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## SUBJECTIVE ESTIMATION OF ERGONOMIC CONDITIONS OF WORKING WITH VIDEO DISPLAY UNITS

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In a group of 49 operators entering data into video display units, the type and frequency of subjective complaints were assessed and subjective assessment of ergonomic working conditions was examined. A detailed ergonomic analysis of the equipment and workplaces was done. The results showed a high frequency of subjective complaints. Incompatibility was established between the objectively measured ergonomic features and subjective estimation of the workplaces.

*Key terms:*  
computer-human interaction, occupational  
exposure, subjective complaints

The introduction of new technologies has brought along new categories of psychic problems, known under the common name of «technostress». The term was introduced in Japan to denote two typical groups of reactions to the introduction of new technologies. One group comprised refusal, inflexibility and fear; and the other uncritical enthusiasm with new working possibilities leading towards complete dedication to job and loss of social contacts.

The degree of frustration and stress reactions as well as the degree of general fatigue of operators are directly related to the computer imposed rhythm and job demands. It is well known that overburdened operators complain of general fatigue, depressive mood, inertness, irritation and exhaustion (1-4). That is why their working abilities tend to be diminished (1, 2). The frequency of the problems shows a good correlation with the total number of hours spent in work with computers, as well as with the number of hours without rest. They can cause a high rate of absenteeism and sick leaves, and an elevated workforce fluctuation.

The aim of this study was to describe the difference between the results of objective ergonomic analysis and subjective perception of ergonomic characteristics of work with video display units.

## SUBJECTS

The subjects in the study were 49 persons with secondary school education, aged between 19 and 35 years ( $M=26.0$ ), who worked with video display units for a period from three to 169 months ( $M=43.3$ ). Forty-two subjects were women. Thirty-six subjects worked only in the morning hours and 16 worked in shifts (morning and/or afternoon). They all worked in the same working premises equipped with 80 video display units, entering data six to eight hours a day.

## METHODS

A standardized, especially prepared questionnaire was administered to all subjects, in order to assess the frequency and type of subjective complaints pertaining to work with video display units. The subjective perception of ergonomic conditions was in the focus of interest, and was correlated with subjective complaints. The questionnaire consisted of questions pertaining to personal and working histories, satisfaction with job, psycho-physical discomfort connected with ergonomic features of the workplace, and the frequency of the occurrence of eye, muscular/skeletal, and psychological problems related to work with video display units.

Ergonomic analysis of equipment (monitors and keyboards), and workstations was carried out according to the recommendations of The Central Organization of Salaried Employees in Sweden (TCO 1986).

## RESULTS AND DISCUSSION

Many authors have focussed attention on the importance of the pattern of working conditions and individual characteristics in the appearance of physical and psychological disturbances (1-7). The factor that may help understand the complexity of the problem and a variety of possible health effects is as *Caplan* (1) calls it "misfit" between the individual perception of the working conditions and actual conditions.

Ergonomic analysis (3) showed six inappropriate features: 1. unstable chair, 2. reduced work surface, 3. screen size too small, 4. lack of vertical monitor adjustment, 5. unstable keyboard, 6. lack of local illumination for monitors with negative contrast. Tables 1 and 2 allow to see an interesting fact: the first five variables listed above were falsely perceived as appropriate by a very high percentage of subjects (46.9-98.0%). For example, even the very obvious fact that none of the monitors were vertically adjustable was overlooked by 40 subjects (82%). This was corroborated by previous results obtained from canonical correlations (3). On the other hand three variables, which complied with ergonomic recommendations, were falsely perceived as "uncomfortable" by as many as 29-61% of the subjects. Although monitors did not glitter, even 30 (61%) operators



perceived them as glittering. The same was true of the variables »monitor reflection« and »keyboard reflection« with 29 and 47% of incorrect subjective perceptions. The most striking discordance concerned the estimation of appropriate screen size. Although objective analysis showed the screen to be too small for data entry, only one of our 49 subjects perceived the fact.

Table 1 *Ergonomic characteristics of computer equipment and subjective perception (n=49)*

Characteristics	Objective analysis	Subjective perception			
		Yes		No	
		f	%	f	%
Appropriate screen size	No	48	98	1	2
Monitor glitter	No	30	61	19	39
Monitor reflection	No	14	29	35	71
Appropriate character design	Yes	44	90	5	10
Appropriate line distance	Yes	46	94	3	6
Possible vertical monitor adjustment	No	40	82	9	18
Stable keyboard	No	38	78	11	22
Keyboard reflection	No	23	47	26	53

Table 2 *Ergonomic characteristics of VDU workplace and subjective perception (n=49)*

Characteristics	Objective analysis	Subjective perception			
		Yes		No	
		f	%	f	%
Stable chair	No	38	78	11	22
Adequate spaciousness	No	23	47	26	53

The results of the study showed a high incidence of subjective complaints which is in accordance with the data from literature (1, 2, 5-7). Obviously, the dominant subjective complaints call for further efforts to adapt work processes and environment to man (7). We believe that the complex interaction between the physical, ergonomic, and psychological factors associated with the computerization of office jobs may also require further multidisciplinary investigations. A study design which would include a greater number of subjects in ergonomically different conditions of work, but on the same jobs, could allow extraction of some stable psychological factors which, very probably, reflect specific difficulties in work with display units and which might, in fact, remain unrecognized.

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## Sažetak

## SUBJEKTIVNA PROCJENA ERGONOMSKIH UVJETA RADA S RAČUNALIMA

U skupini od 49 operatera zaposlenih na unosu podataka u računalo, ispitana je upitnikom vrsta i učestalost subjektivnih smetnji te subjektivna procjena ergonomskih uvjeta rada. Također je napravljena detaljna ergonomska analiza opreme i radnih mjesta. Rezultati su pokazali visoku učestalost subjektivnih smetnji. Nađena je i nepodudarnost između objektivno utvrđenih ergonomskih nedostataka radnih mjesta i subjektivne procjene istih radnih mjesta.

*Ključne riječi:*

interakcija računalo-čovjek, profesionalna izloženost, subjektivne smetnje

## Requests for reprints

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