

The HSE indicator tool, psychological distress and work ability

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Background	The Health and Safety Executive (HSE) indicator tool is one of the most commonly used tools for assessing the risk of work-related stress. Few studies, however, have investigated whether and how its scales are related to psychological distress or other work-related health outcomes.
Aims	To investigate the relationship between the HSE indicator tool, psychological distress, as measured by the General Health Questionnaire (GHQ)-12, and work ability, assessed by the Work Ability Index (WAI).
Methods	All the employees of a mid-sized bank in Italy were asked to fill in an anonymous cross-sectional questionnaire. The questionnaire was structured in four sections: the first one comprised socio-demographic questions and the other three corresponded, respectively, to the Italian translations of the GHQ-12, the HSE and the WAI questionnaires.
Results	Four hundred and thirteen employees completed the questionnaire. The response rate was 99%. Controlling for age and gender, the indicator subscales were negatively associated with the adopted measures of psychological distress and work ability. The GHQ score was also highly correlated with the WAI score and able to explain ~47% of its variance. The only subscale that was still significantly associated with the WAI after removing the effect of psychological distress was 'control'.
Conclusions	The study presents new evidence for the validity of the HSE indicator tool to estimate the risk of work-related stress and suggests that most but not all the effects of psychosocial conditions on work ability might be mediated by the level of psychological distress induced by these conditions.
Key words	GHQ; HSE indicator tool; psychological distress; WAI; work-related stress.

Introduction

The problem of stress in the workplace and of its impact on the psychological and physical health of workers has been increasingly investigated [1]. Research efforts have focused on understanding the nature and the sources of work-related stress, its effects on workers' health and on developing tools to identify and assess the risk of stress. The two most influential models of stress are those of Karasek [2] and Siegrist [3]. The first one maintains that work-related stress is the result of a combination of high work demands and low job control, mitigated by social support [4], while the second sees it as deriving from an effort/reward imbalance. Evidence has accumulated that these stress-related conditions are indeed associated with several distress symptoms and common mental disorders, such as depression and anxiety [5], and can be considered work-related psychosocial risk factors [6], which can lead to increased sickness absence [7].

With the aim of identifying stress factors and helping organizations to manage and address them, the UK's Health and Safety Executive (HSE) [8], has developed the indicator tool [9]. It consists of a 35-item questionnaire, which measures seven scales, each one corresponding to a different domain of work design associated with stress: 'demands', 'control', 'managers' support', 'peer support', 'relationships', 'role' and 'change'. For each domain, the HSE indicates optimal levels of performance to reduce risk of stress and that can be used as interim targets for interventions aimed at improving psychosocial working conditions. However, this tool is not supposed to measure the effects of work-related stress on people but only to estimate the risks and identify the possible sources.

Relatively few studies have investigated the relationship between the management standards (MS) and psychological distress or other stress-related work outcomes. Main *et al.* [10] found a weak association between the MS and psychological distress, job satisfaction, sickness

absence and job performance. They were, however, using a preliminary version of the indicator tool, different from the definitive one now available on the HSE website. More recently, Kerr *et al.* [11] found that the HSE MS were positively associated with 'job satisfaction' and negatively associated with 'job-related anxiety', 'job-related depression' and 'witnessed errors/near misses'. Similar associations with anxiety and depression were also found in a sample of UK veterinary surgeons [12]. These studies strongly supported the validity of both the MS and of the indicator tool. However, in these studies, the stress-related work outcomes were measured in various ways and differently from the General Health Questionnaire (GHQ) [13], which is generally thought to be the best tool to estimate the effects of stress on psychological health. It thus seems important to study the relationships between the measures of psychosocial risk provided by the HSE indicator tool and psychological distress as measured by the GHQ. This was the main aim of the study.

Work-related stress can influence both individuals' and organizations' health. In fact, there is evidence that high levels of stress can lead to increased sickness absence and can give rise to the phenomenon named 'Presenteeism': when people go to work when they are sick [14]. Both situations produce suboptimal performance for individuals and organizations. This can help convince companies to address the problem of stress, by investigating the relationships between psychosocial working conditions, psychological distress and the individuals' work ability. This was the second aim of our study.

Methods

All 82 branches of a bank in Italy were visited by one of a team of three researchers. Each researcher was equipped with a laptop computer containing an electronic version of a cross-sectional survey. Employees had been previously informed about the survey aimed at improving their working conditions and were invited to participate in the survey. Those who volunteered were asked to complete the survey on the researchers' laptops following a brief introduction and explanation on how to use the laptop. Employees completed the survey without the researcher present but available for any further explanation if needed. The data collection period lasted ~3 weeks. As all measurement instruments were anonymous, ethical approval was not sought.

The survey consisted of four sections. The first one comprised only demographic questions and items related to job characteristics. The remaining three sections were the Italian translations of, respectively, the 12-Item General Health Questionnaire (GHQ-12), the HSE indicator tool and the Work Ability Index (WAI) questionnaire.

The GHQ-12 is a widely used tool to assess the level of psychological distress and to screen for cases of minor psychological disorders [15]. It consists of 12 items,

has been extensively validated and shown to be highly reliable, with a reported Cronbach's α ranging from 0.82 to 0.90 [16]. The questions ask whether the respondent has recently experienced several different symptoms, with responses ranging from 'less than usual' to 'much more than usual'. Half the items are positively worded and the other half negatively. There are several possible ways to score the answers: in the original scoring system (GHQ score) each question/problem is rated as either present (0) or absent (1), ignoring its intensity; alternatively, responses can be scored on a conventional four-point Likert scale (0-1-2-3). Several studies have compared the different scoring systems, concluding that for screening aims, there are few differences [17], although the Likert system yields more normally distributed scores. The total score is the sum of the scores on the single items, so that it ranges between 0 and 12 for the GHQ coding and from 0 to 36 for the Likert coding. Although this instrument was designed to yield a single measure of psychological distress, several studies [18] have also investigated the factorial structure of the questionnaire, concluding that it can be best thought of as a multidimensional scale reflecting different aspects of psychological distress. While some studies have found two factors underlying the GHQ-12, there is now general consensus that the questionnaire contains three moderately correlated factors: 'successful coping', 'stress' and 'loss of confidence/self-esteem'[19].

The HSE indicator tool consists of a 35-item questionnaire, which measures seven scales, each one corresponding to a different potential stressor, where lower scores mean higher risk of work-related stress. Responses are scored on a five-point Likert scale for some items and on a five-point frequency scale for others. Four scales are related to aspects of the job-content (i.e. demands, control, managers' support and peer support) and three scales to aspects of the job context (relationships, role and change). Previous studies have shown that the questionnaire has acceptable validity and reliability and have empirically supported its factor structure [20].

The WAI [21] gives an evaluation of the physical and mental demands of employees in relation to their work, diagnosed diseases, limitations in work due to disease, sick leave, work ability prognosis and psychological resources. The WAI is made up of seven dimensions, and the index is derived as the sum score of the ratings on each dimension. The range of the total score is 7-49, which is classified into 'poor' (7-27), 'moderate' (28-36), 'good' (37-43) and 'excellent' (44-49) work ability.

The analyses were performed using the open source statistical software R [22]. After calculating descriptive statistics, we calculated the employees' scores on the seven HSE subscales, their overall GHQ score (Likert coding), their score on each of the three GHQ factors and their WAI score. We then analysed the bivariate correlations between the research variables. After this, we conducted hierarchical multiple regression analyses

trying to predict each of the research variables (GHQ total, GHQ factor scores and WAI score) from the HSE factor scores, controlling for 'age' and 'gender'.

Results

The survey was administered to a total of 418 employees, with a response rate of 99% for the GHQ-12, 98% for the HSE and 85% for the WAI. The smaller response rate for the WAI may be due to the fact that it was the last and the longest part of the survey. The sample was approximately balanced for gender; almost all the employees had a permanent and full-time job and most of them had considerable seniority within the organization. Thus, these characteristics were not assessed for their influence on stress, psychological distress and work ability (Table 1).

The mean scores on the measures of interest [the seven HSE factors, the GHQ-12 total score ('Likert coding'), and the WAI score] are reported in Table 2. In comparison to the benchmark data gathered by the HSE from 136 UK organizations, the average scores were above the 50th percentile for only three of the seven subscales of the indicator tool (managers' support, peer support and relationships). One was between the 20th and the 49th percentile (control) and the remaining three were

below the 20th percentile. The average total GHQ score was slightly above the cut-off threshold (11/12) and 57% of respondents turned out to be potential cases of psychological disorders. The mean WAI score was 38.1, corresponding to a good work ability, although quite close to the lower boundary of the category.

We conducted a principal component analysis with oblimin rotation on the GHQ-12 data. Consistent with previous research [18], the analysis yielded three moderately correlated factors (Table 3), explaining ~54% of the total variance in the data. The size of the correlation between the factors supported the appropriateness of the rotation method chosen. The factor loadings of the three factors extracted by the analysis are reported in Table 3. Overall, the extracted factors corresponded very closely to those extracted by Sánchez-López [19], so we used their same names for the factors. We computed participants' standardized scores on each factor, in order to be able to use these subscales as distinct measures of potential stress outcomes.

The correlations between the seven HSE subscales and the measures of potential outcomes of stress—the GHQ-12 score, the scores on the three subscales of the GHQ-12 (stress, successful coping and 'self-esteem') and the WAI score—are reported in Table 4. All the seven subscales of the indicator tool were significantly correlated to the variables measuring potential outcomes of work-related stress. Correlations were negative with the GHQ-12 and with its factors (except for the stress factor but that was an artefact of the factors rotation procedure) and positive with the WAI. Among the HSE subscales, demands showed the highest correlation with the GHQ stress factor. We also found that the total GHQ score was highly negatively correlated to the WAI score.

Table 1. Demographic and work characteristics

Variable	Type	<i>n</i> (%)		
Gender	Female	221 (55)		
	Male	179 (45)		
	NA	13		
Age group	18–30	17 (4)		
	31–40	74 (18)		
	41–50	209 (52)		
	Over 50	103 (26)		
	NA	10		
Years at organization	<6	29 (7)		
	6–11	21 (5)		
	12–17	47 (12)		
	≥18	308 (76)		
	NA	8		
Contract type	Permanent	376 (94)		
	Other	23 (6)		
	NA	14		
Full-time	Yes	375 (89)		
	No	44 (11)		
	NA	12		
Extra work	Yes	324 (82)		
	No	69 (18)		
	NA	20		
Extra work hours/week	None	24 (10)		
	Moderate (1–4)	144 (59)		
	Excessive (5+)	78 (31)		
	NA	167		
	Range	Mean (<i>n</i>)	SD	
Age (years)	22–60	45.6 (316)	7.4	
Extra work hours/week	0–20	3.8 (246)	3.0	

Table 2. Average scores on measures of interest and proportions of respondents in the different performance classes for each HSE scale (columns a–d)

Measure	Mean (SD)	(a)	(b)	(c)	(d)	<i>n</i>
HSE demands	2.86 (0.62) ^a	57%	8%	11%	24%	410
HSE control	3.32 (0.72) ^b	46%	8%	15%	31%	410
HSE managers' support	3.46 (0.77) ^c	39%	9%	13%	39%	408
HSE peer support	3.82 (0.71) ^c	34%	14%	–	52%	408
HSE relationships	4.13 (0.64) ^d	20%	12%	14%	54%	410
HSE role	3.85 (0.76) ^a	61%	–	11%	28%	410
HSE change	2.72 (0.88) ^a	54%	13%	–	33%	408
GHQ-12 (Likert)	14.1 (7.1)					413
GHQ—case	57%					413
WAI	38.1 (6.27)					352

^aPerformance labelled by Analysis Tool as 'Urgent action needed'.

^bPerformance labelled by Analysis Tool as 'Clear need for improvement'.

^cPerformance labelled by Analysis Tool as 'Good, but need for improvement'.

^dPerformance labelled by Analysis Tool as 'Very good, need to maintain'.

Table 5 reports the results of the multiple regression analyses to predict the scores of respondents on each of the research variables. For each dependent variable, we first fitted a model with only age and gender as predictors (Step 1) and then entered in a subsequent model all the HSE predictors (Step 2). None of the first order models significantly explained the variability in the dependent variables, but all the second order models did, with a percentage of variance explained ranging from 14% for the GHQ self-esteem factor to 39% for the total GHQ score, controlling for age and gender. The total GHQ score was

Table 3. PCA estimates of the oblique (*oblimin*) factor loadings for the GHQ-12

GHQ-item	Factor loadings		
	Successful coping	Stress	Self-esteem
Playing a useful part	0.83		
Capable of making decisions	0.79		
Able to enjoy day-to-day activities	0.77		
Able to face problems	0.68		
Able to concentrate	0.52		
Feeling reasonably happy	0.47	-0.40	
Felt constantly under strain		-0.84	
Loss of sleep over worry		-0.82	
Feeling unhappy and depressed		-0.62	0.40
Could not overcome difficulties		-0.46	
Thinking of self as worthless			0.85
Losing confidence			0.81
Eigenvalues	5.93	1.20	1.02
Variance explained (%)	31.0	14.5	9.7

significantly associated with four HSE subscales: demands, control, role and change. The strongest association was found with demands. Interestingly, not all these subscales were associated with each single GHQ factor. For the stress factor, we found significant associations with demands and change. The coping factor was instead associated with change, control and role, while the self-esteem factor was only associated with control and role. As for the WAI score, it was also associated only with control, role and change.

Given the size of the negative correlation between the GHQ and the WAI scores, we also tried to predict the WAI score from the GHQ, controlling for age and gender. The model was able to explain ~47% of the variance in the WAI data (multiple-*r* = 0.69; adjusted *R*² = 0.47; *F*(4,338) = 77.93; *P* < 0.0001). Finally, to test whether the HSE subscales were able to explain any of the variance in the WAI data that was not already explained by the GHQ, we inserted all the HSE subscales in the model in a subsequent regression analysis. This third order model explained 2% more variance than the second order model, but only HSE control scale (*B* = 1.35; *P* < 0.01) was significantly associated with the WAI.

Discussion

Our principal finding is that the HSE indicator subscales are negatively associated with psychological distress and positively associated with work ability. We also found a strong association between psychological distress and work ability.

While our study is not the first to show the validity of the HSE indicator tool and to link performance on its subscales to stress-related work outcomes, its strength lies in the fact that it is the first to use the GHQ as an outcome measure. The only study that investigated the relationships between the HSE MS and the GHQ used a preliminary version of the indicator tool [10] and

Table 4. Correlations between the indicator tool subscales and measures of potential stress-related work outcomes

	Demands	Control	Managers' support	Peer support	Relationships	Role	Change	GHQ	Stress	Coping	Self-esteem	WAI
Demands	(0.81)											
Control	0.49***	(0.79)										
Managers' support	0.38***	0.44***	(0.79)									
Peer support	0.30***	0.43***	0.56***	(0.80)								
Relationships	0.38***	0.40***	0.45***	0.49***	(0.81)							
Role	0.23***	0.47***	0.43***	0.30***	0.26***	(0.81)						
Change	0.35***	0.47***	0.50***	0.35***	0.25***	0.55***	(0.80)					
GHQ	-0.45***	-0.46***	-0.39***	-0.31***	-0.29***	-0.44***	-0.48***	(0.90)				
Stress	0.53***	0.38***	0.36***	0.30***	0.29***	0.26***	0.41***	-0.79***				
Coping	-0.30***	-0.40***	-0.31***	-0.25***	-0.19***	-0.44***	-0.44***	0.81***	-0.44***			
Self-esteem	-0.18***	-0.30***	-0.22***	-0.19***	-0.21***	-0.32***	-0.25***	0.69***	0.44***	-0.30***		
WAI	0.29***	0.39***	0.32***	0.30***	0.29***	0.38***	0.37***	-0.67***	0.50***	-0.54***	-0.51***	

P* < 0.05; *P* < 0.01; ****P* < 0.001.

Table 5. Multiple regression analyses predicting potential negative outcomes of stress: psychological distress (GHQ-12 and factors) and work ability^a.

Predictors	GHQ total		GHQ—stress		GHQ—coping		GHQ—self-esteem		WAI	
	1	2	1	2	1	2	1	2	1	2
Step 1										
Gender (=male)	0.11 *	0.17*	0.09	0.16	0.14**	0.23**	0.01	0.00	-0.12	0.04
Age ^b	0.08	0.17	0.00	-0.00	0.10	0.22*	0.09	0.21	-0.11	-0.29**
Age ^c	-0.07	0.08	-0.13*	-0.05	-0.06	0.08	0.12	0.36**	-0.00	-0.43***
Step 2										
Demands		-0.35***		-0.56***		-0.13		-0.02		0.10
Control		-0.18**		-0.04		-0.20**		-0.22**		0.25**
Manager's support		-0.00		-0.03		0.02		0.01		-0.01
Peer support		-0.04		-0.07		-0.03		-0.01		0.11
Relationships		-0.03		-0.06		0.03		-0.09		0.07
Role		-0.23***		-0.02		-0.29***		-0.24***		0.23***
Change		-0.20***		-0.20***		-0.20***		-0.05		0.12*
Summary statistics										
Multiple R	0.14	0.63	0.13	0.60	0.19	0.56	0.09	0.40	0.10	0.53
Adjusted R ²	0.01	0.39	0.01	0.35	0.03	0.30	0.00	0.14	0.00	0.26
F	2.60	25.83***	2.29	21.97***	4.79	17.9***	1.12	7.35***	1.07	13.24***

^aEntries are standardized beta weights from full models.

^b41–50 years old versus younger.

^c>50 years old versus younger.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

subsequent studies used different outcome measures [11, 12]. The GHQ is one of the most widely used and validated tools for assessing psychological distress, and most of the studies into work-related stress have used this instrument [6]. It is thus clearly important to show its relationship with the HSE indicator tool. On the other hand, using the GHQ as an outcome measure allows our study to be more easily compared with other studies about the effects of psychosocial working conditions on the psychological well-being of workers.

Previous researches have indicated that the HSE indicator scales are negatively correlated with general [11] and job-related [10] anxiety and depression and positively correlated with mental well-being [11]. Our results are clearly consistent with these findings, and it is interesting to notice that of three GHQ factors, the ones that had highest correlation with the HSE indicator subscales were stress and successful coping. This seems to suggest a specific sensitivity of the scales of the indicator tool to work-related aspects of psychological distress, and we would therefore recommend it for investigating sources and risks of work-related stress within organizations. Contrary to some previous studies, in our regression models, only four of the HSE subscales were significantly associated with the GHQ scores. These were demands, control, role and change. Also Nieuwenhuijsen *et al.* [6], in their systematic review of the relationships between psychosocial working conditions and stress-related disorders, found evidence for the lack of co-worker and supervisor support

as risk factors for stress only for males and not for females. While we did not find significant gender differences in the HSE scores, gender was significantly associated with the GHQ score, and when we included interaction terms between gender and all the HSE subscales, we did find a significant negative association of peer support with the GHQ score, though for males only. We should also note, however, that the three HSE subscales for which we did not find significant associations were also the ones in which the average scores for our sample were labelled as good or 'very good' by the HSE benchmark. It might thus be that we could not find associations because in the specific organization respondents worked for, the risks of stress related to these aspects of the work environment were too low to matter and significantly affect psychological distress.

Another important strength of our study is the use of the WAI as a secondary outcome measure of work-related stress. While other studies [23] have already shown the relationships between psychosocial working conditions and work ability, this has been the first time the HSE indicator was used to investigate these relationships. We found low to moderate significant correlations between all the indicator tool subscales and the WAI and multiple regression analysis showed that control, role and change were all associated with the WAI and able to explain a significant proportion (26%) of the variance in the data. We also found that WAI and GHQ were highly correlated ($r = -0.67$; $P < 0.001$) and that GHQ was able to explain ~47% of the variance in the WAI scores ($P < 0.001$).

Other studies have claimed that mental health and work ability are strongly associated [24] and noticed that they appear to have largely the same determinants. This could imply that the effect of psychosocial work-related factors on work ability might largely be mediated by psychological distress, as our hierarchical regression strategy seems to confirm. On the one hand, our study suggests that the association between psychological distress and work ability might be stronger than previously thought [23]. On the other hand, it might be that previous findings about the relationships between work-related factors and work ability might have also been mostly due to the indirect effect of psychological distress. However, the fact that control was still significantly associated with work ability suggests that certain aspects of psychosocial working conditions could impair work ability beyond what could be expected in light of how they also impair workers mental health.

There are some limitations of the study that need to be acknowledged: (i) the relatively small sample size ($N = 352\text{--}413$) compared to other similar studies; (ii) data are related to a population of bank employees only, with considerable seniority, and this could limit the generalizability of our findings to other kind of workers and (iii) the cross-sectional study design does not allow inference of causal relationships between psychosocial risk factors and psychological distress or work ability.

In conclusion, our study reached its two aims: (i) confirming the validity of the HSE indicator tool for assessing the risk of stress in workplaces and (ii) showing a negative association between psychological distress and work ability as well as an association between job control and work ability that could not be explained by psychological distress alone. These findings indicate that stress can be detrimental to individual health and business outcomes and that the HSE indicator tool may help to manage these risks.

Key points

- The Health and Safety Executive management standards as measured by the indicator tool were negatively related to psychological distress as measured by the General Health Questionnaire-12 and positively related to work ability as measured by the Work Ability Index.
- Psychological distress was strongly correlated to work ability.
- Of the seven Health and Safety Executive management standards, only 'control' was able to explain a significant part of the variance in the Work Ability Index that was not already explained by psychological distress.

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