

STRESS CHARACTERISTICS IN DIFFERENT WORK CONDITIONS: IS IT POSSIBLE TO IDENTIFY SPECIFICITY OF RISK FACTORS BY THE QUESTIONNAIRE METHOD?

A. SANCINI, F. TOMEI, M.P. SCHIFANO, V. DI GIORGIO, T. CACIARI,
M. FIASCHETTI, L. SCIMITTO, C. CETICA¹, M. FIORAVANTI² and G. TOMEI²

University of Rome "Sapienza", Department of Occupational Medicine, Rome; ¹EURISTAT-Scientific Director, Rome; ²University of Rome "Sapienza", Department of Psychiatric Science and Psychological Medicine, Rome, Italy

Received November 3, 2009 – Accepted March 3, 2010

The aim of this study is to identify, by a brief ad hoc questionnaire, specific dimensions of perceived occupational stress that could be relevant in two different work conditions of female workers: visual display unit (VDU) operators, for whom the risk of work-related stress is already known in literature, and kindergarten teachers, for whom very few studies have examined this risk. A questionnaire, prepared specifically for workers, was filled in by 70 all-female kindergarten teachers and 70 all-female VDU operators. The two groups were matched for age and length of service. The questionnaire was examined by factor analysis and questionnaire single item scores. Total score and factor scores were examined between group comparison of means analysis. The level of significance was established at $p < 0.05$. Kindergarten teachers show significantly higher values of the questionnaire total score than VDU operators, indicating a higher level of perceived stress related to their occupation. In particular, the factor scores concerning perceived load of work responsibilities, the first of the three factors accounting for the structure of the questionnaire (1. perceived load of work-responsibility; 2. independence and autonomy in performing work-duties; 3. negative features of work interfering with psycho-physical wellbeing) are significant between groups. Compared to VDU operators, kindergarten teachers perceive a more stressful condition of responsibility in taking independent decisions and autonomously managing their work. When appropriate comparisons are performed between groups of workers operating under different occupational conditions, it is possible to identify, using an ad hoc questionnaire, different sources of occupational stress which are effective in the work environment of different categories of female workers.

Occupational stress is a very complex problem that may be related to organizational, physical, social and environmental work features (1). Italian legislation, through the Legislative Decree n.81/08, art. 28 paragraph 1 (EU Directive 89/391/CEE), made it mandatory to evaluate work-related stress

risk factors, and in order to accomplish this task ad hoc tools and procedures are needed.

Scientific data identify different methods for assessing work-related stress hazards: subjective ones, based on questionnaires, often complex and composed of many items, rating scales and

Key words: stress, workers, kindergarten teachers, VDU operators

Mailing address:

Prof. Francesco Tomei,
Via Monte delle Gioie No. 13
00199 Rome, Italy
Tel: ++39 06 49912565
Fax: ++39 06 86203178
e-mail: francesco.tomei@uniroma1.it

psychometric tests (2-3); physiological methods, such as biological indicators and instrumental exams (4-5); epidemiological procedures, to quantify indicators such as absences from work due to illness, risk factors for allergies, gastrointestinal and psychological disorders, etc. (6).

Since the decision to consider one or more stressors stems from the adopted theoretical model and since there is no unique and standardized tool considering and evaluating all the variables that can influence the stress condition, we have proposed an experimental brief self-assessment questionnaire, to analyze, in a large sample of workers, the sources of stress and psycho-physical alteration in workplace mostly referred to workers (7). This questionnaire aims to be easily understood by workers and quickly and easily administered by the occupational physician during medical surveillance visits; it also aims to be a screening tool on large samples and, at the same time, to detect the need for a further in-depth examination of single workers.

This study makes a comparative analysis of two populations of healthy female workers: VDU operators, for whom extensive data document occupational stress hazards (8-9-10-11-12-13) and kindergarten teachers, for whom there is a very poor documentation about specific stressors related to their particular work conditions (14-15).

The aim of this study is to evaluate the possibility to assess, by an ad hoc questionnaire, the specific conditions of perceived stress of different types of female workers which could be related to the specific environmental and organizational factors of their type of work.

MATERIALS AND METHODS

The ad hoc questionnaire is composed of 8 items that investigate: degree of autonomy, independence of decision and continuous effort during working hours, decision-making responsibility, issues of interaction with colleagues and/or users, opportunity to receive satisfaction from work and concerns about the impact of work on health status. Answers are distributed over 7 points, from 1 (not at all) to 7 (very much); total scores are rated from 8 to 56.

The questionnaire was given to 140 female workers: 70 kindergarten teachers and 70 VDU operators. The two groups were matched by age and length of service (Table

I). They were asked by the occupational physician to complete the experimental self-description questionnaire during their routine medical surveillance visits.

All the participants signed a written consent to the study after being informed about the processing of their personal data and agreeing for the data obtained from the protocol to be treated anonymously and collectively according to the principles of the Helsinki Declaration.

Statistical analysis of the data was carried out comparing differences of means between groups both for single item scores and for the questionnaire total score. The level of significance was established at $p < 0.05$. A factor analysis, method of principal components with an orthogonal rotation of the factors, was performed in order to explore the structure of the questionnaire and the single factor scores were compared between groups. Factor extraction was limited to those with an age and value greater than 1.

The items of the questionnaire were analyzed for their reliability by Cronbach's alpha. Questionnaire data were analyzed controlling the potential effects of the cultural levels of the participants.

RESULTS

Kindergarten teachers have a significantly higher total score than VDU operators (Fig. 1). Kindergarten teachers present also higher scores of items n. 3, 4, 5 and 8 than VDU operators and lower scores of item n.7. The most between group discriminating items was no. 5 (Table II).

Factor analysis extracts three factors (Table III): 1) perceived workload responsibility; 2) independence and autonomy in performing work duties; 3) negative features of work, interfering with psycho-physical wellbeing. The percentage of variance expressed by these three factors is about 70% of

Table I. Age and length of service in the examined populations.

	Kindergarten teachers N=70 Mean (SD)	VDU operators N=70 Mean (SD)
Age	47.59 (6.68)	48.24 (7.28)
Length of service	18.67 (9.89)	19.72 (10.23)

SD = Standard Deviation

There are no significant differences between groups.

Table II. Means and standard deviations of the items and of the total score of the questionnaire.

ITEMS	Kindergarten teachers (70) Mean (SD)	VDU workers (70) Mean (SD)
1) How much autonomy do you have in your current job?	2.91 (1.34)	3.41 (1.69)
2) How much independence of decisions does your current job allow you to have?	3.20 (1.43)	3.67 (1.79)
3) What kind of continuous effort during working hours does your current job require?	6.46 (1.16) ^a	5.11 (1.64)
4) How much does your work require sudden decisions?	5.40 (1.61) ^a	4.11 (2.04)
5) How much responsibility does your work require?	6.90 (0.39) ^a	4.57 (2.03)
6) How much difficulty do you feel in social relationships because of your job?	2.97 (2.16)	2.84 (2.17)
7) How much do you feel satisfied by your current job?	2.04 (1.49)	3.27 (1.93) ^b
8) How much does your job provoke negative effects on your health, according to you?	4.04 (2.19) ^a	3.03 (2.15)
Sum of the item scores	33.93 (5.82) ^a	29.80 (7.78)

SD = Standard Deviation

^a kindergarten teachers have significantly higher means with respect to VDU workers

^b VDU workers have significantly higher means with respect to kindergarten teachers

Table III. Factor analysis.

Item	Factor 1	Factor 2	Factor 3
1) How much autonomy do you perceive in your current kind of work?	-0.136037	-0.912385	-0.000905
2) How much independence of decisions your current work allows you?	-0.123976	-0.904017	0.066813
3) What kind of continuous effort during working hours does your current occupation require?	0.622376	0.113791	0.224669
4) How much does your work require sudden decisions?	0.810340	0.124813	0.135388
5) How much responsibility does your work require?	0.867307	0.069584	0.075165
6) How much do you feel difficulties in relationships because of your occupation?	0.139459	0.110425	0.803523
7) How much do you feel satisfied by your current work?	-0.575875	-0.193185	0.536571
8) How much does your work provoke negative effects on your health, according to you?	0.416936	-0.248547	0.664549
9) percentage of specific variance of factors	0.294377	0.224294	0.181763

Table IV. Means and standard deviation of factor scores.

FACTORS	Kindergarten teachers (70) Mean (SD)	VDU workers (70) Mean (SD)
1) perceived weight of work-responsibility	0.58 ^a (0.52)	-0.58 (1.01)
2) independence and autonomy in performing work-duties	0.072 (0.87)	0.87 (1.11)
3) work negative features, especially acting on psycho-physical health	0.02 (1.08)	-0.02 (0.91)

SD = standard deviation

^a = kindergarten teachers have significantly higher means with respect to female VDU workers

the total variance. Only the first factor is significant between group differences ($p=0.000$) (Table IV); kindergarten teachers feel that their condition of autonomy in taking decisions and conducting work is more stressful than VDU operators.

The 8 item questionnaire has a Cronbach's alpha of 0.50. Statistical analysis showed no correlation between the results and the cultural levels of participants.

DISCUSSION

In the assessment of work-related stress, the currently available specific tools for measurement and evaluation of stress-inducing factors for each worker and for the working population in general are scarce and often complex (16). In addition, the time required for administration, processing and any specific training for their use make them unfeasible in some clinical settings. This happens especially in protocols that require the evaluation on large samples, when it is essential to have quick and practical tools (16). This is why we have tried to create an ad hoc instrument that could easily and quickly analyze individual responses to stressful events, even on large samples.

To reach this aim, our questionnaire does not investigate all the dimensions of work-related stress, but the main ones, such as autonomy, responsibility, dissatisfaction, concerns about health, interpersonal relationships (17). The Cronbach's alpha of 0.50 is low, but considering the small numbers of items it

is indicative of a sufficient coherence of the present items in order to be treated as a whole by means of the questionnaire total score. It remains that these findings stress the need for further increasing the future number of items.

Analysis of the results obtained by comparing the subjective evaluation of potential sources of stress in two categories of female workers considered at risk of occupational stress, VDU operators and kindergarten teachers, shows that it is possible to identify different specific hazards of stress related to work conditions by questionnaire.

VDU operators belong to a widely studied category of workers for whom the risk of occupational stress is well-known. Indeed, the Italian legislation protects them from various risks, including occupational stress, in compliance with the Europe Agreement of the 8th October 2004, and especially mental fatigue, according to Italian Legislation. Many studies regard this type of workers. The possible sources of stress and mental fatigue for these workers are identified in workplace features, such as microclimate, noise and ergonomic factors (11), organizational factors such as repetitiveness, monotony of tasks, dissatisfaction, excessive sedentariness, prolonged time in using VDU and low possibility of human relations (8-13). For these factors, a correlation with an increase in aesthenopia and musculoskeletal symptoms is also demonstrated (9-10, 12-13).

Our results are consistent with this literature data: VDU operators show significantly higher scores for item no.7, regarding personal dissatisfaction,

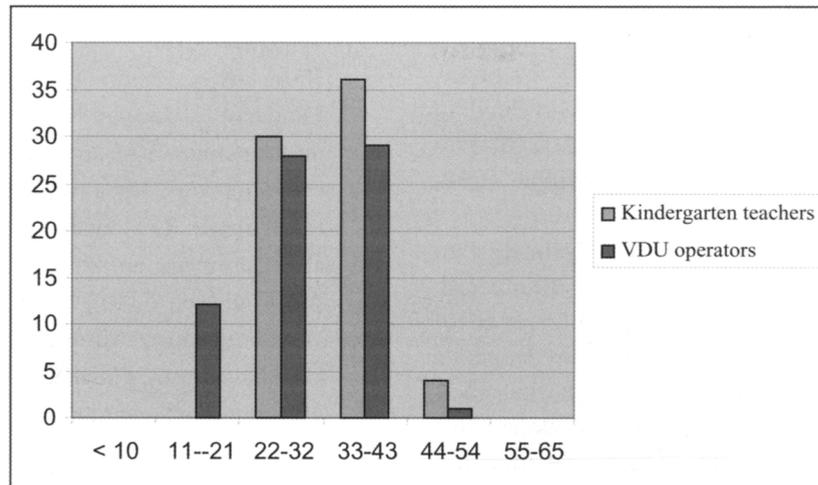


Fig. 1. Distribution of the total score in female kindergarten teachers and female VDU operators.

confirming that monotony and boredom of tasks, static workplace, low autonomy in division of work, little opportunity in taking decisions and in interacting with colleagues are perceived as the main sources of work-related stress.

Kindergarten teachers, who offer educational services for early childhood, fall into the teaching category, indicated by the European Foundation for the Improvement of Living and Working Conditions (17) as one of those at increased risk of stress in most European countries.

Many studies concern stress in the school environment, but they are mainly focused on primary and secondary school teachers, for whom, moreover, it is hard to identify unique sources of stress, common to every teacher and specific for the category, and different from stress risk factors of other types of workers (18-23).

In particular, only few studies are present in literature on kindergarten teachers (14-15), and for this reason we have chosen them as the category to analyze.

According to our results, the main sources of perceived stress in these female workers are: the continuous effort during working hours; the need to take sudden decisions; the high degree of responsibility; the possible negative consequences on health because of the exposure to various occupational risks, such as noise, prolonged maintenance of incongruous postures, atypical manual handling of loads (child weight could be between 8 and 20 kilos) and exposure to the biological agents responsible for

the common infectious diseases of childhood (24-25).

Particularly, as the significantly higher score of the first factor in factorial analysis shows, the autonomy of responsibility in taking decisions is perceived as the main source of work-related stress by kindergarten teachers.

The few available data match our results, showing that the continuous effort during working hours provoked by excessive physical and mental workload, the high degree of responsibility and the irregular shifts may contribute to the development of alterations in the wellbeing of kindergarten teachers (15). for whom the sources of stress, even if similar to those of primary school teachers, are peculiar in having to deal with parents for whom school is as a child-minding service and in having to perform non-teaching tasks, such as looking after the hygiene of children or replacing parental figures in cases of discomfort (14).

The evaluation of the score of total stress shows that female kindergarten teachers perceive stress more intensively than female VDU workers. The total scores are not high, because we are not evaluating patients with pathological conditions; but we identify an early perception of stress, or the tendency to react more distinctly under conditions of stress. Therefore, the statistically significant difference between the two groups may suggest that the perception of stress is greater in one group than the other, both in general and for some specific dimensions. If the results are confirmed by further

studies in other work categories, the relevance may be confirmed of the use of the questionnaire as a screening tool for working people, in order, firstly, to identify individual workers who need to be examined more in-depth and, at the same time, to assess the level of perception of occupational stress in the working population as a whole.

In conclusion, our results seem to indicate that female kindergarten teachers consider their high degree of responsibility due to the wide range of autonomy that they have in their everyday decisions and the continuous effort and attention that their work demands to be the main sources of stress, also because of the continuous interaction that their job requires with children and their parents. On the other hand, female VDU operators seem to be stressed especially by the repetitiveness of their duties which take place indoors and reduce their interpersonal relationships.

These results show that the features of work environment and job content that cause the development of specific stress reactions in different categories of workers could be evaluated by a questionnaire. This questionnaire may allow us to select individual workers to undergo an in-depth examination and simultaneously to develop preventive strategies targeted against the specific stress hazards identifiable in any work environment (26-29, 7).

REFERENCES

1. Cooper CL, Sloan SJ, Williams S. Occupational stress indicator management guide. Windsor: NFER-Nelson, 1988.
2. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. *J Occup Health Psychol* 1998; 3:322-55.
3. Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, Peter R. The measurement of effort-reward imbalance at work: European comparisons. *Soc Sci Med* 2004; 58:1483-99.
4. Hong RH, Yang YJ, Kim SY, Lee WY, Hong YP. Determination of appropriate sampling time for job stress assessment: the salivary chromogranin A and cortisol in adult females. *J Prev Med Public Health* 2009; 42:231-6.
5. Hjortskov N, Rissén D, Blangsted AK, Fallentin N, Lundberg U, Søgaard K. The effect of mental stress on heart rate variability and blood pressure during computer work. *Eur J Appl Physiol* 2004; 92:84-9.
6. Bourbonnais R, Mondor M. Job strain and sickness absence among nurses in the province of Québec. *Am J Ind Med* 2001; 39:194-202.
7. WHO – European Ministerial Conference on Mental Health. Helsinki, Finland, 12-15 January 2005. (<http://www.euro.who.int/document/MNH/ebrief06.pdf>).
8. Smith MJ. Psychosocial aspects of working with video display terminals (VDTs) and employee physical and mental health. *Ergonomics* 1997; 40: 1002-15.
9. Mocchi F, Serra A, Corrias GA. Psychological and visual fatigue in working with video display terminals. *Occup Environ Med* 2001; 58:267-71.
10. Seppälä P. Experience of stress, musculoskeletal discomfort, and eyestrain in computer-based office work: a study in municipal workplaces. *Int J Hum Comput Interact* 2001; 13:279-304.
11. Takahashi K, Sasaki H, Saito T, Hosokawa T, Kurasaki M, Saito K. Combined effects of working environmental conditions in VDT work. *Ergonomics* 2001; 44:562-70.
12. Larsman P, Sandsjö L, Klipstein A, Vollenbroek-Hutten M, Christensen H. Perceived work demands, felt stress, and musculoskeletal neck/shoulder symptoms among elderly female computer users. The NEW Study. *Eur J Appl Physiol* 2004; 96:127-35.
13. Tomei G, Rosati MV, Martini A, Tarsitani L, Biondi M, Pancheri P, Monti C, Ciarrocca M, Capozzella A, Tomei F. Assessment of subjective stress in video-display terminal workers. *Ind Health* 2006; 44:291-5.
14. Kelly AL, Berthelsen DC. Preschool teachers' experiences of stress. *Teaching and Teacher Education* 1995; 11:345-57.
15. Tsai E, Fung L, Chow L. Sources and manifestations of stress in female kindergarten teachers. *International Education Journal* 2006; 7:364-70.
16. Derogatis LR. BSI Brief Symptom Inventory: Administration, Scoring, and Procedure Manual (4th

- Ed.). Minneapolis, MN, 1993: National Computer Systems.
17. European Foundation for the Improvement of Living and Working Conditions 2005. Work-related stress. (www.eurofound.eu.int).
 18. Griffith J, Steptoe A, Cropley M. An investigation of coping strategies associated with job stress in teachers. *Br J Educ Psychol* 1999; 69:517-31.
 19. Friedman IA. Self-efficacy and burnout in teaching: the importance of interpersonal-relations efficacy. *Soc Psychol Educ* 2003; 6:191-215.
 20. Dorman JP. Relationship between school and classroom environment and teacher burnout: a LISREL analysis. *Soc Psychol Educ* 2003; 6:107-27.
 21. Dick R, Wagner U. Stress and strain in teaching: a structural equation approach. *Br J Educ Psychol* 2001; 71:243-59.
 22. Forcella L, Di Donato A, Coccia U, et al. Anxiety, job stress and job insecurity among teachers with indefinite or definite time contract. *G Ital Med Lav Ergon* 2007; 29:683-6.
 23. Santavirta N, Solovieva S, Theorell T. The association between job strain and emotional exhaustion in a cohort of 1028 Finnish teachers. *Br J Educ Psychol* 2007; 77:213-28.
 24. Kovess-Masféty V, Sevilla-Dedieu C, Rios-Seidel C, Nerrière E, Chan Chee C. Do teachers have more health problems? Results from a French cross-sectional survey. *BMC Public Health* 2006; 6:101-13.
 25. Bellingrath S, Weigl T, Kudielka BM. Chronic work stress and exhaustion is associated with higher allostatic load in female school teachers. *Stress* 2009; 12:37-48.
 26. Knezevic B, Milosevic M, Golubic R, Belosevic L, Russo A, Mustajbegovic J. Work related stress and work ability among Croatian university hospital midwives. *Midwifery* 2009; Epub ahead of print.
 27. Bartram DJ, Yadegarfar G, Baldwin DS. Psychosocial working conditions and work-related stressors among UK veterinary surgeons. *Occup Med* 2009; 59:334-41.
 28. Janwantanakul P, Pensri P, Jiamjarasrangsri W, Singsongsook T. Association between prevalence of self-reported musculoskeletal symptoms of the spine and biopsychosocial factors among office workers. *J Occup Health* 2009; 51:114-22.
 29. Sveinsdóttir H, Biering P, Ramel A. Occupational stress, job satisfaction, and working environment among Icelandic nurses: a cross-sectional questionnaire survey. *Int J Nurs Stud* 2006; 43:875-89.