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Occupational exposure to work-related stress, a proposal of a pilot study to detect psychological distress in collar-workers

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Key words: Occupational medicine, work-related stress, white-collar workers, depression, anxiety
Parole chiave: Medicina occupazionale, stress lavoro-correlato, depressione, ansia, lavoro d'ufficio

Abstract

Introduction. *Work-related psychosocial risks have been identified as significant occupational health and safety risks; the occupational physicians must assess and monitor the health status of workers in order to verify that work is not a source of harm to exposed operators. The aim of the study was to investigate the outcomes related to anxiety and depression traits in workers exposed to stress-related work.*
Methods. *A questionnaire was administered to a large population of Italian public administration workers; the Centre for Epidemiologic Studies - Depression Scale questionnaire was used to measure depression, the Self rating Anxiety Scale was used to measure anxiety, the UK Management Standards Indicator tool questionnaire was used to assess work adjustment. A descriptive analysis, a multivariate analysis, as well as logistic regression models were used to assess the health outcomes related to stress.*
Results. *A total of 292 workers participated in the study; 100% of participants had a Centre for Epidemiologic Studies - Depression Scale score over the cut-off; 41.78% had a Self rating Anxiety Scale score over the cut-off; the results support a correlation between the Centre for Epidemiologic Studies - Depression Scale results and the UK Management Standards Indicator tool results; and a correlation between Self-rating Anxiety Scale results and the UK Management Standards Indicator tool results.*
Conclusions. *The Demand, Management, Support and Relationship results were associated with mental health outcomes, and it could be a useful tool in occupational medicine, to identify workers at risk for negative mental health outcomes, becoming an essential tool in workers' health assessment and for prevention of mental health disorders.*

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Introduction

Work-related psychosocial risks, which include issues such as work-related stress, have been identified as a significant occupational health and safety risk over the past two decades (1). Work-related stress is considered by 51% of workers to be a common feature of work (2), in Italy a survey carried out on a large sample showed that workers feel more exposed to work-related stress than to other risks (3).

The Italian legislation (Legislative Decree 81/08 and amendments) mandates that periodically all employers must carry out an assessment of work-related stress' risk. One of the tools vastly used in Italy for the assessment of this risk, is the one developed by the National Institute for Insurance against Accidents at Work (Istituto nazionale Assicurazione Infortuni sul Lavoro, INAIL); this method entails the application of a cyclical assessment system divided into four phases. In order to allow evaluation, the INAIL has made available two evaluation tools (4-6); The first consists in assessing the objective indicators relating to stress (reference events, contents, and factors related to the working environment), the second in assessing the perception of workers in relation to the factors of context and content of work (6). The INAIL methodology fully responds to the law requirements on work-related stress risk assessment, also referring to the purpose of the legislation: to reduce hazards in the working environment, in order to protect the physical and mental health of workers, preventing work-related accidents and illnesses. Currently, in Italy, there are no further interventions required by law on work-related stress other than those already mentioned.

One aspect that has yet to be addressed is that of health outcomes, although it is well known to the scientific community that distress and, therefore, that work-related stress, can have effects on the psychophysical well-being of workers. Similar evaluations have been performed in workers for similar outcomes, such as burnout (7-9). The evaluation of workers' health outcomes falls within the responsibilities of the occupational physician; this evaluation must be performed if the risks could potentially have an effect on the psychophysical well-being of workers. Occupational physicians must assess and monitor the health status of workers in order to verify that work is not a source of harm to exposed operators. As previously stated, however, in Italy, for the occupational-related stress risk, the greatest attention has been paid, up until now, to risk assessment and management aspects rather than to the monitoring of the risk's effects on workers' health.

The aim of this study is therefore to address the issue of emerging health effects caused by the work-related stress risk; in particular, the aim was to investigate the psychological component of workers' health, by studying the outcomes related to anxiety and depression traits in workers exposed to work-related stress.

There are many theories and studies dealing with the correlation between stress and conditions such as depression, post-traumatic stress disorder, schizophrenia, cardiovascular diseases, infectious diseases, and sleep disorders (10-15). The aim of the study is to investigate the effects of work-related stress, as understood and assessed under current Italian legislation, through a study on mental health outcomes. Signs and/or indicators related to anxiety and depression were evaluated through self-administered questionnaires; in the work of Borrelli et al (16) tools such as the Self-rating Anxiety Scale (SAS) and the Center for Epidemiologic Studies Depression Scale (CES-D) were used to outline risk profiles related to the anxiety and depression outcomes respectively, in populations at risk for work-related stress.

In the present study CES-D and SAS were used to further investigate health outcomes for work-related stress, which was added to the instrument developed by INAIL; these scales are used and proposed as additional tools for the occupational physician. The Italian version of the UK Management Standards Indicator tool (HSE) questionnaire was also used. The HSE questionnaire was developed and validated in order to assess and prevent (when used for multiple assessments over time) the work-related stress in workers (17). Currently, although results from this tool have been correlated with other mental health outcomes (18-20), this questionnaire is only validated to assess work-related stress.

The primary outcome of the study is investigating working conditions in the white-collar sector in relation to work-related stress; the present study carries out an analysis on work-related anxiety and depression, and the secondary outcome is the evaluation of two additional tools for the occupational physician to investigate psychological health outcomes in workers. Furthermore, this study aims to evaluate the HSE as a tool for the occupational physician, not only to evaluate work-related stress, but also as a preliminary screening tool for mental distress in workers, as it has been reported in previous literature to also correlate with anxiety and depression symptoms (18-20).

Methods

The study has been carried out in a large company of the Italian public administration, which fulfils the State's duties and tasks pertaining to economics,finance, budgetary and tax policies, and is structured in several departments with offices mainly located in Rome, although it has some units in other Italian cities. The activities performed are mainly administrative, back-office tasks, although some front-office activities are performed. The study was conducted in a Department of the company with 690 white collar workers.

The study was performed administering a survey to employees, including socio demographic and occupational questions, as well as three questionnaires. The Italian version of the HSE, the CES-D and the SAS.

The HSE is a questionnaire consisting of 35 items structured in 6 dimensions: Demand, Management support, Colleague support, Interpersonal, Role and Change; responses are scored on a five-point frequency Likert scale for items 1-23, and on a five-point agreement Likert scale for items 24-35. Lower scores correspond to higher levels of risk for each psychosocial risk assessed.

The CES-D is a tool consisting of 20 items, investigating depressive symptoms. The tool has a four-point Likert scale. A score of 16 was used as threshold for differentiating between those who have depressive symptoms and those who have not (21-23).

The SAS is a tool including 20 items to investigate on anxiety. The tool has a four-point Likert scale. The cut-off score of 36 recommended by Zung (24) was adopted for this study.

Descriptive statistics were adopted to describe socio-demographic aspects of participants and study variables characteristics, which were presented through theoretical score ranges, arithmetic means, standard deviations. The Wilcoxon rank-sum (Mann-Whitney) test and the Kruskal-Wallis equality of populations rank test were performed to check correlations between sociodemographic an occupational information and psychosocial risk factors, depression, and anxiety scores; p values were considered significant if they were <0.05.

In a second stage, using the CES-D and SAS score as dependent variables, and the sociodemographic data, occupational informations, and HSE dimensions as predictors, two logistic regression models

were elaborated. Coefficient of regression, standard errors, p value, and beta coefficient were calculated. Variance Inflation Factor (VIF) was measured and a cut-off of 5 was established.

Finally, multiple regression analyses predicting commonly negative outcomes of work-related stress were performed, with age, gender, job task, educational level, seniority, work overtime, length of service, and HSE score and dimensions, as predictors of anxiety and depression levels.

Internal correlation between HSE dimensions, SAS score, and CES-D score, was evaluated with Spearman correlation test.

To analyse the collected data, the STATA 16 statistical package was used.

Results

The sample for the study was drawn from a Public Administration Department with 690 employees who participated in the survey; only completed questionnaires (with at most 4 missing items for tool) were used. Completion of the survey was completely voluntary and anonymous. The final sample was composed of 292 workers.

Table 1 presents the socio-demographic characteristics of participants; the sample included 165 females (56.5%) and 127 males (43.5%), 185 of them were over the age of 50 years (63.4%), 107 were under 50 years (36.6%). According to job qualification, 11 (3.8%) had a primary school diploma, 127 (43.4%) high school diploma, 14 (4.8%) earned a bachelor's degree, 83 (28.4%) obtained a master's degree, 57 (19.5%) completed a postgraduate qualification. In regards to occupational groups, 13 (4.4%) were employees, 110 (37.7%) were officers and 169 (57.9%) were upper-level officers or managers. Concerning work schedule, average overtime was 2.23 hours per week (*SD* = 4.13). The variable defined as Work overtime indicates the hours per week of overtime declared by the workers when completing the survey.

The large majority of the sample (232, 79.5%) had been working in the same company (variable defined as "Length of service") for more than 10 years, while workers employed in the same company for less than 5 years and between 5 and 10 years represented the 14.4% (42) and the 6.2% (18) of the sample, respectively.

Concerning the years that employees worked overall, and not specifically in the department included in this study, (this variable was defined as "Total seniority"), most participants (n=105, 35.9%) had been working in total for 21 to 30 years.

Table 2 shows arithmetic means, standard deviations, skewness, kurtosis, minimum/maximum scores, and median, for each of the HSE subscales, CES-D score and SAS score. The two areas most at-risk for work-related stress were relationship (M=2.19, SD= 0.91) and demand (M= 2.57, SD= 0.78). Concerning psychological distress, the CES-D mean score was 40.54 (*SD* = 15.81), all participant had a CES-D score over the cutoff level of 16. The SAS mean score was 40.80 (*SD* = 12.88); 122 workers (41.8%) had a SAS score over the cutoff level of 36, 170 (58.2%) were lower.

The correlation between variables (Table 3) was assessed with Wilcoxon rank-sum (Mann-Whitney) and Kruskal-Wallis equality of populations rank tests and significant association was found between gender and management support (p=0.02); age was correlated to relationship (p=0.044), role (p=0.002), CES-D (p=0.032) and SAS (p=0.024); educational level was correlated to relationship (p<0.01), role (p=0.04) and SAS (p<0.05); task was correlated to relationship (p<0.05), CES-D (p=0.01) and SAS (0.02); length of service was correlated to management support (p<0.05), relationship (p=0.01) and role (p<0.01); total seniority was correlated to management support (p=0.04) and role (p<0.01); work

Table 1 - Socio-demographic characteristics of study population.

		n	%
Gender	Male	127	43.5
	Female	165	56.5
Age	50 or less	107	36.6
	>50	185	63.4
Educational level	Primary School	11	3.8
	Secondary School	127	43.4
	Bachelor's degree	14	4.8
	Master's degree	83	28.4
	Postgraduate	57	19.5
Job task	Upper level Officer/manager	169	57.9
	Officer	110	37.7
	Employee	13	4.4
Length of service (years)	<5	42	14.4
	5-10	18	6.2
	>10	232	79.4
Total seniority (years)	<5	29	9.9
	5-10	17	5.8
	11-20	47	16.1
	21-30	105	36.0
	>31	94	32.2
Work overtime (hours/week)	None	115	39.4
	<5	105	36.0
	5-10	28	9.6
	11-20	7	2.4
	21-30	0	0
	31+	37	12.7

Table 2 - HSE, CES-D and SAS scores.

Variable	Observation	range	min	max	mean	p50
Demand	292.00	1-5	1.25	6.00	2.57	2.38
Control	292.00	1-5	1.17	6.00	3.71	3.83
Management support	292.00	1-5	1.00	6.00	3.66	3.80
Collegue support	292.00	1-5	1.00	6.00	3.84	4.00
Relationship	292.00	1-5	1.00	6.00	2.19	2.00
Role	292.00	1-5	1.60	6.00	4.36	4.50
Change	292.00	1-5	1.00	6.00	3.32	3.33
HSE_totals~e	292.00	1-5	2.37	6.00	3.34	3.31
CES-D_score	292.00	0-60	21.00	100.00	40.54	35.00
SAS_score	292.00	20-80	23.00	100.00	40.80	36.50

Table 3 - Mann-Whitney test and Kruskal-Wallis test.

			Demand		Control		Management support		Collegue support	
		n	p50 (iqr)	p-value	p50 (iqr)	p-value	p50 (iqr)	p-value	p50 (iqr)	p-value
Gender[1]	Male	127	2.38 (0.88)	ns	3.83 (1.00)	ns	3.80 (1.00)	0.02	4.00 (0.75)	ns
	Female	165	2.38 (1.00)		3.83 (0.83)		3.80 (1.00)		4.00 (0.75)	
Age[1]	<50	107	2.25 (0.88)	ns	3.67 (0.83)	ns	3.80 (0.80)	ns	4.00 (0.75)	ns
	50+	185	2.50 (1.00)		3.83 (0.83)		3.80 (1.20)		4.00 (0.75)	
Educational level[2]	Primary School	11	2.25 (1.00)	ns	3.83 (1.00)	ns	4.20 (0.80)	ns	4.25 (0.75)	ns
	Secondary School	127	2.50 (1.00)		3.83 (0.83)		3.80 (1.20)		4.00 (0.75)	
	Bachelor's degree	14	2.25 (0.62)		3.92 (1.17)		3.80 (0.40)		4.12 (0.75)	
	Master's degree	83	2.38 (0.75)		3.83 (0.67)		4.00 (1.00)		4.00 (0.75)	
	Postgraduate	57	2.62 (1.00)		3.67 (1.00)		3.60 (1.00)		4.00 (0.75)	
Task[2]	Upper level Officer/manager	169	2.50 (0.88)	ns	3.83 (0.83)	ns	3.80 (1.00)	ns	4.00 (0.75)	ns
	Officer	110	2.31 (1.00)		3.83 (0.67)		3.80 (1.20)		4.00 (1.00)	
	Employee	13	2.25 (0.50)		3.83 (0.83)		3.80 (1.00)		4.00 (0.75)	
Length of service (years)[2]	<5	42	2.25 (0.75)	ns	3.67 (0.67)	ns	4.20 (0.80)	<0.05	4.00 (0.75)	ns
	5-10	18	2.25 (1.12)		3.83 (0.67)		4.10 (0.80)		4.00 (0.50)	
	>10	232	2.44 (1.00)		3.83 (0.83)		3.80 (1.00)		4.00 (0.75)	
Total seniority (years)[2]	<5	29	2.38 (0.88)	ns	3.83 (0.67)	ns	4.20 (0.80)	0.04	4.00 (0.75)	ns
	5-10	17	2.25 (1.00)		3.67 (0.67)		4.20 (0.80)		4.25 (0.50)	
	11-20	47	2.38 (1.12)		3.67 (0.83)		3.80 (0.80)		4.00 (0.75)	
	21-30	105	2.50 (0.88)		3.83 (0.83)		3.60 (1.20)		4.00 (0.75)	
	31+	94	2.38 (1.00)		3.83 (0.83)		4.00 (1.20)		4.00 (0.75)	
Work overtime (hours/week)[2]	None	115	2.38 (0.88)	ns	3.83 (1.00)	0.04	3.80 (1.20)	ns	4.00 (0.75)	ns
	<5	105	2.38 (1.00)		3.83 (0.67)		3.80 (1.20)		4.00 (0.75)	
	5-10	28	2.31 (0.88)		3.67 (0.92)		3.90 (0.90)		3.88 (1.12)	
	11-20	7	3.00 (1.12)		4.17 (0.50)		4.20 (0.80)		4.00 (0.75)	
	21-30	0	-		-		-		-	
	31+	37	2.62 (1.12)		4.00 (0.67)		4.00 (0.80)		4.00 (0.50)	

Probability: [1]Wilcoxon rank-sum (Mann-Whitney)test; [2]Kruskal-Wallis equality-of-populations rank test

Relationship		Role		Change		HSE total		CES-D		SAS	
p50 (iqr)	p-value	p50 (iqr)	p-value	p50 (iqr)	p-value	p50 (iqr)	p-value	p50 (iqr)	p-value	p50 (iqr)	p-value
2.00 (1.00)	ns	4.60 (1.00)	ns	3.33 (1.33)	ns	3.31 (0.40)	ns	34.00 (14.00)	ns	36.00 (10.00)	ns
2.00 (1.00)		4.40 (0.80)		3.33 (1.33)		3.31 (0.43)		34.00 (13.00)		38.00 (11.00)	
1.75 (1.00)	0.044	4.40 (1.00)	0.002	3.33 (1.33)	ns	3.29 (0.40)	ns	34.00 (11.00)	0.032	35.00 (9.00)	0.024
2.00 (1.25)		4.60 (0.80)		3.33 (1.33)		3.34 (0.49)		37.00 (14.00)		38.00 (12.00)	
1.75 (0.75)	0.00	4.40 (0.60)	0.04	4.00 (1.00)	ns	3.37 (0.29)	ns	42.00 (22.00)	ns	41.00 (12.00)	<0.05
2.25 (1.25)		4.60 (0.80)		3.33 (1.67)		3.31 (0.46)		37.00 (19.00)		39.00 (14.00)	
1.75 (0.50)		4.70 (0.60)		3.83 (1.33)		3.34 (0.26)		32.50 (10.00)		36.50 (14.00)	
1.75 (0.75)		4.40 (0.80)		3.33 (1.33)		3.31 (0.43)		34.00 (9.00)		36.00 (7.00)	
2.00 (1.00)		4.20 (1.00)		3.00 (1.00)		3.31 (0.49)		34.00 (9.00)		35.00 (9.00)	
2.00 (1.00)	<0.05	4.60 (0.80)	ns	3.33 (1.33)	ns	3.31 (0.40)	ns	34.00 (10.00)	0.01	36.00 (7.00)	0.02
2.25 (1.25)		4.60 (0.60)		3.33 (1.33)		3.31 (0.43)		38.50 (19.00)		39.00 (15.00)	
2.25 (1.00)		4.40 (0.80)		3.67 (1.00)		3.29 (0.37)		34.00 (5.00)		38.00 (13.00)	
1.75 (0.75)	0.01	4.20 (0.80)	0.00	3.33 (1.33)	ns	3.27 (0.29)	ns	35.00 (11.00)	ns	34.50 (8.00)	ns
1.62 (0.75)		4.60 (1.00)		3.33 (1.00)		3.36 (0.43)		32.00 (10.00)		36.00 (6.00)	
2.00 (1.12)		4.60 (1.00)		3.33 (1.33)		3.34 (0.44)		35.50 (14.00)		37.00 (11.00)	
1.75 (0.75)	0.01	4.60 (0.60)	0.00	3.67 (1.00)	ns	3.31 (0.37)	ns	35.00 (12.00)	ns	35.00 (8.00)	ns
1.50 (0.75)		4.40 (0.80)		3.33 (0.67)		3.40 (0.34)		34.00 (8.00)		38.00 (10.00)	
2.00 (1.00)		4.40(1.20		3.33(1.00)		3.20 (0.49)		34.00 (12.00)		36.00 (10.00)	
2.00 (1.00)		4.40(0.80)		3.00(1.33)		3.31 (0.37)		36.00 (12.00)		38.00 (11.00)	
2.25 (1.25)		4.60(0.80)		3.33(1.33)		3.37 (0.46)		36.50 (14.00)		37.00 (13.00)	
2.00 (1.25)	ns	4.60(0.80)	ns	3.33(1.33)	ns	3.29 (0.43)	0.02	36.00 (15.00)	ns	38.00 (12.00)	ns
2.00 (1.25)		4.40(0.80)		3.00(1.00)		3.31 (0.34)		34.00 (10.00)		36.00 (9.00)	
2.00 (1.25)		4.80(0.40)		3.17(1.67)		3.30 (0.30)		34.50 (11.50)		36.00 (13.50)	
1.75 (0.50)		4.80(0.40)		3.67(1.00)		3.69 (0.69)		32.00 (26.00)		36.00 (12.00)	
-		-		-		-		-		-	
1.75 (0.50)		4.80(0.80)		3.67(1.00)		3.51 (0.40)		39.00 (12.00)		37.00 (9.00)	

Table 4 - SAS score logistic regression (*p<0.01, **p<0.001)

	SAS_score		CES-D_score	
	Coef.	P>|t|	Coef.	P>|t|
Gender	-0.08	0.94	0.30	0.80
Age	0.96	0.48	-3.47	**0.03***
Educational_level	0.02	0.98	-0.34	0.74
Task	-1.00	0.27	-0.62	0.56
Total_seniority	0.18	0.74	-0.65	0.30
Length_of_service	-0.01	0.99	-0.47	0.64
Work_overtime	-0.39	0.23	0.59	0.12
Demand	-0.39	0.61	1.98	**0.03***
Control	-0.06	0.94	-1.09	0.31
Management_Support	1.89	**0.03***	-2.06	**0.04***
Collegue_Support	0.47	0.57	0.50	0.61
Relationship	1.72	**0.02***	1.99	**0.02**
Role	0.41	0.65	-1.68	0.12
Change	-0.78	0.28	3.13	**<0.001****
CES-D_score	0.58	**<0.001****		
SAS_score			0.79	**<0.001****
cons	7.98	0.16	9.68	0.14

overtime was correlated to control (p=0.04) and HSE total score (p=0.02).

The regression model with SAS total score (Table 4) as a dependent variable was significant at p<0.001 (F 26.12, adjusted r_squared 0.564); in the SAS score regression model, the management support, relationship, and CES-D score were significant (respectively p=0.03, p= 0.02 and p<0.001); of these, the CES-D has more influence in the model (r=0.71), than management support (r=0.14) and relationship (r=0.12). Multicollinearity was tested for all predictors, VIF values were ranged between 1.03 and 2.64.

Regression model with CES-D total score (Table 4) as a dependent variable was significant at p<0.001 (F 30.56, adjusted r_squared 0.603); in the CES-D score regression model, age, demand, management support, relationship, change, and SAS score were significant (respectively p=0.03, p= 0.03, p=0.04, p=0.02, p<0.001, and p<0.001); of these, the SAS score has more influence in the model (r=0.65) than change (r=0.208), management support (r=0.14) and relationship (r=0.11), age (r=0.11), demand (r=0.10). Multicollinearity was tested for all predictors, VIF values were ranged between 1.03 and 2.64.

In the multiple regression analyses, job task and HSE total score, as well as the Control and Relationship dimensions of the HSE, are statistically significant predictors of anxiety (p<0.05) (Table 5). Age, job task, HSE total score, as well as the Demand, Control, Management support, Colleague support, and Role dimensions of the HSE, were statistically significant predictors of depression (p<0.05) (Table 5).

Internal correlation between HSE dimensions, SAS score, and CES-D score, was evaluated with Spearman correlation test (Table 6).

Discussion

The aim of this study was to evaluate a possible correlation between mental health

Table 5. Multiple regression analyses predicting commonly negative outcome of work-related stress (*p<0.05, **p<0.01, ***p<0.001).

	Anxiety				Depression			
	1	2	3	4	1	2	3	4
Step 1								
Age	-1.85	-1.69	-1.92	-1.97	-3.27	-3.11	-3.99	-5.04*
Gender	0.50	0.43	0.41	0.18	0-87	0.78	0.92	0.45
Step 2								
Task		-3.33*	-3.30*	-2.53*		-3.17*	-3.40*	-2.64*
Educational level		0.91	0.90	-0.33		1.22	1.25	-0.60
Step 3								
Seniority			-0.01	-0.37			-0.38	-0.94
Work overtime			-0.25	-0.09			-0.19	-0.52
Length of service			-0.37	-0.53			-0.41	-0.89
Step 4								
HSE score				22.67*				54.62*
Demand				-3.77				-9.38*
Control				-5.19*				-11.49*
Management support				-1.96				-8.84*
Collegue support				-1.18				-4.62*
Relationship				2.77*				0.02
Role				-4.28				-10.32*
Summary statistic								
Multiple R	0.01	0.03	0.03	0.23	0.01	0.03	0.02	0.30
Adjusted R2	-0.01	0.02	0.01	0.19	0.01	0.01	0.01	0.26
F	0.73	2.29	1.35	5.93***	1.52	2.02	1.21	8.49***

Table 6 - Spearman correlation *p<0.05

	Demand	Control	Management support	Collegue support	Relationship	Role	Change	CES-D Score	SAS Score
Demand	1.00								
Control	-0.20*	1.00							
Management support	-0.16*	0.38*	1.00						
Collegue support	-0.08	0.30*	0.56*	1.00					
Relationship	0.41*	-0.25*	-0.29*	-0.31*	1.00				
Role	-0.10	0.37*	0.30*	0.27*	-0.16*	1.00			
Change	-0.12*	0.42*	0.65*	0.45*	-0.25*	0.30*	1.00		
CES-D Score	0.31*	-0.15*	-0.10	-0.07	0.40*	-0.14*	-0.07	1.00	
SAS Score	0.21*	-0.04	-0.06	0.02	0.35*	-0.50	-0.05	0.58*	1.00

outcomes and work environment factors in 292 Italian white-collar workers. Results highlight that 100% of participants had a CES-D score over the cut-off and 41.8% had a SAS score over the cut-off.

Furthermore, results support a correlation between CES-D results and HSE (particularly with the demand, management support, relationship, and change dimensions) and between SAS and HSE (management support and relationship).

Previous studies highlighted lower percentages of the population exceeding the CES-D cut-off; in particular, 10.9% of adults were found to be over the cut-off in an Irish study (25); in an Italian study 49% of workers scored above the CES-D cut-off and 11% above the SAS cut-off (16). As a factor influencing the high prevalence of workers who scored above the CES-D cut-off in this study, the present investigation was conducted in a period of personnel shortage, with a strong input from the human resources department to the occupational physician, to investigate work-related stress and mental health outcomes in general, as the workplace climate was perceived to be detrimental for the psychological wellbeing of employees. Furthermore, the mean age of employees included in this study was very high, with most workers being over 50 years of age, and the fact that depressive symptoms have a higher prevalence in the older population may have influenced the outcome (26); as the retirement age for this kind of work currently starts at the age of 60, most employees included were close to retirement, therefore the workload incremented by the personnel shortage might have been perceived as even more stressful by the included workers, and might have also influenced the CES-D outcome.

As highlighted by Brookes et al.'s systematic review (27), the HSE questionnaire has been reported by many studies, performed across different countries and on different types of workers, as an apt tool to assess work-related stress in workers. Furthermore, the association between high job demands and anxious or depressive symptoms has been highlighted in scientific literature (13, 28).

This study aimed to examine the HSE as a possible screening tool, to better evaluate workers at risk for negative mental health outcomes because of work environment factors, not only focusing on work-related stress but assessing anxiety and depression as well. Results from this study highlighted that the HSE was associated with depression and anxiety, showcasing the opportunity to evaluate mental health outcomes through this tool.

Scientific literature supports the association between the HSE and mental health outcomes in workers, in particular with anxiety and depression, highlighting the possibility to use the questionnaire to predict at-risk workers for negative mental health outcomes. A study performed by Kerr et al (18) had also found an association between the HSE (in particular with the relationship - also highlighted in our results – and demands dimensions) and work-related anxiety; a study by Hackett et al (19) has found the change dimension to be an accurate predictor of depression, in accordance with our results. Furthermore, a study performed with the HSE tool identified an association of the demand dimension with anxiety/depression symptoms (20); this association was confirmed for depression by our results. These associations could be useful in stress management, as the most critical areas are highlighted by the dimensions correlating with anxiety and depression, appropriate interventions could be established for these work environment factors, defining an appropriate follow-up.

As highlighted by the scientific literature, and confirmed by our results, the HSE is associated with depression and anxiety in workers, and could be useful as a screening tool to identify more susceptible workers.

This could be a useful tool for occupational physicians, allowing them to identify and assess workers at risk for depression or anxiety, in order to plan health surveillance monitoring for these workers aimed at preventing the onset or worsening of mental health symptoms. Further research is needed, in order to confirm its ability to predict mental health outcomes in different types of workers, and to perform a follow-up and evaluate workers' mental health improvements after the appropriate measures have been put in place. These measures may include acts to improve the work dimensions evaluated as critical and reduce work environment's stressors. Improvements may be evaluated by performing the test again over time.

Limitations

This study has some limitations. The sample consisted only of white-collar workers, therefore further research is needed in order to evaluate the correlation between mental health outcomes and work-related stress in different types of workers. Furthermore, a selection bias may be present, due to the survey being completed on a voluntary basis, and an information bias may be present due to the self-reported responses. This is a pilot study with a small sample and further research needs to be carried out. In addition, interactions between similar items of different psychometric instruments might have led to an overestimation of the outcomes concerning mental health, and the scales used to assess depression and anxiety only represent a first screening tool and not a clinical evaluation. The use of these scales is validated to monitor workers' wellbeing, they are not validated as a diagnostic tool, but they can be a warning element for psychological wellbeing. If any warning sign is detected, the occupational physician should be alerted and could implement other evaluation measured, useful in the screening of psychological illnesses in at-risk populations. As the study is cross-sectional, the temporal link between the outcome and the exposure cannot be determined, because both are examined at the same time.

Conclusions

The HSE was associated with anxiety and depression symptoms in a sample of 292 Italian white-collar workers. This study confirms the correlation between HSE and mental health outcomes, highlighting an association between the HSE and results from the CES-D and SAS questionnaires. The HSE could be a useful tool in occupational medicine, not only to assess work environment, but also to identify - through this questionnaire - workers at risk for negative mental health outcomes, in order to put the appropriate preventive measures in place and closely monitor mental health outcomes in these workers. In this context, the HSE could be an essential tool in workers' health assessment and prevention of mental health disorders.

Riassunto

Esposizione occupazionale allo stress lavoro-correlato, una proposta di studio pilota per rilevare lo stress negli impiegati

Introduzione. I rischi psicosociali legati al lavoro sono stati identificati come rischi significativi per la salute e la sicurezza sul lavoro; i medici del lavoro devono valutare e monitorare lo stato di salute dei dipendenti per verificare che il lavoro non sia una fonte di danno per gli operatori esposti. Lo scopo dello studio è stato quello di indagare gli esiti relativi ai tratti ansiosi e depressivi nei lavoratori esposti allo stress lavoro-correlato.

Metodi. È stato somministrato un questionario a un'ampia popolazione di lavoratori della pubblica amministrazione italiana. Per misurare la depressione è stato utilizzato il questionario Centre for Epidemiologic Studies - Depression Scale, per misurare l'ansia è stata utilizzata la Self rating Anxiety Scale, per valutare

l'adattamento al lavoro è stato utilizzato il questionario Management Standards Indicator. Per valutare gli esiti di salute correlati allo stress sono state utilizzate un'analisi descrittiva, un'analisi multivariata e modelli di regressione logistica.

Risultati. Un totale di 292 lavoratori ha partecipato allo studio; il 100% dei partecipanti presentava un punteggio della Centre for Epidemiologic Studies - Depression Scale superiore al cut-off; il 41% risultava avere un punteggio della Self rating Anxiety Scale superiore al cut-off. I risultati supportano una correlazione tra la Centre for Epidemiologic Studies - Depression Scale ed il Management Standards Indicator, inoltre supportano una correlazione tra i risultati della Self-rating Anxiety Scale e i risultati dello strumento Management Standards Indicator.

Conclusioni. I risultati delle dimensioni Demand, Management, Support e Relationship del questionario Management Standards Indicator sono stati associati con outcome di salute mentale e potrebbero essere uno strumento utile in medicina del lavoro per identificare i lavoratori a rischio di esiti negativi, diventando uno strumento essenziale nella valutazione della salute mentale dei lavoratori e nella prevenzione dei disturbi associati.

References

1. Schreibauer EC, Hippler M, Burgess S, Rieger MA, Rind E. Work-Related Psychosocial Stress in Small and Medium-Sized Enterprises: An Integrative Review. Int J Environ Res Public Health. 2020 Oct; **17**(20): 7446. doi: 10.3390/ijerph17207446.
2. European opinion polls on safety and health at work | Safety and health at work EU-OSHA [Internet]. [cited 2022 Jun 13]. Available on: https://osha.europa.eu/en/facts-and-figures/european-opinion-polls-safety-and-health-work [Last accessed: 2023 January 21].
3. INAIL, Luciani A, Medei L, Fornaroli M. Indagine nazionale sulla salute e sicurezza sul lavoro.[Internet]. [cited 2023 March 20]. Available on: https://www.inail.it/cs/internet/docs/progetto_insula_report_rls-pdf.pdf [Last accessed: 2023 March 20]
4. Persechino B, Valenti A, Ronchetti M, et al. Work-Related Stress Risk Assessment in Italy: A Methodological Proposal Adapted to Regulatory Guidelines. Saf Health Work. 2013 Jun; **4**(2): 95-9. doi: 10.1016/j.shaw.2013.05.002. Epub 2013 May 16.
5. Rondinone B, Persechino B, Castaldi T. Work-related stress risk assessment in Italy: the validation study of the health safety and executive indicator tool. G Ital Med Lav Ergon. 2012 Oct-Dec; **34**(4): 392-9.
6. Di Tecco C, Ronchetti M, Ghelli M, Russo S, Persechino B, Iavicoli S. Do Italian Companies Manage Work-Related Stress Effectively? A Process Evaluation in Implementing the INAIL Methodology. BioMed Res Int. 2015; **2015**: 197156. doi: 10.1155/2015/197156. Epub 2015 Oct 4.
7. Borrelli I, Santoro PE, Fiorilli C, et al. A new tool to evaluate burnout: the Italian version of the BAT for Italian healthcare workers. BMC Public Health. 2022 Mar 9; **22**(1): 474. doi: 10.1186/s12889-022-12881-y.
8. Buonomo I, Santoro PE, Benevene P, et al. Buffering the Effects of Burnout on Healthcare Professionals' Health-The Mediating Role of Compassionate Relationships at Work in the COVID Era. Int J Environ Res Public Health. 2022 Jul 23; **19**(15): 8966. doi: 10.3390/ijerph19158966.
9. Fiorilli C, Buonomo I, Romano L, et al. Teacher Confidence in Professional Training: The Predictive Roles of Engagement and Burnout. Sustainability. 2020 Jan; **12**(16): 6345. doi: 10.3390/su12166345.
10. Kalmbach DA, Anderson JR, Drake CL. The impact of stress on sleep: Pathogenic sleep reactivity as a vulnerability to insomnia and circadian disorders. J Sleep Res. 2018 Dec; **27**(6): e12710. doi: 10.1111/jsr.12710. Epub 2018 May 24.
11. Bonde JPE. Psychosocial factors at work and risk of depression: a systematic review of the epidemiological evidence. Occup Environ Med. 2008 Jul; **65**(7): 438-45. doi: 10.1136/oem.2007.038430. Epub 2008 Apr 16.
12. Harvey SB, Modini M, Joyce S, et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. Occup Environ Med. 2017 Mar; **74**(4): 301-10. doi: 10.1136/oemed-2016-104015. Epub 2017 Jan 20.
13. Madsen IEH, Nyberg ST, Magnusson Hanson LL,et al. Job strain as a risk factor for clinical depression: systematic review and meta-analysis with additional individual participant data. Psychol Med. 2017 Jun; **47**(8): 1342-56. doi: 10.1017/S003329171600355X. Epub 2017 Jan 26.
14. Sara JD, Prasad M, Eleid MF, Zhang M, Widmer RJ, Lerman A. Association Between Work-Related Stress and Coronary Heart Disease:

A Review of Prospective Studies Through the Job Strain, Effort-Reward Balance, and Organizational Justice Models. J Am Heart Assoc Cardiovasc Cerebrovasc Dis. 2018 Apr 27; **7**(9): e008073. doi: 10.1161/JAHA.117.008073.
15. Giorgi G, Arcangeli G, Perminiene M,et al. Work-Related Stress in the Banking Sector: A Review of Incidence, Correlated Factors, and Major Consequences. Front Psychol. 2017; **8**: 2166. doi: 10.3389/fpsyg.2017.02166.
16. Borrelli I, Benevene P, Fiorilli C, D'Amelio F, Pozzi G. Working conditions and mental health in teachers: a preliminary study. Occup Med (Lond). 2014 Oct; **64**(7): 530-2. doi: 10.1093/occmed/kqu108. Epub 2014 Aug 21.
17. Cousins R, Mackay CJ, Clarke SD, Kelly C, Kelly PJ, McCaig RH. 'Management Standards' and work-related stress in the UK: Practical development. Work Stress. 2004; **18**(2): 113-36. doi: 10.1080/02678370410001734322.
18. Kerr R, McHugh M, McCrory M. HSE management standards and stress-related work outcomes. Occup Med (London). 2009 Dec; **59**(8): 574-9. doi: 10.1093/occmed/kqp146. Epub 2009 Oct 7.
19. Hackett A, Palmer S, Farrants J. Phase 1 of an investigation into the levels of stress in United Kingdom hospice services. Int J Palliat Nurs. 2009 Feb; **15**(2): 66-72. doi: 10.12968/ijpn.2009.15.2.39802.
20. Marcatto F, Colautti L, Larese Filon F, et al. Work-related stress risk factors and health outcomes in public sector employees. Saf Sci. 2016 Nov 1; **89**: 274-8. doi: 10.1016/j.ssci.2016.07.003.
21. Roberts RE, Vernon SW. The Center for Epidemiologic Studies Depression Scale: its use in a community sample. Am J Psychiatry. 1983 Jan; **140**(1): 41-6. doi: 10.1176/ajp.140.1.41.
22. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Appl Psychol Meas. 1977; **1**(3): 385-401. https://doi.org/10.1177/014662167700100306.
23. Kato R, Haruyama Y, Endo M, Tsutsumi A, Muto T. Heavy overtime work and depressive disorder among male workers. Occup Med (Lond). 2014 Dec 1; **64**(8): 622-8. doi: 10.1093/occmed/kqu120. Epub 2014 Sep 25.
24. Zung WW. The measurement of affects: depression and anxiety. Mod Probl Pharmacopsychiatry. 1974; **7**(0): 170-88. doi: 10.1159/000395075.
25. Mc Dowell CP, Carlin A, Capranica L, et al. Associations of self-reported physical activity and depression in 10,000 Irish adults across harmonised datasets: a DEDIPAC-study. BMC Public Health. 2018 Jul 1; **18**(1): 779. doi: 10.1186/s12889-018-5702-4.
26. Luppa M, Sikorski C, Luck T, et al. Age- and gender-specific prevalence of depression in latest-life--systematic review and meta-analysis. J Affect Disord. 2012 Feb; **136**(3): 212-21. doi: 10.1016/j.jad.2010.11.033. Epub 2010 Dec 30.
27. Brookes K, Limbert C, Deacy C, O'Reilly A, Scott S, Thirlaway K. Systematic review: work-related stress and the HSE management standards. Occup Med (Lond). 2013 Oct; **63**(7): 463-72. doi: 10.1093/occmed/kqt078. Epub 2013 Jul 11.
28. Melchior M, Caspi A, Milne BJ, Danese A, Poulton R, Moffitt TE. Work stress precipitates depression and anxiety in young, working women and men. Psychol Med. 2007 Aug; ***37***(8): 1119-29. doi: 10.1017/S0033291707000414. Epub 2007 Apr 4.

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