

Psychosocial risks assessment at hospital: development of a French questionnaire

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KEY WORDS

Psychosocial risks; questionnaire; hospital workers; validation; work-related stress; well-being

PAROLE CHIAVE

Rischi psicosociali; questionario; lavoratori ospedalieri; validazione; stress lavoro-correlato; benessere

SUMMARY

Background: *In order to improve the well-being, health, and performance of hospital workers, it should be important to focus on the psychosocial risk (PSR) factors in the work environment and on job satisfaction. Although many epidemiological questionnaires are used to measure PSR among healthcare workers, no specific existing model can be applied to all categories of hospital workers.* **Objective:** *To develop a short French self-administered instrument for measuring the PSR for hospital workers: the PSRH questionnaire.* **Methods:** *The content of the PSRH questionnaire was partly derived from the well-known and standardized questionnaires (Karasek Job Content and Siegrist effort-reward imbalance questionnaires). The validation process was carried out in all the departments of a large public university hospital (Marseille, France). Eligible workers were adult employees present on the day of the assessment: healthcare, administrative, and technical workers. A total of 2203 subjects were included from September 2012 to October 2013.* **Results:** *The PSRH contains 24 items describing 6 dimensions (Management, cooperation and hierarchical support; Requirements, constraints and autonomy related to work; Support and relationship with the team; Complexity of the work and unforeseen factors; Meaning of work and recognition; and Conciliation work - work out). The six-factor structure presented satisfactory internal consistency and scalability. All the scores showed significant correlations with a well-being score. Acceptability was high.* **Conclusion:** *The PSRH is a self-administered instrument assessing PSR at hospital that presents satisfactory psychometric properties. Future studies should identify factors that determine low- and high-risk workers in order to implement appropriate preventing strategies.*

RIASSUNTO

«*La valutazione dei rischi psicosociali presso l'ospedale: un questionario francese*». **Introduzione:** *Al fine di migliorare il benessere, la salute e le prestazioni dei lavoratori ospedalieri, è importante focalizzarsi sui fattori di rischio psicosociale (PSR) nel luogo di lavoro e sulla soddisfazione lavorativa. Sebbene per misurare i PSR tra i lavoratori del settore della sanità vengono usati molti questionari epidemiologici, non esiste un modello specifico che possa essere*

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utilizzato per tutte le categorie di lavoratori ospedalieri. **Obiettivo:** Sviluppare un breve strumento da autosomministrare in lingua francese per misurare i PSR tra i lavoratori dell'ospedale: il questionario PSRH. **Metodi:** Il contenuto del questionario PSRH è in parte derivato da questionari standardizzati ben noti (Il Job Content Questionnaire di Karasek e l'Effort-Reward Imbalance di Siegrist). La validazione dello strumento è stata effettuata somministrandolo in tutti i reparti di un grande ospedale universitario pubblico (Marsiglia, Francia). I lavoratori ammissibili erano lavoratori adulti presenti il giorno della somministrazione del questionario: lavoratori sanitari, amministrativi e tecnici. Un totale di 2.203 soggetti hanno risposto al questionario dal settembre 2012 all'ottobre 2013. **Risultati:** Il PSRH contiene 24 item che descrivono 6 dimensioni (Management, cooperazione e supporto gerarchico; Richieste, obblighi e autonomia relativi al lavoro; Supporto e relazioni con il team; Complessità del lavoro e fattori imprevisti; Significato del lavoro e apprezzamento; Equilibrio casa-lavoro). La struttura a sei dimensioni presenta una soddisfacente coerenza interna e scalabilità. Tutti i punteggi mostrano correlazioni significative con un punteggio sul benessere. L'accettabilità è alta. **Conclusioni:** Il PSRH è uno strumento da autosomministrare per valutare i PSR in ospedale che presenta soddisfacenti proprietà psicometriche. Studi futuri dovrebbero determinare i fattori che permettono di identificare lavoratori ad alto e basso rischio allo scopo di mettere in atto appropriate strategie di prevenzione.

BACKGROUND

Psychosocial risk (PSR) factors are defined as risks for mental, physical and social health, caused by conditions of employment and organizational and relational factors likely to interact with mental functioning (French Collège d'expertise sur le suivi statistique des risques psychosociaux http://travail-emploi.gouv.fr/IMG/pdf/rapport_SRPST_definitif_rectifie_11_05_10.pdf). Psychosocial factors work through the stress and the effects of this impact depend on the following: 1. the working environment (objective work stressors); 2. the self-perceived work stressors; and 3. the personal characteristics of the individual. Currently, it is well documented that PSRs are among the major professional risks based on their prevalence (20 to 30% of workers are estimated to be exposed to work related-stress) (25). Absenteeism (25), depression (23), work-related suicides (27), and musculoskeletal complaints (29) are induced by PSR factors. In the health sector, it has often been shown that negative psychosocial work factors, such as occupational stress, are associated with intention to leave, absenteeism, and actual turnover behavior (11, 26), decreasing work performance and the quality of care offered (7, 21), as well as contributing to poorer health of the workers (8, 19).

To improve workers wellbeing, health, and performance, we should focus on the PSR factors in

the work environment, as well as job satisfaction. In France, the assessment of PSR factors and their prevention are included in the French Code of Work. All employers of private and public companies have to provide their own evaluations on a written standardized document, called "the single document of work risk assessment", including the inventory and hierarchical ranking of the identified occupational risk (French Code of Work, articles L4121-3 and R4121-1, available in <http://www.legifrance.gouv.fr>). The employers also have to develop proposals of targeted, planned actions to prevent these risks. Standardization of the PSR evaluation is necessary to assess the effects of targeted prevention measures and provide comparable findings over time.

Some standardized questionnaires are available and were designed to assess the different facets of PSR factors in workers. The most widespread questionnaires are the following: the Job Content Questionnaire (JCQ) of Karasek (14), measuring the demand-control model; the Siegrist questionnaire (28), measuring the effort-reward imbalance (ERI) model; and the Maslach Burnout Inventory (MBI) (22), which is used to measure burnout. More recently, the Copenhagen Psychosocial Questionnaire (COPSOQ) of Kristensen (5, 18) was available, measuring psychosocial working conditions but not based on theoretical model. None of these simultaneously assess the different aspects, but combining

the questionnaires lengthens the time of assessment, which is not compatible with repeatedly assessing large samples.

The aim of this study was to develop a short, French, self-administered instrument for measuring the PSR for a specific population of hospital workers according to the psychometric standards: the PSR for workers at Hospital, or PSRH questionnaire.

METHODS

General context

The study was undertaken at a public university hospital of Marseille, south of France, under the responsibility of the department in charge of work risk assessment.

This study was performed in association with the occupational medicine department. The health establishment contained 1087 beds and 5229 workers. A steering committee (consisting of 3 occupational physicians caring for this hospital staff, one occupational psychologist and one epidemiologist) selected items from the shortlist of 40 draft indicators provided by the French national panel of experts [<http://www.epsilon.insee.fr/jspui/handle/1/4632>. Edited by n°081 DA; 2010]. This national expert college was in charge, from the French Minister for Labor and Health, to provide standard indicators for statistical monitoring PSR factors, on the basis of international literature review available data from national statistical surveys. The set of items proposed by the national expert college derived from well-known and standardized questionnaires, including the Karasek-Job Content Questionnaire (14) and the Siegrist effort-reward questionnaire (28), and from 3 large national French studies (9, 24). Twenty-four out of these 40 items were selected by the steering committee according to their relevance, content, the appropriateness of the health context, and the factor loadings on their respective original scales. These 24 questions were answered using a balanced four-point Likert scale, defined as '1 – Never/No', '2 – Sometimes', '3 – Often', and '4 – Always/Yes'.

POPULATION AND DESIGN

The validation step was carried out at all of the departments at the hospital. The occupational physician who led the survey held a meeting with all managers to explain the objectives and modalities of the study. Eligible workers were adult employees who were present on the day of the assessment, including healthcare workers, administrative workers, and technical workers. They were included from September 2012 to October 2013. The inclusion criteria were: workers older than 18 years of age and who had been working in the department for more than 3 weeks. Eligible workers were invited to respond on a voluntary basis.

An occupational physician gave the 24-item self-administered questionnaire to employees who agreed to participate in the study. Socio-demographic data, job categories (healthcare, administrative, and technical workers), work schedule (day/night), socio-economic categories (A: 3 years after high school diploma degree; B: 2 years after high school diploma degree; and C: less than a high school diploma or without diploma) were recorded. The wellbeing at work (WBAT) was assessed using a visual analogic scale (VAS) ("How do you consider your well-being at work?") 0 lowest and 10 highest wellbeing) (4). The participants completed their own questionnaires, but they could ask for assistance to complete part or the entire questionnaire if necessary. The participants had to return the questionnaire to the occupational physician.

Ethics

The study conformed to the principles of the Declaration of Helsinki and French Good Clinical Practices. According to the French law (Article L1121-1, Law n° 2011-2012 29 december 2011 - art. 5), ethical approval was not needed. All subjects participated on a voluntary basis. Consent for participation in the study was obtained from all participants.

Validation of the questionnaire

The validation was performed on the 24-item version of the questionnaire. The definitions of the

main psychometric properties are summarized in figure 1. Two random samples were extracted from the initial sample. The construct validity (factorial

structure) was established on the first random sample and the stability of the structure was assessed on the second random sample. The construct valid-

A valid measure refers to the extent to which a concept is well-founded and corresponds accurately to the 'real world'. The validity of a measurement is considered to be the degree to which the tool measures what it claims to measure.

Three main properties must be explored: reliability, internal validity and external validity.

Reliability

The reliability or internal consistency is the extent to which a measurement gives consistent results, i.e. the extent with which a set of items in a dimension measures the same attribute. Reliability is assessed by the computation of Cronbach's alpha coefficients. Cronbach's alpha coefficients higher than 0.70 result satisfactory reliability.

Internal Validity

Two main aspects must be considered: content validity and construct validity.

- Content validity is a non-statistical type of validity that involves the examination of the questionnaire content to determine whether it covers all the aspects of the domain to be measured.
- Construct validity refers to the extent to which the questionnaire developed from a theory do actually measure what the theory says they do. It mainly relies on statistical analyses of the internal structure of the questionnaire including the relationships between responses to different items. Construct validity was assessed by performing:
 - Exploratory or confirmatory factorial analyses: in the case of confirmatory factorial analysis, a Kaiser-Meyer-Olkin (KMO) measure higher than 0.50 and a total variance higher than 70% indicate that the number of identified factors (or dimensions) fit to the model;
 - Rash analysis to explore the unidimensionality of each domain identified: unidimensionality is retained if item goodness-of-fit (INFIT) statistics values range from 0.7 to 1.2;
 - Computation of correlation coefficients: correlation coefficients of each item with its dimension (item internal consistency, IIC) higher than 0.40 and higher than the correlation coefficients of this item with other dimensions (item discriminant validity, IDV) reflect a satisfactory construct validity.

External validity

External validity concerns the extent to which the internal construct can be support by external criteria. External validity relies on assessment of:

- Convergent validity: relationships between the dimensions of the questionnaire and the dimensions of other previously validated questionnaires measuring the same concept;
- Criterion validity: relationships between the dimensions of the questionnaire and other features: sociodemographic, or clinical features...

Figure 1 - Psychometric properties of a standardized questionnaire: definitions

ity was assessed using principal component factor analyses with a Varimax rotation to determine the final structure and number of independent dimensions. Eigen values greater than or equal to 1 were retained. Items were included in the dimensions if they had loadings greater than 0.4. Items with multiple loading on several factors were included in the factor that had more of a conceptual relationship. A confirmatory factor analysis was performed using the LISREL model. The following indicators were required: the Root Mean Square Error of Approximation (RMSEA) was considered acceptable if <0.08 and the Comparative Fit Index (CFI) if higher than 0.9.

Item-internal consistency was assessed by correlating each item with its scale (corrected for overlap) using Pearson's coefficient (correlation of 0.4 recommended for supporting item-internal consistency (3)); item discriminant validity was assessed by determining the extent to which items correlate more highly with the dimensions they are hypothesized to represent compared to the other items. For each dimension scale, internal consistency reliability was assessed using the Cronbach's alpha coefficient (coefficient of at least 0.7 expected for each scale (3)). The unidimensionality of each dimension was assessed using Rasch analysis. The partial credit model, an extension of the Rasch model to Likert-type responses, was used. The scalability of each of the dimension scales was assessed by the pattern of item goodness-of-fit statistics (INFIT); the INFIT ranged between 0.7 and 1.3, ensuring that all the items in the scale tended to measure the same concept. Floor and ceiling effects were reported for the homogeneous repartition of the response distribution. Inter-dimension correlations were examined using Pearson's and polychoric coefficients. Differential item functioning (DIF) analyses were performed, comparing the item between different groups (gender, age, and work schedule) with DIF-detect v.1.0. The external validity was assessed by studying the relationships between the dimension mean scores and WBAT score. The discriminant validity was determined by comparing the dimension mean scores across patient groups (gender, age, job category, work schedule, and socioeconomic category). Acceptability was determined by proportions

of the missing values and the average completion time. Data analysis was performed using SPSS 13.0, MAP-R, LISREL and WINSTEP software.

RESULTS

Sample characteristics

Of the 5229 eligible workers (data provided by the direction of the hospital), 40% ($n=2089$) were included because they were present when the occupational physician entered their department to administer the questionnaire. Only 4 people refused to participate (due to privacy doubt, no interest in the subject, bad experience with another questionnaire, or without justification). Students were also eligible and 144 were added. The study sample included 2203 subjects. Their characteristics are displayed in table 1. The sex ratio was 1:5 and the mean age was 40.1 years (SD 12.3).

Table 1 - Characteristics of the study sample: whole study sample (N=2203) and random sample (N=1101)

	Whole study sample N (%)	Random sample N (%)
Age class (years)		
Less than 30	580 (26,3)	322 (31,6)
31 – 50	874 (39,7)	440 (43,1)
More than 50	603 (27,4)	258 (25,3)
Gender (men)	457 (20,7)	225 (21,9)
Job category		
Healthcare	1729 (81,8)	863 (81,9)
Administrative	241 (11,4)	125 (11,9)
Technical	144 (6,8)	66 (6,3)
Socio-economic category*		
C	563 (28,8)	294 (30,3)
B	897 (45,8)	436 (44,9)
A	498 (25,4)	241 (24,8)
Work schedule (day)	1877 (85,2)	939 (85,3)

A: 3 years after high school diploma degree; B: 2 years after high school diploma degree; and C: less than a high school diploma or without diploma

Scoring

The negatively worded item scores (4 items: 4, 5, 6 and 13) were reversed such that higher scores indicated a higher level of work conditions. For each subject, the score of each dimension was obtained by computing the mean item of each dimension. All dimension scores were linearly transformed to a 0–100 scale to facilitate and standardize the analysis results. A global score was computed as the mean of the dimension scores. Higher scores indicate a higher level of work conditions.

Validity

Internal structural validity

From the first random sample including 1101 observations, the structure of the questionnaire was established by principal component factor analysis, identifying a 6-factor structure that accounted for 59.6% of the total variance. This model showed a good fit, and all of the indices from the confirmatory LISREL model were satisfactory (RMSEA=0.083 [0.079-0.086], CFI=0.89). The stability of the structure was studied on the second random sam-

ple including 1102 observations, showing a similar 6-factor structure (accounting for 58.6% of the total variance) and satisfactory indicators (RMSEA=0.088 [0.086-0.092], CFI=0.89).

The dimensions were named according to their constitutive items as the following: Management and Cooperation and Hierarchical Support (MCHS) (5 items), Requirements, Constraints and Autonomy Related to Work (RCARW) (6 items), Support and Relationship with the Team (SRT) (3 items), Complexity of the Work and Unforeseen Factors (CWUF) (4 items), Meaning of Work and Recognition (MWR) (4 items), and Conciliation Work - Work Out (CWWO) (2 items). The structure is presented in Appendix 1. The 24 items are detailed in the Appendix 2 (French formulation, English item general meaning, original questionnaire of the item, and mention of rewording) (Editor's note: both Appendices are published in the online version of this article, available at www.lamedicinadellavoro.it). Item and dimension scales characteristics are summarized in table 2. Internal consistency was satisfactory for all dimensions; each item achieved the 0.40 standard for item-internal consistency, except for one item of the CWUF dimension. The correlation of each item with its contributive dimension was higher than with

Table 2 - Dimension characteristics of PSRH

Dimension (number of items)	Mean	SD	IIC min-max	IDV min-max	Floor (%)	Ceiling (%)	Alpha ^a	INFIT min-max
MCHS (5)	54,97	23,77	0,58-0,69	0,09-0,41	1,2	4,0	0,83	0,84-1,05
RCARW (6)	58,89	19,65	0,47-0,66	0,21-0,43	0,3	2,5	0,81	0,70- 1,28
SRT (3)	67,25	21,95	0,52-0,60	0,12-0,40	0,6	10,7	0,73	0,92-1,06
CWUF (4)	56,11	18,55	0,35^b -0,51	0,06-0,38	0,1	1,0	0,66	0,86-1,13
MWR (4)	69,68	18,08	0,45-0,47	0,02- 0,55^c	0,0	8,6	0,68	0,96-1,04
CWWO (2)	68,95	27,33	0,61	0,16-0,42	2,6	27,6	0,75	0,98-1,0
Global (24)	61,29	14,50			0,0	0,1	0,88	NA

MCHS Management, Cooperation and Hierarchical Support; RCARW Requirements, Constraints and Autonomy Related to Work; SRT Support and Relationship with the Team; CWUF Complexity of the Work and Unforeseen Factors; MWR Meaning of Work and Recognition; CWWO Conciliation Work - Work Out

SD: Standard deviation - IIC: Item-internal consistency - IDV: Item discriminant validity - INFIT: intlier-sensitive fit
- NA: not applicable

^a Cronbach's Alpha

^b item-scale correlation is less than 0,4

^c item correlation with competing scale is significantly higher than its correlation with its own scale

Score ranging from 0 to 100; the higher the score, the better it is. Bold values represent unsatisfactory values

the others (item discriminant validity), except for one item of the MWR dimension and one of the CWUF dimension. The floor effect ranged from 0 to 2.6% and the ceiling effect from 0 to 10.7% (except for 27.6% for the CWWO dimension). Cronbach's alpha coefficients ranged from 0.73 to 0.88 in the entire sample, indicating satisfactory internal consistency, which was except for the CWUF dimension (0.66) and MWR dimension (0.68). The inter-dimension correlations were all significant (all p -values < 0.01); they ranged from 0.19 to 0.49 (table 3). With respect to uniform DIF, no difference was found between any of the parameters (gender, age, and work schedule).

External validity

The correlations between the WBAT VAS and the global score of the questionnaire were moderate (0.60, $p < 0.01$); the correlations between the WBAT VAS and the dimension scores ranged from 0.28 to 0.48, and all p -values were < 0.01 (table 3).

Discriminant validity

There were no statistical associations according to gender, except for the CWWO and the CWUF dimensions for which the men reported significantly higher scores than women, respectively. Scores differed with age of workers for 4 of the 6 dimensions and for the global score. Significantly higher scores were reported by the technical workers on 2 dimensions (CWUF and CWWO). The scores for the SRT, MWR, and CWWO were significantly higher for the workers with night schedules compared to others, while the MCHS scores were significantly lower. Some links were revealed based on the socio-economic class. Mean scores are provided in table 4.

Acceptability

The average time for completing the questionnaire ranged from 3 to 7 min. Missing data for each dimension were low, from 1.1 to 2.4%.

Table 3 - Correlations between wellbeing-at-work scale and the dimension/total scores of PSRH

		WBAT VAS	MCHS	RCARW	SRT	SWUF	MWR	CWWO
MSCH	R	0,458**						
	n	1027						
RCARW	R	0,483**	0,464**					
	n	1032	1096					
SRT	R	0,449**	0,378**	0,388**				
	n	1030	1094	1099				
CWUF	R	0,362**	0,224**	0,486**	0,241**			
	n	1031	1096	1100	1098			
MWR	R	0,417**	0,484**	0,414**	0,446**	0,191**		
	n	1016	1082	1084	1083	1083		
CWWO	R	0,276**	0,239**	0,398**	0,222**	0,240**	0,241**	
	n	1032	1096	1101	1099	1100	1084	
Global	R	0,603**	0,703**	0,776**	0,661**	0,566**	0,667**	0,635**
	n	1012	1080	1080	1080	1080	1080	1080

MCHS Management, Cooperation and Hierarchical Support; RCARW Requirements, Constraints and Autonomy Related to Work; SRT Support and Relationship with the Team; CWUF Complexity of the Work and Unforeseen Factors; MWR Meaning of Work and Recognition; CWWO Conciliation Work - Work Out

WBAT VAS: wellbeing-at-work visual analogic scale

R: Pearson's correlation coefficient

** $p < 0.01$

Score ranging from 0 to 100; the higher the score, the better it is

Table 4 - Comparisons of scores (mean ± standard deviation) according to socio-demographic data and working characteristics

	MCHS	RCARW	SRT	CWUF	MWR	CWWO	Global
Gender							
Men (n=225)	56.0±23.0	61.7±18.7	67.3±19.6	61.9±18.6	69.4±18.2	67.4±27.4	63.9±14.5
Women (n=802)	54.9±23.8	58.6±19.6	67.6±22.5	55.0±18.0	69.8±17.8	69.4±27.5	62.6±14.3
Anova	NS	<0.05	NS	<0.001	NS	NS	NS
Age classes							
≤ 30 yrs (n=322)	54.4±22.1	61.4±19.0	70.1±22.6	59.7±19.7	70.2±16.8	65.3±28.3	63.5±14.5
31-50 yrs (n=440)	54.7±24.5	57.3±18.6	65.2±21.3	54.5±17.5	68.7 ±18.3	69.4±27.8	61.7±13.9
≥ 51 yrs (n=258)	58.0±23.5	60.8±20.4	68.2±20.2	56.7±17.4	71.3±18.1	73.5±24.3	64.8±13.7
Anova	NS	<0.01	<0.01	<0.001	NS	<0.001	<0.05
Job category							
Healthcare (n=863)	54.7±23.6	59.2±19.2	67.6±21.6	56.4±18.5	69.8±17.4	67.8±27.6	62.6±14.2
Administrative (n=125)	57.0±23.2	56.4±21.4	67.4±24.5	53.6±17.5	70.6±19.2	77.1±24.8	63.8±14.6
Technical (n=66)	59.0±25.4	62.8±20.3	67.7±21.7	60.5±21.6	67.9±22.8	72.2±25.9	65.1±15.5
Anova	NS	NS	NS	<0.05	NS	<0.001	NS
Work schedule							
Day (n=939)	57.1±23.5	58.9±20.3	65.9±22.2	56.1±19.2	69.2 ±18.3	67.4±27.5	62.5±14.8
Night (n=162)	42.8±21.5	58.6±15.6	75.1±18.88	56.2±14.4	72.2±16.4	77.4±24.6	63.8±11.1
Anova	<0.001	NS	<0.001	NS	<0.05	<0.001	NS
Socio-economic* category							
C (n=294)	55.8±24.7	57.3±21.0	66.0±23.0	57.4±18.5	72.0±18.6	70.1±27.7	63.2±14.1
B (n=436)	53.2±22.7	58.0±18.19	66.9±22.3	53.8±17.1	69.0±17.5	71.3±26.3	62.1±13.6
A (n=241)	61.5±23.5	60.5±19.2	69.4±19.0	54.6±18.9	68.5±17.5	63.4±29.2	62.9±15.27
Anova	<0.001	NS	NS	<0.05	<0.01	<0.001	NS

MCHS Management, Cooperation and Hierarchical Support; RCARW Requirements, Constraints and Autonomy Related to Work; SRT Support and Relationship with the Team; CWUF Complexity of the Work and Unforeseen Factors; MWR Meaning of Work and Recognition; CWWO Conciliation Work - Work Out; NS: non significant

*A: 3 years after high school diploma degree; B: 2 years after high school diploma degree; and C: less than a high school diploma or without diploma

Bold values: p-value<0.05

DISCUSSION

The assessment and the prevention of PSR factors at work have been a legal and mandatory procedure for all French private and public companies. The aim of this PSR factor assessment is to facilitate choices about the ways of organizing and providing appropriate prevention strategies as well as to evaluate the impact of implementing these strategies. In accordance with this, providing a reliable and valid instrument for the PSR assessment that can be

shared between different services or establishments is necessary. From this point of view, the availability of a short standardized questionnaire for assessing PSR in the specific context of the hospital should be interesting. We demonstrated the validity and acceptability of the PSRH in a study with a large sample of workers at a public university-hospital.

Our proposals meet the standards for the psychometric properties. Indeed, the internal structure, supported by a satisfactory internal consistency of PSRH (58% of the total variance), confirmed that

the PSR concept was multidimensional. Regarding the existing questionnaires, some variations can be defended. None of the existing questionnaire explores the balance work - work out, except for a single item from the COPSQ. The Siegrist questionnaire does not approach the management, organizational or emotional demands side. The JCQ of Karasek examines support but does not address the recognition and organizational commitment side. The MBI focuses on the emotional demands and is not constructed to assess prevention of the PSR factors. The COPSQ (18) is the most complete questionnaire, but even its short version (40 items) may be long for a rapid ground assessment or reassessment; moreover its French validated version (5) was not available at the beginning of our study.

External validity, explored with the socio-demographic/job characteristics, globally confirmed our assumptions. The studies reporting findings about the assessment of PSR in the context of healthcare (1, 6, 16, 20, 30): 1) were often performed by mail and less often on the workplace and/or 2) focused on healthcare workers (nurses or physicians) but not on administrative and technical workers. Although the methodology of data collection is not the same, there are significant differences of our global scores with job characteristics indicators like studies in healthcare workers, but the relationship seems to be reversed: Ferrand et al. (6) describe more "poor or moderate self-reported health" for technician or administrative than the others, and Tripodi et al. (30) show a less important "decisional latitude" in this 2 categories than the others. They also found significant differences between dimension scores in relation with age, but Ferrand et al. got also the opposite variation: a better "self-reported health" in less than 30 years compared to others.

Difficulties in the MCHS were less important for the technical category, which was most likely due to the less confusing hierarchy compared to administrative and healthcare workers who often ran a multidisciplinary team and received instructions from various categories of workers. Working during the night seemed more difficult for the MHCS dimension because the contacts with the hierarchy were scarce.

On the other hand, the night workers reported more satisfactory scores on dimensions related to their relationship with the team (SRT), which could sometimes be more cohesive due to isolation.

For the CWUF dimension, we noticed lower scores in women, administrative workers, and the B socioeconomic category, indicating that these populations are more exposed to these factors. MWR scores were worse for the A socioeconomic category including a large majority of managers who may have no or few little hierarchy above them, and consequently no or little feed-back about their work. MWR scores were also worse for the day workers compared to the night workers. As expected, workers with higher levels of the PSRH have better scores of wellbeing-at-work, confirming the correlation between the psychosocial risk and wellbeing, which is in agreement with previous studies (12). Finally, the acceptability of the PSRH was good. The rate of missing data was low for the six dimensions. The average completion time was usually shorter than ten minutes, which will facilitate its use in routine practice for both evaluation and reevaluation.

Strengths and limitations

First, the representativeness of the sample should be discussed. Due to the cross-sectional design, the questionnaire was proposed to 40% of the total of the theoretical effect size. The participants were the subjects present in the units at the time that the occupational physician passed through the workplace (only 4 refused to participate). We could not compare minimal characteristics between the non-participants and the participants due to the non-availability of this information. The design of cross-sectional studies obviously may cause selection bias if participation is related to rating the psychosocial work environment and outcome (healthy worker effect) (13).

Second, some aspects of the validation process were not available at the time of this study, notably reproducibility, defined as the ability to produce the same results in the absence of a meaningful change, and sensitivity to change, defined as the ability to detect a meaningful change. These two properties are the core psychometric properties of a measuring

instrument (10, 15). However, examination of the reproducibility and sensitivity to change requires longitudinal data collection. Future studies should explore these issues. It is also necessary to reinforce external validity by studying the relationships between the PSRH and other well-validated questionnaires. The correlation between wellbeing-at-work scale and the dimension/total scores of PSRH is affected by the common method bias.

The method of data collection employed, in which workers completed the questionnaire while at work, should overestimate the level of satisfaction compared to questionnaires that are completed at home, which is in agreement with another study measuring satisfaction (17).

Item generation was based on combining items taken from published instruments or found in the literature and expert opinions. It is recognized that the content provides more relevant information when it is derived directly from workers' concerns and perceptions (2). This approach requires interviews and specific analysis of the interview content. However, the PSRH can be used to precisely identify units in which this qualitative approach is needed to develop appropriate prevention actions and recreate dialogue and social cohesion.

NO POTENTIAL CONFLICT OF INTEREST RELEVANT TO THIS ARTICLE WAS REPORTED

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