

COMMUNICATION
UDC 613.65:681.3LOCOMOTOR STRAIN
SYNDROME IN USERS
OF VIDEO DISPLAY
TERMINALS

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The results of an investigation of fatigue and pain in the locomotor system are presented. The investigation comprised a group of workers (n=56) who spent most of their working hours at video display terminals (VDTs), and a control group (n=39) of workers with a mainly free rhythm of work and insignificant physical strain.

Fatigue and pain occurred more frequently in the muscles and joints of the workers working on VDT's (78.8 : 59%), although the differences did not reach statistical significance. On the basis of a rheumatological examination and earlier medical documentation a diagnosis of cervical syndrome was more frequently determined in the VDT group (23.2%) than in the control group (10.3%), while low back pain was diagnosed equally in both groups (17.5%). According to subjective estimation in 46.9% of VDT workers and in 17.9% of the controls disorders were associated with unsatisfactory work conditions. The need for relaxation exercises at the workplace and for the introduction of ergonomic principles for work with VDTs is discussed, particularly with regard to adaptation of the work chair, table, text-stand and foot-rest, and the need to respect anthropometric requirements and working hours. The benefit of movement and isometric exercises at the workplace is emphasized.

Key terms:
fatigue, occupational exposure, pain,
rheumatological examination

Although work with video display terminals (VDTs) is common today, the rapidly increasing technology has in many ways ignored the harmful effects of such work on the health of the individual. This is one of the reasons why there has been an increase in the number of disorders which become chronic diseases, and which workers connect with the use of VDTs. The locomotor system is frequently the »shock organ for homo sedens« (1-7).

With the aim of determining the extent of the adverse effect of work on a VDT and the occurrence of fatigue and pain in the musculo-skeletal system, an investigation was carried out of the frequency of rheumatic disorders and/or

diseases in workers from the Institute for Financial Control, who spend a major part of their working hours sitting in front of VDTs. The investigation comprised a questionnaire to be completed by workers and a medical examination of the locomotor system.

SUBJECTS AND METHODS

The investigation comprised 95 subjects (48 men and 47 women) mean age 42.64 ± 9.19 years. The study group comprised 56 subjects (23 men; 33 women) who spend more than five hours each day sitting in front of a VDT. The control group comprised 39 subjects (25 men; 14 women) not using VDTs, with a relatively free work rhythm. The VDT group, in which there were more women than men, was slightly younger than the control group (40.8 ± 9.2 : 44.5 ± 10.3 years). However, the difference did not reach the level of statistical significance. Neither was the number of years of work significantly greater in the VDT group (18.2 ± 10.2 : 22.4 ± 9.2 years). All examinees completed a detailed questionnaire with 52 questions on fatigue and pain during work. Characteristic postures of the body during work were recorded in photographs. All the subjects were requested to give answers to the following questions: what contributes to fatigue and/or pain during work; what reduces it; when does the first feeling of fatigue occur; when is it most intensive; and in what part of the body does it occur most frequently. Finally, they were asked to mark on a sketch of the body the levels of fatigue intensity and pain, and to mark the usual areas where fatigue and pain are felt. After completing the questionnaire the examinees were given a medical examination of the locomotor system which was carried out during working hours in an improvised clinic within the Institute for Financial Control. The results of earlier medical examinations (laboratory findings, X-rays, specialist findings) were taken into account. Apart from diagnoses of disease of the locomotor system a rheumatologist gave advice on the need for treatment and recommendations for bal-neorehabilitation and/or preventive recreative exercises.

RESULTS

The percentage of VDT workers who felt fatigue at work was 76.8% and that of control workers 59%. ($\chi^2=2.65$; $P>0.05$). Pain was slightly more frequent in VDT workers (58.9 : 41%) ($\chi^2=2.28$ $P>0.05$). Control workers began to feel fatigue and pain earlier and according to them symptoms of strain in the locomotor system occurred at a younger age than in the group of VDT workers (22.9 : 26.3).

Answers to the question: »Do you feel fatigue and pain during work?« are shown in Table 1.

Table 1 *Feeling of fatigue and pain*

	FATIGUE		PAIN	
	VDT group n=56	Control group n=39	VDT group n=56	Control group n=39
No symptoms given	23.2%	41.0%	37.5%	53.8%
Mild and constant at the beginning of work	12.5%	7.6%	5.4%	15.4%
Increases markedly during work	26.8%	35.9%	35.7%	15.4%
Increases and decreases during work	37.5%	15.1%	21.4%	15.4%
	$\chi^2=7.4785$ NS		$\chi^2=7.74435$ NS	

One third of the VDT subjects claimed that pain increased during work. Only 15.4% of the controls shared this opinion. This was also the case with regard to fatigue and pain which increased and decreased during work.

Table 2 shows the answers which subjects gave most frequently as the reason for increased fatigue or pain.

Table 2. *Reasons for increased fatigue and pain*

Most frequent answers	FATIGUE		PAIN	
	VDT group n=56	Control group n=39	VDT group n=56	Control group n=39
Sitting in an unphysiological position	46.4%	17.9%	26.8%	28.2%
Prolonged work	19.6%	17.9%	23.2%	7.7%
Uncomfortable chair	5.4%	17.9%	1.8%	10.3%
No reason given	28.6%	46.2%	48.2%	53.8%
	$\chi^2=15.9134$ P<.01		$\chi^2=4.94660$ NS	

Fifty per cent of the control workers gave no reason for the increased fatigue and pain, which they most probably did not associate with their work. Among the VDT workers 46.4% connected the occurrence of fatigue with an unsatisfactory sitting position. Every fifth VDT worker considered that working for long periods was the reason for fatigue, and every fourth worker that it contributed to pain.

Table 3 and the Figure show the body parts and places where subjects most frequently complained of fatigue or pain.

The VDT workers graded disorders in the characteristic body areas giving most points to fatigue and pain in the neck (63 points : 41 in the control group), and in the low back and the back. They also frequently reported fatigue in the joints of the dominant arm. However, differences were not as marked with regard to pain.

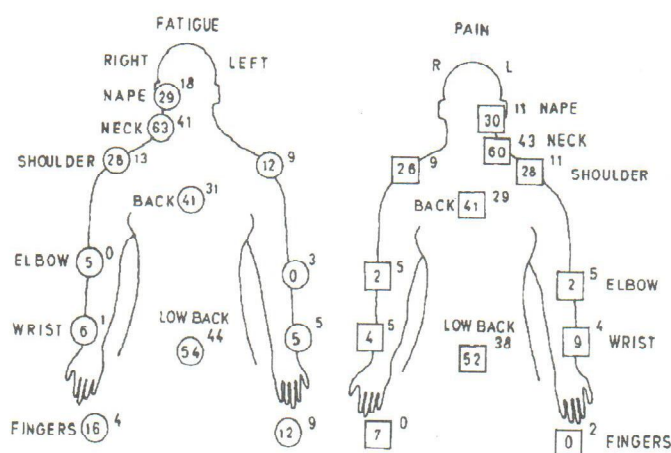


Figure. Body parts where VDT workers ($n=56$) and controls ($n=39$) most frequently complained of fatigue and pain. Numbers in checkboxes denote points of grading by VDT workers; numbers outside the checkboxes refer to points of grading by control workers.

Table 3. Parts of the body in which examinees most frequently reported symptoms

Body part	Fatigue		Pain	
	VDT group $n=56$	Control group $n=39$	VDT group $n=56$	Control group $n=39$
Low back	33.8%	28.2%	39.3%	25.6%
Back	17.8%	12.8%	14.3%	7.7%
Nape	14.2%	15.4%	19.6%	7.7%
Neck	3.6%	0	0	0
Right shoulder	0	2.6%	0	2.6%
Other	0	0	0	2.6%
Without symptoms	30.6%	31.0%	26.8%	56.4%

The most frequently diagnosed diseases of the musculo-skeletal system are shown in Table 4.

Disease of the cervical spine was most frequently diagnosed by a medical examination. Low back pain and extraarticular rheumatic diseases were diagnosed equally in both the VDT and control groups.

Table 4. Most frequent diagnoses of disease of the musculo-skeletal system

Diagnoses of disease of the musculoskeletal system (LMS)	VDT group n=56		Control group n=39	
	First diagnosis	Second diagnosis	First diagnosis	Second diagnosis
Low back pain	17.5%	3.6%	17.9%	0
Cervical syndrome	23.2%	10.7%	10.3%	10.3%
Cervicobrachial syndrome	9.9%	16.1%	10.3%	15.4%
Thoracic syndrome	3.6%	0	2.6%	0
Arthrosis of lower extremities	3.6%	3.6%	0	7.7%
Fibromyalgia	7.1%	7.1%	5.1%	2.6%
Periarthritis HSC	5.4%	3.6%	12.8%	0
Static syndrome	7.1%	14.3%	7.7%	2.6%
Other	1.8%	1.8%	2.6%	0
No diagnosis of LMS disease	21.2%	39.2%	31.7%	61.4%

As many as 60.7% of VDT workers and only 41% of control subjects were interested in participating in active relaxation during work. In the VDT group 57.1% expressed interest in organized therapy and so did 43.6% in the control group.

DISCUSSION

Workers on VDTs reported fatigue and pain in segments of the locomotor system more frequently than control subjects, although differences did not reach the level of statistical significance. Disorders of the locomotor system were determined significantly more frequently in VDT workers compared to similar studies in literature, which were carried out on larger samples (1, 2, 7). Data from an epidemiological study carried out on a random sample of the population of Croatia, aged 35 to 55 years indicate that every fourth woman and fifth man suffer from back pain (8). With regard to the cervical spine women suffer significantly from the effects of spondylarthrotic changes (21% women and 19% men, $P < 0.01$) (9). The results of this study should be considered in the light of the fact that women are more inclined to disorders or diseases of the cervical spine. The occurrence of fatigue and pain in such workers presents a challenge to scientists and physicians with regard to prevention, particularly secondary prevention by which disorders are prevented from becoming diseases which can lead to permanent work disability (4, 5, 7, 10). The group of examinees engaged in work on VDTs showed great interest in preventive recreational rest periods.

Efforts should be made to recognize early signs of »strain syndrome«, today a frequent diagnosis in workers on video display terminals, thus, preventing disorders becoming diseases (7, 11). Adaptation of the work chair and table to the anthropometric characteristics of the worker could significantly reduce the effect of unsatisfactory, unphysiological positions of the body. Workers should be encouraged to study the »dynamics of sitting«. Ergonomic adaptation is an economically acceptable method for the prevention of disease of the locomotor system.

LITERATURE

1. *Maeda K.* Occupational cervicobrachial disorders and its causative factors. *J Human Ergol* 1977;6:193-202.
2. *Hunting W, Laubli T, Grandjean E.* Postural and visual loads at VDT workplaces. *Ergonomics* 1981;24:917-31.
3. *Knave BG.* Work with video display terminals among office employees - subjective symptoms and discomfort. *Scand J Work Environ Health* 1985;11:457-66.
4. *Hagberg M.* Occupational shoulder and neck disorders. Umea: Swedish Work Environment Fund. 1987.
5. *Krapac L.* Oštećenja vratne kralježnice i gornjih ekstremiteta i profesija. *Arh hig rada toksikol* 1989;40:389-92.
6. *Goldoni J, Bobić J, Šarić M.* Psychological and ergonomic aspects of work with video display terminals. *Arh hig rada toksikol* 1992;43:219-26.
7. *Armstrong TJ.* Cumulative trauma disorders of the upper limb and identification of work-related factors. In: Millender LH, Louis DS, Simmons B. eds. *Occupational Disorders of the Upper Extremity*. New York: Churchill Livingstone, 1992:19-45.
8. *Mimica M, Krapac L, Malinar M.* Epidemiološko istraživanje kroničnih reumatskih bolesti u našoj populaciji. *Lij vjes* 1980;102:539-42.
9. *Krapac L, Mimica M.* Pogostnost reumatskih težav vratne hrbtnice prinasa in v svetu. *Zdrav vestn* 1989;58:23-26.
10. *Krapac L, Krmpotić A, Pavićević L, Domljan Z.* Cervicobrachial syndrome - work and disability. *Arh hig rada toksikol.* 1992;43:255-62.
11. *Pećina M.* Sindromi prenaprezanja. Zagreb: Globus, 1993:9-34. (in Croatian)

Sažetak

SINDROM ZAMORA I BOLI U LOKOMOTORNOM SUSTAVU PRI RADU S VIDEO TERMINALIMA

Prikazuju se rezultati istraživanja pojave zamora i boli u strukturama lokomotornog sustava djelatnika (n=56) koji znatan dio rada provode sjedeći uz računalo. Poredbenu skupinu (n=39) činili su ispitanici koji imaju pretežno slobodan ritam rada i neznatna fizička opterećenja. Zamor i bol se češće javljaju mišićima i zglobovima ispitanika koji rade za računalima (76,8% prema 59% u poredbenoj skupini), ali razlike nisu dosegle statističku značajnost. Bol se najčešće javljala u vratnoj i slabinskoj kralježnici, ali i u zglobovima dominantne ruke. Pri radu se umor u ispitivanoj skupini najčešće pojačavao, ali i smanjivao (37,5%), dok se bol izrazito pojačavala tijekom rada (35,7%). U ispitivanoj skupini, na temelju kliničkog reumatološkog pregleda i uvida u raniju medicinsku dokumentaciju najčešće je postavljana dijagnoza cervikalnog sindroma

(23,2% prema 10,3% u poredbenoj skupini), dok je križobolja podjednako dijagnosticirana u obje skupine (17,5%). Ispitanici ove tegobe u 46,9% povezuju s nepovoljnim uvjetima rada, a u poredbenoj skupini to smatra 17,9% anketiranih. Raspravlja se o potrebi provođenja rasteretnih vježbi na samom radnom mjestu, za koje je interes pokazalo 60,7% anketiranih iz ispitivane, i 41% iz poredbene skupine, kao i preventivnim rekreativnim odmorima djelatnika za računalima. Napominje se potreba uvođenja ergonomskih principa u radu s računalima, posebice glede prilagodbe radnog stolca, stola, nosača teksta i podloška za noge, te poštovanja antropometrijskih zahtjeva, kao i radnog vremena. Naglašava se korisnost kretanja i izometričkih vježbi na radnom mjestu.

Cljučne riječi:

bol, profesionalna izloženost, reumatološki pregled, umor

Requests for reprints

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