

# Assessment of Subjective Stress in Video Display Terminal Workers

Gianfranco TOMEI<sup>1</sup>, Maria Valeria ROSATI<sup>1</sup>, Agnese MARTINI<sup>1</sup>, Lorenzo TARSITANI<sup>2</sup>,  
Massimo BIONDI<sup>2</sup>, Paolo PANCHERI<sup>2</sup>, Carlo MONTI<sup>1</sup>, Manuela CIARROCCA<sup>1</sup>,  
Assuntina CAPOZZELLA<sup>1</sup> and Francesco TOMEI<sup>1\*</sup>

<sup>1</sup>Occupational Medicine Department, University of Rome “La Sapienza” Viale Regina Elena 336, 00161 Rome, Italy

<sup>2</sup>III Psychiatric Clinic, University of Rome “La Sapienza” Viale dell’Università 30, 00185 Rome, Italy

*Received August 1, 2005 and accepted February 1, 2006*

**Abstract:** Stress assessment in the workplace has been focused on its environmental, psychological and biological aspects. We carried out an evaluation of the subjective components of stress in a working population of 60 subjects employed in a large Public Service, 30 Video Display Terminal (VDT) workers (15 men and 15 woman) and 30 office-workers not assigned to VDT (15 men and 15 woman), by using the “Rapid Stress Assessment Scale”: a short questionnaire of easy administration in work environment. VDT workers of both sexes showed higher total stress score vs. office workers (respectively  $p<0.05$ ,  $p<0.05$ ). Gender differences were present: female VDT workers showed higher scores of clusters anxiety ( $p<0.001$ ) and aggressiveness ( $p<0.05$ ); male VDT workers’ score were significantly higher in somatization ( $p<0.05$ ) and aggressiveness cluster. Our results showed that in VDT workers are experienced greater subjective response to stress than “office workers” and confirm the gender differences in stress experiencing.

**Key words:** Stress, Occupational health, VDT work, Gender specificity, Questionnaire

During the last 20 yr the use of computer came to be practically ubiquitous and, against the considerable improvements in the working performances, it is nowadays acknowledged as one of the major causes of chronic stress at the workplace<sup>1,2</sup>.

As recently Lundberg<sup>3</sup> outlined stress can be defined as “the imbalance between perceived demands from the environment and the individual’s perceived resources to meet those demands”. When the commitment required by work is exceeding in comparison with the worker’s capacity to fulfil it and the worker himself is not able to establish and adapt important elements of his own working conditions, the situation becomes stressful: this will probably hasten the wear and tear rate of the body, increasing the risk of disease. Several working factors, including the labour organization and the technological devices employed, can produce an immediate reaction of stress, which changes according to individual characteris-

tics and susceptibility: if these short-term reactions become chronic, they can provoke many effects on health<sup>4</sup>.

High workload, increased work pressure and low job control were related to high daily life stress in VDT (video display terminal) operators<sup>5,6</sup>. Marcus and Gerr<sup>7</sup> showed that increased psychosocial strain, increased reporting of job stress and lack of social support were all related to an increase of clinical symptoms.

An always growing importance is attached to the evaluation of the diverse aspects of stress in the workplace: whereas several works published so far in the literature concerned the assessment of objective job stress/stressors, at the moment the attention is focused on means for the evaluation of the subjective aspects of stress<sup>8</sup>) that emphasise the assessment and perception of the injury caused by an experience or a situation.

Therefore, a dimensional evaluation of stress through the assessment of its subjective components was carried out, by using a short questionnaire of easy administration

\*To whom correspondence should be addressed.

in the work environment<sup>8)</sup>.

The research was carried out on an initial working population of 200 subject performing clerical tasks in a large Public Service. A random sample of 60 subjects with at least 2-yr of service was included in the study: 30 workers assigned to VDT and 30 workers not assigned to VDT matched for sex, age and working life (Table 1).

In compliance with the Italian legislation, the subjects employing alphanumeric displays for a period  $\geq 20$  h/wk, deducted the pauses of 15 min every 2 h, were considered VDT operators.

All the subjects worked 5 d/wk for 36 h of effective service; the group including the VDT operators used VDT for 27 h/wk (SD 2.5; min-max 24–35) on average, deducted the pauses of 15 min every 2 h. Mean VDT operation time in non-VDT workers are 5 h/wk (SD 1.76; min-max 2–8). None of the subjects studied performed front-line activities nor used VDT in the spare time more in order than 1 h total to week.

For both groups, pertaining to the same Public Service, the working environment was adequate and the working equipments were suitable and in perfect conditions. The ergonomic and illuminino-technical conditions were analogous and, therefore, it has not been thought necessary to carry out the measures.

All VDT and non VDT office workers were asked to complete a questionnaire about age, sex, working life, tasks, protracted use of any type of drugs (for at least 6 months); considering that drug consumption can be correlated with stress related disorders, we considered these reports as aspecific index of the use of allopathic medicine.

For the methodological organization of data collection, there were used specific socio-communicative competences related to the development of tools suitable for the collection of information and analysis of data.

All workers were administered the “Rapid Stress

Assessment scale” (RSA) to complete on a non-working day<sup>8)</sup>. We used this scale because of the lack of validated Italian versions of short psychometric instruments to assess subjective stress in large samples. This is a multiple choice self-assessment rating scale with 15 items, with four possible answers, ranging from “not at all” to “much” and rated from 0 to 3. This scale explores individual responses to stressful situations and divides them into five dimensions (clusters) which are able to quantify the stress: depression, anxiety, somatization, aggressiveness and lack of social support. Each cluster comprised three items rating 0–9; the total stress score is obtained from the addition of the 5 clusters score and ranges from 0 to 45 points. The items comprised in the different clusters are showed in Table 2.

Since the RSA is specific, flexible and very practical and easy to administer and process (about three minutes to complete it and thirty seconds for the computerised scoring) it proved to be sufficiently reliable and valid (test-retest reliability:  $r$  between 0.7 and 0.92,  $p < 0.0001$ ; significant content validity, with RSA areas correlating with “Minnesota Multiphasic Personality Inventory” (MMPI) scales; Pearson’s coefficients: depression  $r = 0.61$ , anxiety  $r = 0.6$ , somatization  $r = 0.54$ , aggressiveness  $r = 0.38$ ,  $p < 0.0001$ ; lack of social support  $r = 0.38$ ,  $p < 0.005$ . Satisfactory concurrent validity<sup>8)</sup>.

All the subjects agreed to the processing of their personal data, stating that they were aware that those data fall within the category of “sensitive data” and they agreed for the data obtained from the protocol to be treated anonymously and collective, with scientific procedures and objectives, according to the principles of the Declaration of Helsinki.

Statistical analysis of the data was based on calculation of means, standard deviation (SD), and frequencies, according to the nature of the single variables. The differences between the means were compared by using

**Table 1. Age, working life, VDT operation time and education in VDT and non VDT office workers of both sexes**

		VDT workers N=30		non VDT workers N= 30	
		Female N=15	Male N=15	Female N=15	Male N=15
Age (yr)	Mean	41.3	44.4	40.9	44.2
	SD	7.1	8.5	6.9	6.0
Working life (yr)	Mean	13.4	20.3	12.9	20.5
	SD	6.8	8.9	7.1	8.7
VDT operation time (h/wk)	Mean	5.0	5.0	27.0	27.0
	SD	1.7	1.8	2.5	2.4
Education (yr)	Mean	15.5	16.4	16.6	17.1
	SD	2.7	4.3	3.1	3.9

**Table 2. RSA clusters' items**

Clusters	Items
Anxiety	I feel restless I am worried I have trouble remembering things
Depression	I feel discouraged I am in low spirits I am in a good mood*
Lack of social support	My spare time is well spent* I can talk with people who understand my difficulties* I live a little be isolated from others
Somatization	I just need to relax myself I have some physical symptoms (headache, muscular pains, chest tightness or pressure, palpitations) that I think there are caused by nervous tension I eat badly or irregularly
Aggressiveness	I feel irritable I feel annoyed I'm angry

\*The items are rated on the contrary (from 3 to 0) because they assess characteristics opposed to their dimension.

**Table 3. Total and clusters' scores in VDT and non VDT office workers of both sexes**

		Female Workers		P	Male Workers		P
		VDT	non VDT		VDT	non VDT	
Anxiety	mean $\pm$ SD	4.4 $\pm$ 2.0	1.5 $\pm$ 1.7	<0.001	2.8 $\pm$ 1.8	1.6 $\pm$ 1.5	n.s.*
	min-max	1-8	0-7		0-5	0-4	
Depression	mean $\pm$ SD	3.6 $\pm$ 2.3	2.2 $\pm$ 2.1	n.s.*	3.2 $\pm$ 1.6	1.9 $\pm$ 1.5	n.s.*
	min-max	0-7	0-6		0-7	0-5	
Lack of social support	mean $\pm$ SD	3.5 $\pm$ 1.7	2.6 $\pm$ 2.0	n.s.*	3.1 $\pm$ 1.6	2.1 $\pm$ 1.1	n.s.*
	min-max	0-5	0-6		1-6	1-4	
Somatization	mean $\pm$ SD	4.1 $\pm$ 1.9	3.7 $\pm$ 2.1	n.s.*	4.7 $\pm$ 2.0	2.7 $\pm$ 1.4	<0.05
	min-max	2-7	1-8		0-7	0-5	
Aggressiveness	mean $\pm$ SD	2.9 $\pm$ 1.7	1.6 $\pm$ 2.2	<0.05	2.9 $\pm$ 2.5	0.8 $\pm$ 0.6	<0.05
	min-max	0-7	0-7		0-8	0-2	
Total	mean $\pm$ SD	18.1 $\pm$ 6.6	11.1 $\pm$ 8.3	<0.05	16.1 $\pm$ 7.5	9.2 $\pm$ 3.9	<0.05
	min-max	10-30	2-29		4-27	3-18	

n.s.: not significant.

Student's t-test for unpaired data. Frequencies of the single variables were compared by using the chi-square test with Yates's correction and the Fischer's exact test. The Fischer's exact test was used when the overall total was less than 20 or between 20-40 and the lowest of the four expected values were less than 5. RSA's scores evaluation was performed by means of Mann-Whitney U test. The level of significance was established at  $p < 0.05$ . Statistical analysis was done using SOLO-BMDP™ Statistical Software package.

The evaluation of the RSA scores showed a stress sub-

jective level significantly higher in the VDT operators compared to the control group (man  $p < 0.05$  and woman  $p < 0.05$ ).

This result is significant for the anxiety and aggressiveness clusters in women ( $p < 0.001$  and  $p < 0.05$ ) and for the somatization and aggressiveness clusters in men ( $p < 0.05$  and  $p < 0.05$ ).

In woman, the cluster related to depression approaches to significance, however without reaching it ( $p = 0.054$ ).

Table 3 show the scores obtained in the two groups of workers for the different clusters tested, as well as the

total scores.

The percentage of subjects making use of prolonged allopathic therapies did not indicate significant differences between VDT and non-VDT office-workers for both sexes, as did not the total scores obtained for the different clusters.

These results suggest that the workers assigned to VDT perceive a higher maladapting response of stress versus the office-workers who did not use VDT. This confirms data from literature about objective/subjective stress and work at VDT<sup>9–12</sup>.

Given the always growing importance assigned to chronic stress in the field of occupational pathology, there is the need of adequate means for the evaluation of stress and its effects in the work environment. Also the possible identification of the subjects most susceptible to the stress caused by work is essential, considering that susceptibility to stressful situations can vary greatly from individual to individual.

The analysis of gender differences confirm the data supplied in some studies on stress evaluation<sup>3, 13–14</sup>) and, as we have already observed, suggest the possibility of a higher perception of stress in the female sex<sup>15</sup>); women seem to express the uneasiness associated to the working activity at the level of anxiety and aggressiveness, whereas men appear to show a greater tendency to somatization and aggressiveness.

The results of this study focus on the importance of identifying and evaluating work-related stress in this work category and others, in order to identify the sources and implement preventive procedures to limit or neutralise stress, for example by reorganising professional duties, improving social support, adapting physical working conditions to the workers' abilities, demands and reasonable expectations, and by providing adequate compensation for the workers' efforts, in order to improve their physical, mental and social well being<sup>16</sup>).

Standardized or simple approaches to the development of a stress preventive programme are not available. The programme design, as well as the suitable solutions are influenced by manifold factors including, for example, the complexity of labour organization, the availability of resources and, in particular, the presence of different kinds of stressors (working overload, difficult interactions with the public, scarcely flexible work programme, kind of job)<sup>2</sup>).

Three distinct points are crucial: identification, intervention and problem evaluation. The best method to explore the extent and the cause of a suspected problem of stress into a company depends partially on the typology of the company itself as well as on the availability of resources. In this stage, the collection of information about workers' sensations, moods, stress perception lev-

els, health and degree of satisfaction is essential.

Once the causes of stress have been identified and the extent of the problem has been understood, the next step consists in the implementation of an interventional strategy, such as the redesign of work, with a redistribution of the working load; the interventions can be also more specific, focussing on individual workers, often reluctant to every kind of organizational change. In such cases, interventions of assistance and stress management are required.

Some interventions could be quickly effected (e.g., communication or training in stress management), whereas others can take longer times (e.g., redesign of the production process). Before putting the interventions into practice, workers should be informed about the actions that will be undertaken and their realization times. A (re)-evaluation is essential to understand if the intervention is producing the desired effects and if changes in that direction are necessary. The evaluation stage serves also to bring into focus the information collected during the problem identification stage, including the information supplied by workers about working conditions, levels of stress perceived, health problems and degree of satisfaction<sup>9, 10</sup>).

In our opinion it could be useful to provide workers with a questionnaire, like that used in the present study, in order to identify possible stressor in the workplace and the subjective reaction to them by workers. The adopted means, thanks to the rapidity of administration and scoring, allowed an easy evaluation in the work environment.

## References

- 1) Rantanen J (1999) Challenges for occupational health from work in the information society. *Am J Ind Med Suppl* **1**, 1–6.
- 2) Paoli P, Merlié D, European Foundation for the Improvement of Living and Working Conditions (2001) Third European survey on working conditions 2000. 86, Office for Official Publications of the European Communities, Luxembourg.
- 3) Lundberg U (2002) Psychophysiology of work: stress, gender, endocrine response, and work-related upper extremity disorders. *Am J Ind Med* **41**, 383–92.
- 4) Michie S (2002) Causes and management of stress at work. *Occup Environ Med* **59**, 67–72.
- 5) Smith MJ (1997) Psychological aspects of working with video display terminals (VDTs) and employee physical and mental health. *Ergonomics* **40**, 1002–15.
- 6) Conway FT (1999) Psychological mood state, psychosocial aspects of work, and musculoskeletal discomfort in intensive video display terminal work. *Int J Hum Comp Interact* **11**, 95–107.

- 7) Marcus M, Gerr F (1996) Upper extremity musculoskeletal symptoms among female office workers: associations with video display terminal use and occupational psychological stressors. *Am J Ind Med* **29**, 161–70.
- 8) Tarsitani L, Biondi M (1999) Sviluppo e validazione della scala VRS (Valutazione Rapida dello Stress). *Medicina Psicosomatica* **3**, 163–77 (in Italian).
- 9) Seppala P (2001) Experience of stress, musculoskeletal discomfort, and eyestrain in computer-based office work: a study in municipal workplaces. *Int J Hum Comput Interact* **13**, 279–304.
- 10) Smith MJ, Conway FT, Karsh BT (1999) Occupational stress in human computer interaction. *Ind Health* **37**, 157–73.
- 11) Steffy BD (1989) The psychological impact of video display terminals on employees' well-being. *Am J Health Promot* **4**, 101–7.
- 12) Pickett CW, Lees RE (1991) A cross-sectional study of health complaints among 79 data entry operators using video display terminals. *J Soc Occup Med* **41**, 113–6.
- 13) Consoli SM, Taine P, Szabason F, Lacour C, Metra PC (1997) Development and validation of a perceived stress questionnaire recommended as a follow-up indicator in occupational medicine. *Encephale* **23**, 184–93.
- 14) Murphy SA, Beaton RD, Cain K, Pike K (1994) Gender differences in fire fighter job stressors and symptoms of stress. *Women Health* **22**, 55–69.
- 15) Pancheri P, Martini A, Tarsitani L, Rosati MV, Biondi M, Tomei F (2002) Assessment of subjective stress in the municipal police force of the city of Rome. *Stress and Health* **18**, 127–32.
- 16) Cooper CL, Cartwright S (1994) Healthy mind, healthy organization a proactive approach to occupational stress. *Human Relations* **47**, 455–71.