göz sorunları, yorgunluk ve stres gibi kas-iskelet sistemi rahatsızlıkları GET kullanıcılarında yaygındır. Bilgisayar sıklıkla kullanılan bir görüntüleme cihazıdır ve Bilgisayar görme sendromu (BGS) önde gelen bir mesleki sağlık sorunu olarak ortaya çıkmıştır. BGS'nun belirtileri arasında kuru göz, göz yorgunluğu, bulanık görme, çift görme, gözlerde kızarıklık, gözlerde yanma ve batma hissi, gözyaşlarında artış veya azalma, çift görme, odak değiştirmede gecikme ve renk algılama düzensizlikleri ve yakın görüşte bozulma bulunur. Ekranlı araçlardan kaynaklanan riskler, iş merkezinin doğru şekilde kurulduğu ve düzenli aralıklarla molaların verildiği sağlıklı ve güvenli çalışma koşullarında önlenebilir. Düzenli egzersiz yapmak, kısa sık molalar vermek ve ekran filtresi kullanmak gibi basit önlemler, GET kullanıcılarında iş kaynaklı hastalıkları önlemek için önemli basit müdahalelerdir. GET kullanımı hayatımızın sık bir parçası olduğundan, GET ile ilişkili bozukluklara dikkat çekmek ve bunları önlemek için basit müdahaleler sunmak istedik.

Anahtar kelimeler: Bilgisayarlı görme sendromu, ergonomi, görsel ekran terminali

Abstract

Screen devices are widely used office tools around the world. We are also known as Visual Display Terminal (VDTs). The use of VDT causes health hazards due to the need for high levels of attention and concentration and constant sitting work. Musculoskeletal disorders such as back pain, upper extremity disorders, eye problems, fatigue, and stress are common in VDT users. The computer is a frequently used display device, and computer vision syndrome (CVS) has emerged as a leading occupational health problem. Symptoms of CVS include dry eye, eye fatigue, blurred vision, double vision, redness in the eyes, burning and stinging sensation in the eyes, increase or decrease in tears, double vision, delay in changing focus and color perception irregularities, and deterioration in near vision. Risks arising from screened vehicles can be avoided in healthy and safe working conditions where the work center is set up correctly and breaks are taken at regular intervals. Simple measures such as exercising regularly, taking short frequent breaks, and using a screen filter are important simple interventions to prevent work-related diseases in VDT users. Since VDT use is a frequent part of our lives, we wanted to draw attention to VDT-related disorders and provide simple interventions to prevent them.

Keywords: Computer vision syndrome, ergonomics, visual display terminal

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INTRODUCTION

Vehicle with screen; It refers to any tool that displays letters, numbers, shapes, graphics, and pictures on its screen, regardless of the content of the process applied (1). In international articles, screened vehicles are called VDTs (Visual Display Terminal), and their health hazards are mentioned. Desktop computers used in the office, laptops used for business purposes, tablets, and smartphones, monitors of CNC machines, and imaging devices used for diagnostic purposes (ultrasound devices used in hospitals, etc.) are within the scope of screened devices (2).

In the regulations; It is defined as a person whose main job is to work with screened devices and who uses screened devices for a significant part of his normal work (1).

Computers are one of the most widely used workplace tools in the world. It has become a necessity in the twenty-first century and is routinely used in a variety of organizations, including academic institutions, official departments, and the financial system (3). In China, nearly 95.2% of businesses use computers for a wide variety of professional and/or non-professional purposes in their daily business (4). A recent report by the Korean government showed that 70.3% of companies have at least one computer, and in 78.3% of companies, more than 80% of employees use computers more than once a week (5).

HEALTH HAZARDS

Using VDT causes health hazards due to requiring high levels of attention and concentration and constantly sitting down. Musculoskeletal disorders such as back pain, upper extremity disorders, eye problems, fatigue, and stress are common in VDT users (2). In a study in Serbia where 939 employees were evaluated, musculoskeletal system (55.8%), eye (27.3%), and mental (7.1%) disorders were detected due to long-term computer use (6).

VDT users also have cardiovascular and metabolic health risks due to constant sitting work. Obesity, Type 2 Diabetes, and long-term sitting cause minimal leg muscle activity in the lower extremities, and this prevents venous return, causing edema in the lower extremities (7).

EYE DISORDERS

In the 21st century, computers are one of the most widely used office tools, and for this reason, computer vision syndrome (CVS) has appeared as a leading occupational health problem (3). Approximately 60 million people worldwide are affected by CVS, resulting in decreased productivity in the workplace and reduced employee quality of life. One million new cases occur every year (8,9).

The American Optometric Association (AOA), CVS is a collection of eye and vision disorders caused by activities that occur during computer use. The symptoms of CVS, also known as digital eye strain, which develops due to looking at a digital screen for a long time, are defined as follows: dry and irritated eyes, eye fatigue, blurred vision, double vision, redness of the eyes, burning or stinging sensation in the eyes, increased tearing or decreased tearing, double vision, headache, neck, shoulder and back pain, light/shine sensitivity, delay in changing focus and color perception irregularities, and impairment in near vision (3,10,11).

Looking at the screen for a long time reduces spontaneous blinking, which causes the tear film to become unstable and causes dry eyes (4). CVS symptoms may develop in 90 percent of individuals who use computers for 3-4 hours a day (9).

CVS symptoms cause a decrease in work efficiency, productivity, job satisfaction, and quality of life. Factors such as female gender, longer working hours, prolonged computer use, poor sitting posture, pre-existing eye disease and contact lens use, failure to use a VDT filter, failure to adjust computer brightness, and angle of view of the computer monitor have been associated with CVS (11).

MUSCULOSKELETAL SYSTEM DISORDERS

Musculoskeletal disorders are a common problem in the working population. Occupational musculoskeletal diseases (MSD) occur due to repetitive physical movements that cause damage to tendons, nerves, muscles, and other soft tissues (12). When performed for a long time and in the wrong position, it can be the cause of many MSDs (13). Changes occurring in MSD reduce the individual's physical activity level and therefore functionality (14).

Risk factors for occupational MSD can be divided into three: physical and ergonomic, psychosocial, and personal risk factors. There are physical and ergonomic risks such as repetitive movements, working in the same position for a long time, and inappropriate table and chair features (15). For those working with VDT; individual, ergonomic, and work organization factors; age, gender, female employees with children, using of glasses, smoking, stomach-related stress reactions and negative emotion, inadequate rest breaks in the organization, flexible and overtime work are among the factors associated with musculoskeletal disorders (16).

Having improper posture (e.g. leaning forward) or improper workstation setup (e.g. placing the keyboard too low) causes stress in many body parts for VDT operators. In the study conducted on the use of VDT, neck discomfort (56.8%), shoulder pain (48.9%), and low back pain (43.3%) were observed (17,4).

Musculoskeletal problems in the arms, neck, and shoulders, and disorders in the hands and wrists are common in computer users (7,18,19). In a study conducted on Dutch computer workers, neck and shoulder symptoms were found to be the most common in 33% of cases, followed by hand complaints in 11% and upper arm complaints in 12%, elbow complaints in 6%, lower arm complaints in 8% and wrist complaints in 8% (20).

Carpal Tunnel Syndrome (CTS) symptoms may develop in those who use keyboards and mice intensively for long periods (21). In a study evaluating 60 people using VDT in Egypt, the prevalence of cervical disorders with or without radiculopathy was the most common disease (18.3%), followed by CTS (6.6%) (22).

In a study conducted in India where 400 people working in insurance offices were evaluated, musculoskeletal system symptoms due to continuous sitting work were most commonly affected by the neck (57.2%), shoulders (38.5%), upper back (28.5%) and It was observed in the lower back (46.2%) (23).

282 participants who used computers for an average of 6.68 ± 2.10 hours in a working day were evaluated, and neck (39.1%), back (31.0%), and waist (30.3%) pain were the most common (24).

PSYCHOSOCIAL RISKS

Depressive and anxiety disorders are common mental disorders that contribute to a serious burden of disease and lead to impairment in work and reduced quality of life (5).

Psychosocially, there are risks such as job dissatisfaction, increased work stress, increased workload, lack of support from colleagues and supervisors, time pressure, and lack of breaks. Personal risks include advanced age, being a woman, smoking, and being overweight (15). Computer workers vary in socioeconomic status and job type. Occupation, education, and work situation have a modifying effect on psychosocial risks in computer work.

Working with a computer is a source of stress that requires a lot of attention and concentration. Complex and difficult tasks are required from highly skilled workers via computers. In low-skilled workers, most computer work is highly controlled and repetitive. These tasks are monotonous but require constant attention. Both areas cause job stress. Decreased physical activity while working with a computer causes depression and anxiety. Working with a laptop distracts individuals from social interactions and increases the risk of depression. Hardware or software problems increase stress and anxiety in computer workers with high job demands. Sales and service employees working in computer jobs face high job demands and low job control. The mental health of employees who deal with customers and complaints, such as in call centers, is negatively affected due to low job control and high demands. It has been observed that employees who use computers for more than 3/4 of their working time have a higher rate of Depressive and Anxiety Disorder (DAD) (5,25).

VDT operators mostly work passively and monotonously and have high job demands, leading to stress. As working hours increase, more work stress is observed. The prevalence of job burnout is high in VDT employees (4).

Work stress can lead to both physical and emotional complaints. Work demands affect the severity and frequency of VDT users' complaints (26,27). Certain psychosocial and cultural variables (e.g., job demands and control, individual variables, individual values, workgroup culture) create occupational stress and, when combined with physical load factors, lead to stress and musculoskeletal disorders. Additionally, factors such as inadequate control at work or lack of social support have been reported to be the most common sources of work-related stress (28).

Psychological factors play a role in asthenopia, but it is difficult to define. There are symptoms such as heaviness and redness in the eyes, blurred vision, dry eyes, and sudden double vision. Some environmental factors (lighting, temperature, polluted air, humidity) were found to have no effect. Coworker support has been shown to play a moderating role in health complaints (26).

DISCOMFORTS CAUSED BY WORKING WITH SCREENED DEVICES ACCORDING TO PROFESSIONS

In internet companies; VDT workers are extremely busy and their physical and psychosocial health is negatively affected. Factors such as job duration, daily working hours, working distance from the screen, breaks and rest, inappropriate postures, and sedentary and intense work are associated with VDT-related symptoms. With increased hours working with daily VDT, workers report burnout, musculoskeletal pain, and eye discomfort. Long-term working hours significantly increase back pain, wrist pain, hip pain, dry eyes, eye pain, job burnout, and work stress (4).

In Sri Lanka, two thousand five hundred office workers working with computers in telecommunications and computer training institutes were evaluated. More than two-thirds of computer office staff were monitored for CVS. CVS symptoms; pain in and around the eyes, headache, blurred near vision, blurred distant vision, dry eyes, painful/irritated eyes, red eyes, tearing in the eyes, double vision, twitching of the eyelids and change in vision colors, impairment in distance vision. It is accepted that these symptoms persist for at least 1 week, intermittently or continuously, at least once a year (8).

In Sri Lanka, two thousand five hundred office workers working with computers in telecommunications and computer training institutes were evaluated. More than two-thirds of workers had CVS symptoms. It is accepted that these symptoms persist for at least 1 week, intermittently or continuously, at least once a year (8).

In a study conducted in Ethiopia, CVS symptoms were observed in 70.4% of 416 lecturers working with computers. Female gender, older age, time working in front of the computer, and sitting down are associated with CVS (9).

471 students using computers at the University of Science and Technology were evaluated. Headache was observed in 53.3% of the students, a burning sensation in the eyes was observed in 54.8%, and eye fatigue was observed in 48%. Headache caused work interruption in 43.85% and eyestrain caused work interruption in 43.5%. When viewing the screen from a distance of more than 50 cm, the frequency of headaches decreased by 38%. When screen filters are not used, the incidence of tired eyes increases by 89% (29).

As the duration of VDT use in hospitals increases, the risk of back pain, wrist pain, headache, dry eye, eye pain, occupational stress job burnout, and depression increases. People who spend more than four hours with VDTs have a higher risk of developing depression (30).

A cross-sectional study evaluating 420 medical secretaries found that headaches, and neck, shoulder, and lower back pain were significantly associated with increased stress in the work environment. Age and working hours were significantly associated with neck and shoulder pain. Sixty-three percent had experienced neck pain sometime during the previous year, 15% had almost constant pain, while 32% had experienced neck pain only occasionally. Fifty-one percent experienced low back pain (31).

Hospital automation secretaries have risky postures and activities such as long working years, working in non-ergonomic chairs and an intense workload, keyboard and mouse use, repetitive movements, prolonged static posture, and wrong hand-wrist position. The upper extremity is at risk for musculoskeletal system complaints. In a study conducted on automation secretaries in a hospital in Turkey, 143 people were evaluated. 67.6% of the participants stated that they had MSD complaints in the neck, 47.7% in the shoulder, and 32.1% in the hand and wrist within the last 12 months (15).

28 female medical secretaries (recording secretaries or radiology report secretaries) working in a university hospital in Turkey were evaluated and the prevalence of CTS was found to be 25%. It was observed that neck, shoulder, and wrist MSD symptoms increased as the study period and age increased. Shoulder MSD complaints were found to be 3.4 times more common in those working on a non-adjustable height chair. It was found that shoulder area MSD complaints were 3.1 times more common in those who worked on a chair without back or elbow support (21).

Among bank employees, the prevalence of CVS was found to be 29.3%. Headache (45.4%), itching (38.6%), photophobia (38.0%), blurred vision (37.3%) and eye pain (28.0%) were evaluated as the most common symptoms. There was a trend that CVS was more common in the female gender. CVS is 6 times more likely to occur in people who use corrective lenses (11).

In a study conducted in Ethiopia, the prevalence of CVS in university secretaries doing data entry was found to be 73.9%. CVS symptoms were twice as common in computer users 7 or more hours a day. It was also found to be related to age. Participants experienced blurred vision (31%), eye fatigue (25%), headache (22.2%), redness in the eyes (20.1%), watery eyes (19.4%), and dryness in the eyes (13.4%), double vision (8.8%), and eye irritation were detected in 7.7% (32).

In a study conducted in India, students who use computers, employees who use computers in university office departments, and bank employees were included. Among 150 participants, eye fatigue (53.8%), itching (47.6%), and burning (66.7%) were observed in those who used computers for more than 6 hours (33).

282 computer office employees working at a mobile telecommunications company and bank in Khartoum, Sudan were evaluated. The most common complaints were neck pain in 64% and shoulder pain in 41% (34).

PRECAUTIONS

Risks arising from VDT can be avoided in healthy and safe working conditions where the work center is set up correctly and breaks are taken at regular intervals (2).

The science of ergonomics, which is the harmony of work with people, protects the employee from unnecessary and excessive strain. Ergonomics protects employee health and safety, increases job satisfaction, and improves working conditions and the environment. In this way, the mental and physical well-being of the employee increases, thus increasing work performance and efficiency (14).

To protect the health of VDT users, working environments must be ergonomically corrected. To prevent working for 4 hours or more without a break, stimulating software should be installed on computers, and environments and conditions where they can get up and exercise should be provided (15).

In studies with VDT; Glare or disturbing reflections should be prevented and adequate lighting should be provided. Keyboard; It must be usable, adjustable, separable, and legible. It should be an adjustable chair. The height of the table is determined by bending the elbows to 90 degrees while the shoulders are relaxed. The feet should be able to move easily, and if working standing, loading on a single leg should be avoided (2).

Regular exercise not only strengthens muscles and improves physical condition, but also reduces stress and anxiety by activating the endocrine system. It relaxes the eye muscles and improves optical functions, ultimately preventing ocular diseases. In some studies, physical activity has been shown as an intervention in the treatment of body pain and mood disorders in the workplace. Regular exercise can significantly reduce discomfort caused by physical and psychosocial disorders such as musculoskeletal pain, decreased vision, and job burnout. Pain discomfort and tension in the neck, back, wrists, waist, and shoulders of the employee can be prevented with regular exercise and can be reduced when it occurs. Physical activity reduces occupational stress and reduces symptoms of depression and anxiety by improving coping strategies (4).

In improving working conditions, it is important to reduce job demands and improve job control. This cannot be achieved through the efforts of businesses and individuals alone. Government support, including policies and regulations, is needed (5).

An important way to eliminate MSDs, CVS dangers, and mental health problems is to develop health programs. Programs should target three areas; First, healthy lifestyle (stretching exercise, quitting smoking, and adequate sleep time/quality). Secondly, increasing awareness about the ergonomics of workstations (seat height adjustment, desk height, keyboard and mouse arrangement, screen brightness, and viewing distance). Third, work organization (VTD working time, rotation and shift work, job stress, and social support) (30).

One study has made recommendations to reduce CVS symptoms in VDT workers, such as the 20/20/20 rule, which requires the individual to look at a distance of 20 ft every 20 minutes for at least 20 seconds. The use of anti-reflective/anti-glare glasses blocks the rays from the VDT. Most of its employees who implemented protective measures were not monitored by CVS. The use of a digital screen protector protects CVS (11).

It is recommended to use protective measures that minimize exposure to electromagnetic force radiation from VDT. As a minimum preventive measure, the use of a screen protector is recommended for long-term VDT users (11).

When VDT work time increases, VDT workers need to take appropriate precautions, such as taking periodic breaks, to prevent or alleviate eye symptoms. VDT users should be advised to take breaks and rest at regular intervals when early symptoms (for MSD) appear (4).

In employees who use keyboards and have hand-wrist complaints, CTS can be detected at an early stage by performing intermittent median nerve measurements with ultrasonography, which is a non-invasive, cheap, and reliable method (21).

CONCLUSIONS

VDT is one of the most widely used workplace tools in the world and our country. Health problems caused by VDT can be prevented with simple interventions such as ergonomics and exercise. Questioning the work done by people who present with eye symptoms, musculoskeletal systems, and psychiatric complaints is an important step in identifying VDT disorders. We wanted to draw attention to the interventions necessary to identify health hazards in VDT users and to reduce and prevent them. This review may be important in guiding other research.

REFERENCES

1. Ekranlı Araçlarla Çalışmalarda Sağlık ve Güvenlik Önlemleri Hakkında Yönetmelik, 16/04/2013 tarihli ve 28620 sayılı Resmi Gazete, Madde4-1.
2. Ekranlı Araçlarla Çalışmalarda İş Sağlığı ve Güvenliği Rehberi, T.C. Aile ve Sosyal Hizmetler Bakanlığı, Ekim 2019.
3. Adane F, Alamneh YM , Desta M . Computer vision syndrome and predictors among computer users in Ethiopia: a systematic review and meta-analysis. Trop Med Health. 2022 Mar 24;50(1):26. doi: 10.1186/s41182-022-00418-3. Derleme [PubMed].
4. Cheng X, Song M, Kong J, Fang X et al. Influence of Prolonged Visual Display Terminal Use and Exercise on Physical and Mental Conditions of Internet Staff in Hangzhou, China. Int J Environ Res Public Health. 2019 May 23;16(10):1829. doi: 10.3390/ijerph16101829.

5. Kim T, Kang MY, Yoo MS, Lee D, Hong YC. Computer use at work is associated with self-reported depressive and anxiety disorder. Ann Occup Environ Med. 2016 Oct 13;28:57. doi: 10.1186/s40557-016-0146-8. eCollection 2016.
6. Blagojević L, Petrović B, Blagojević J. Risk factors for health disorders in computer operators in telecom Serbia. Int J Occup Saf Ergon. 2012;18(3):321-7. doi:10.1080/10803548.2012.11076935.
7. Baker R, Coenen P, Howie E, Williamson A, Straker L . The Short Term Musculoskeletal and Cognitive Effects of Prolonged Sitting During Office Computer Work. Int J Environ Res Public Health. 2018 Aug 7;15(8):1678. doi:10.3390/ijerph15081678.
8. Ranasinghe P, Wathurapatha WS, Perera YS, Lamabadusuriya DA, et al. Computer vision syndrome among computer office workers in a developing country: an evaluation of prevalence and risk factors. BMC Res Notes. 2016 Mar 9;9:150. doi: 10.1186/s13104-016-1962-1.
9. Zenbaba D. SahiledengleB, Bonsa M, Tekalegn Y, Azanaw J, Chattu VK. Prevalence of Computer Vision Syndrome and Associated Factors among Instructors in Ethiopian Universities: A Web-Based Cross-Sectional Study. ScientificWorldJournal. 2021; 2021: 3384332.
10. Gangamma MP, Poonam, Rajagopala M. A clinical study on "Computer vision syndrome" and its management with Triphala eye drops and Saptamrita Lauha. Ayu. 2010 Apr;31(2):236-9. doi: 10.4103/0974-8520.72407.
11. Uba-Obiano CU, Onyiaorah AA, Nwosu SN N, Okpala NE. Self-reported Computer Vision Syndrome Among Bank Workers in Onitsha, Nigeria. J West Afr Coll Surg. 2022 Jul-Sep;12(3):71-78. doi: 10.4103/jwas.jwas_120_22. Epub 2022 Oct 6.
12. ÇASGEM. T.C. Çalışma ve Sosyal Güvenlik Bakanlığı. Meslek Hastalıkları Ankara, 2013
13. Malińska M. Musculoskeletal disorders among computer operators. Review Med Pr. 2019 Jul 16;70(4):511-521. doi: 10.13075/mp.5893.00810. Epub 2019 Jul 10.
14. KERSU Ö. Sağlık Çalışanlarında Kas-İskelet Sistemi Rahatsızlıklarına İlişkin Ergonomik Eğitim ve Ekipmanın Yaşam Kalitesine Etkisi. T.C.Eskişehir Osmangazi Üniversitesi Sağlık Bilimleri Enstitüsü Hemşirelik Anabilim Dalı. Doktora Tezi. Eskişehir 2020
15. Durmaz E. Bir Üniversite Hastanesinde Çalışan Sekreterlerin Üst Ekstremite Kas İskelet Sistemi Yakınmalarının İncelenmesi. Sakarya Tıp Dergisi2018;8(2):432-441. https://doi.org/10.31832/smj.413776
16. Bergqvist U, Wolgast E, Nilsson B, Voss M, Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. Ergonomics. 1995 Apr;38(4):763-76. doi: 10.1080/00140139508925148.
17. González ST, Ortiz-Hernández L, Martínez-Alcántara S, Méndez-Ramírez I.Risks and health problems caused by the use of video terminals. Salud Publica Mex. 2003 May-Jun;45(3):171-80.
18. Hales TR, Sauter SL, Peterson MR, Fine LJ, et al. Musculoskeletal disorders among visual display terminal users in a telecommunications company. Review Ergonomics. 1994 Oct;37(10):1603-21. doi:10.1080/00140139408964940.
19. Ranasinghe P, Perera YS, Lamabadusuriya DA, Kulatunga S, et al.Work-related complaints of arm, neck and shoulder among computer office workers in an Asian country: prevalence and validation of a risk-factor questionnaire. BMC Musculoskelet Disord. 2011 Apr 4:12:68. doi: 10.1186/1471-2474-12-68.
20. Eltayeb S, Staal JB, Kennes J, Lamberts PHG, A de Bie R. Prevalence of complaints of arm, neck and shoulder among computer office workers and psychometric evaluation of a risk factor questionnaire. BMC Musculoskelet Disord. 2007 Jul 14:8:68. doi: 10.1186/1471-2474-8-68.
21. Çakmak V. Tıbbi Sekreterlerde Karpal Tünel Sendromuna Yatkınlık: Medyan Sinirin Ultrasonografi ile Değerlendirilmesi. Türkiye Klinikleri J Health Sci. 2020;5(3):635-40. doi: 10.5336/healthsci.2020-73514
22. El-Bestar SF, Abdel-Moniem El-Mitwalli A, Khashaba EO. Neck-upper extremity musculoskeletal disorders among workers in the telecommunications company at Mansoura City. Int J Occup Saf Ergon. 2011;17(2):195-205. doi:10.1080/10803548.2011.11076879.
23. Singh H, Singh LP. Musculoskeletal disorders among insurance office employees: A case study. Work. 2019;64(1):153-160. doi: 10.3233/WOR-192978.
24. Ghasemi M, Kamalikhah T, Salesi M, Rahmati F. Evaluation of psychometric properties of the maastricht upper extremity questionnaire (MUEQ) in iranian computer users. J Educ Health Promot. 2021 Jul 30:10:245. doi: 10.4103/jehp.jehp_1096_20. eCollection 2021.
25. JWahlström J. Ergonomics, musculoskeletal disorders and computer work. Review Occup Med (Lond). 2005 May;55(3):168-76. doi: 10.1093/occmed/kqi083.
26. Mocci F, Serra A, Corrias GA (2001) Psychological factors and visual fatigue in working with video display terminals. Occup Environ Med 58, 267-71.
27. Menzel NN. Psychosocial factors in musculoskeletal disorders. Review Crit Care Nurs Clin North Am. 2007 Jun;19(2):145-53. doi: 10.1016/j.ccell.2007.02.006.
28. Bugajska J, Zołnierczyk-Zreda D, Jedryka-Góral A.The role of psychosocial work factors in the development of musculoskeletal disorders in workers. Review Med Pr. 2011;62(6):653-8.
29. Shantakumari N, Eldeeb R, Sreedharan J, Gopal K. Computer use and vision-related problems among university students in ajman, United arab emirate. Ann Med Health Sci Res. 2014 Mar;4(2):258-63. doi: 10.4103/2141-9248.129058.
30. Meng-Ting Tsou. Influence of Prolonged Visual Display Terminal Use on Physical and Mental Conditions among Health Care Workers at Tertiary Hospitals, Taiwan. Int J Environ Res Public Health. 2022 Mar 22;19(7):3770. doi: 10.3390/ijerph19073770.
31. Kamwendo K, Linton SJ, Moritz U. Neck and shoulder disorders in medical secretaries. Part I. Pain prevalence and risk factors. Scand J Rehabil Med. 1991;23(3):127-33.
32. Alemayehu M, Nega A, Tegegne E, Mule Y. Prevalence of self reported computer vision syndrome and associated factors among secretaries and data processors who are working in University of Gondar, Ethiopia. Journal of Biology, Agriculture and Healthcare. 2014;4(15).
33. Agarwal S, Goel D, Sharma A. Bilgisayar kullanıcılarında göz şikayetlerine katkıda bulunan faktörlerin değerlendirilmesi. Klinik ve Tanısal Araştırma Dergisi: 2013; 7 (2):331–5. doi: 10.7860/JCDR/2013/5150.2760.
34. Eltayeb SM, Staal JB, Hassan AA, Awad SS, et al. Complaints of the arm, neck and shoulder among computer office workers in Sudan: a prevalence study with validation of an Arabic risk factors questionnaire. Environ Health. 2008 Jun 27:7:33. doi: 10.1186/1476-069X-7-33.
35. https://www.cmd-ltd.com/advice-centre/ergonomics/office-ergonomics/, access date: 25.11.2023.