

*Risk Assessment Tool for Adverse Outcomes of Occupational Stress: Development  
and Investigation of its Psychometric Properties*

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Abstract

**Introduction** While psychosocial factors at work have been widely mentioned as important contributors to occupational stress, only recent research suggests that some non-work factors (e.g. some socioeconomic, personality and health risks) could also contribute to the adverse outcomes of work-related stress. **Objective** The aim of our study was to develop a comprehensive instrument that would include a broad spectrum of work and non-work risks related to adverse negative outcomes of occupational stress. **Methods** A preliminary version of the instrument was obtained through three consecutive rounds of a Delphi study. Seven qualified experts in the workplace stress field, who participated in the first round, proposed and evaluated risk factors for adverse outcomes of occupational stress. The proposed most prominent risk factors were later reassessed in two online surveys by an expanded group of 20 experts. The final version of the instrument consisted of 130 risk factors, which were classified into 17 categories based on substantive considerations. **Results** After the questionnaire had been completed by 349 Slovenian employees in different occupations a principal component analysis (PCA) was conducted. A four component solution (Direct Oblimin rotation, 68% explained variance) showed minimal cross-loading and reduced the used variables into the following components, i.e. (i) organizational context, (ii) socio-economic characteristics of the employee, (iii) job characteristics and (iv) individual characteristics of the employee. **Conclusion** The study represents an important step toward the development of a comprehensive instrument for identifying potential risk factors associated with harmful work-related outcomes. Further validation of the tool in different work settings and samples is needed.

**Keywords:** occupational stress, assessment tool, risk factors, principal component analysis

## Introduction

Over the last decades work-related stress gained an increased attention among professionals and researchers (e.g. recently published European researches: Esener (EU-OSHA, 2010), European Working Conditions survey (EUROFOND, 2010)) due to its negative impact on employees, organizations and national economies.

The most commonly-used definition of work-related stress implies that high levels of stress at work are experienced when the demands of the work environment exceed the employees' ability to cope with (or control) them (Milczarek, Schneider & Rial Gonzalez 2009). A growing body of evidence suggests that one of the most undesirable consequences of work-related stress is impaired employees physical and psychological health. (EUROFOND 2007; WHO 2005). Moreover, there are several studies indicating the negative impact of long-term experience of work-related stress on organizational outcomes, such as increased sick leave (absenteeism; Johns 2003), turnover (Bergerman, Corabian & Harstall 2009) and burnout (Maslach, Schaufeli & Leiter 2001), reduced workplace productivity (presenteeism; Johns 2010) and negative consequences associated with work-to-family conflict of employees (Amstad, Meier, Fasel, Elfering & Semmer 2011).

A number of factors can contribute to the experience of work-related stress if not managed properly (e.g. Kopp, Stauder, Purebl, Janszky & Skrabski 2007; Leka, Griffiths & Cox 2003) Besides widely recognized psychosocial risk factors at work arising from job characteristics (e.g. work content, work pace, overload, work schedule, control over work, employee's qualification, participation in decision making, salary), work environments or work organisation (possibilities for career development opportunities, role of an employee in the organisation, interpersonal relations, organisational climate), some non-work factors, such as socio-demographic characteristics of an employee, economic circumstances, family relations, health status, lifestyle, quality of life, technological development, market changes (Pološki Vokić & Bogdanić 2007) could also contribute to the increased experience of work-related stress.

Moreover, different social and economic circumstances may affect subjective experience of work-related stress indirectly through working conditions. For instance, Stauder, Konkoly, Kovács, Balog, Williams and Williams (2010) suggested that the transition from socialism to capitalism results in higher stress because of increased workplace competition and job demands and decreased job security and wages in many sectors. Workplace stress has been also shown to have different effects on the health of employees in different countries (Salavecz et al. 2010).

Slovenian employees may even be more prone to experience workplace stress due to some unique economic, and health characteristics related to low flexibility of the Slovenian labour market (Eurostat 2011a, 2011b), higher levels of absenteeism (Parent-Thirion, Fernández Macías, Hurley & Vermeylen 2005) and lower job satisfaction (Parent-Thirion, Vermeylen, van Houten, Lyly-Yrjänäinen, Biletta & Cabrita 2010) compared to the EU average. Additionally, research also indicates more physical complaints such as back pain, muscle pain, headache (Parent-Thirion et al. 2005), higher prevalence of unhealthy lifestyle, such as unhealthy diet, insufficient physical activity and smoking (Hlastan-Ribič, Djomba, Zalatel-Kragelj, Maučec-

Zakotnik & Fras 2010), one of the highest suicide rates (Parent-Thirion et al. 2005) and alcohol-related morbidity and mortality rates (WHO 2011) in Europe.

In the light of these distinct labour and health characteristics pertaining to Slovenia, we claim that currently available questionnaires for workplace stress assessment (Tabanelli, Depolo, Cooke, Sarchielli, Bonfiglioli, Mattioli & Violante 2008) insufficiently capture broader relevant socio-demographic and labour market peculiarities in different EU countries. Therefore, the aim of the presented study was to develop a comprehensive instrument that would include a broader set of work-related and non-work-related risk factors associated with job stress and its adverse negative outcomes, such as absenteeism, presenteeism, turnover, burnout and work-family conflict and to analyze its psychometric properties.

## **Method**

### **Instruments**

**Development of the risk assessment tool** (Sedlar, Novak & Šprah 2012a) underwent three main phases.

First of all, a preliminary list of risks, related to absenteeism, presenteeism, turnover, burnout and work-family conflict has been established. This phase included a) a review of relevant international research literature on workplace stress, b) a review of Slovenian publications addressing workplace stress, identified via a Co-operative Online Bibliographic System search (from January 2004 through December 2010), using the keywords: burnout, stress management, stress risk factors, job satisfaction, mobbing, staff turnover, absenteeism, presenteeism (Sedlar, Novak & Šprah 2012b), c) an analysis of socio-demographic, health, economical statistical indicators by Slovenian statistical regions from 2004 to 2010 (Novak, Šprah & Fridl, 2012), d) the focus group, where a group of 7 qualified experts in the workplace stress and stress-related fields proposed risks which in their opinion were related to workplace stress. In addition, they were asked to rate on a five-point Likert scale (1 = very unimportant to 5 = very important) the influence that each of the 186 risk factors obtained in previous phases had on absenteeism, presenteeism, turnover, burnout and work-family conflict. The second questionnaire was designed on the basis of the assigned importance to each risk factor (mean values,  $M > 2$ ) and the degree of consensus amongst experts (lower standard deviations, SD).

In the second phase an expanded group of 23 experts and researchers in the workplace stress and stress-related fields reassessed the most prominent risks from the first round on a five-point Likert scale (1 = very unimportant to 5 = very important). Based on high  $M$ , low  $SD$  and high discriminability of the risks obtained in the two consecutive rounds of an online survey a prioritised list of risks related to absenteeism, presenteeism, turnover, burnout and work-family conflict was established.

In the third phase a pilot version of the risk assessment tool was developed and validated in the pilot sample. 130 risk factors obtained in previous phases were transformed into self-rating items, asking respondents to evaluate how much they agree with each of the statement on a five-point Likert scale (1 = strongly disagree/very unlikely for me to 5 = strongly agree/very likely for me) in the last year. Example items are: 'I get little support from my organisation for dealing with difficult

situations.’ ‘There is a lot of competition among co-workers in my work organisation.’ ‘My work is very demanding.’ ‘I have difficulties with effective time management.’ In qualitative content analysis of the risks 17 categories of risk factors were created, 10 categories cover work-related risks (work context and work content) and 6 categories contain risks assessing broader psychosocial context (Table 1). Adequate face validity of the final 130-item version of the risk assessment tool was proven in a pilot sample of 60 Slovenian hospital employees (Sedlar, Novak & Šprah 2012c).

## Procedure

**Data collection.** 141 of participants were employees in four different work organizations from different economic sectors (health, construction, industrial work) that took part in the project »The Support Programme for Employers and Employees for Reducing Work-related Stress and Its Adverse Effects«. The rest of the data were collected from the employees of the Slovenian Association of Free Trade Unions (N=33), employees of various police directorates across Slovenia (N=83), and a convenience sample of Slovenian employees in different occupations (N=92). The approval of the local psychological ethics committee had been obtained prior to the study.

**Analyses.** Missing data were imputed using the EM algorithm, which has been demonstrated to be an effective method of dealing with missing data (Graham, 2009), and all analyses were conducted using a total of 349 participants.

SPSS Statistics 21.0 (SPSS Inc., Chicago, IL, USA) was used to perform all the statistical analyses. A principal component analysis (PCA) was performed to analyse the underlying structure of the risk assessment tool. A Direct oblimin rotation with Kaiser normalization, that allows the factors to be intercorrelated was used to ease interpretation of the results. The criterion used to select the number of factors was an eigenvalue greater than 1. The component score coefficient matrix and component correlations were reported. Internal reliability coefficient (Cronbach's alpha) was determined for each of the scales implied by the qualitative content analysis to evaluate the obtained component structure.

## Participants

The sample consisted of 349 Slovenian employees of various occupations, 170 (49%) of which were male and 179 (52%) female. 26.4% of the participants were from 41 to 50 years old, 35.1% from 31 to 40 years old, 22.6% from 20 to 30 years old, 15.9% more than 50 years old and 8.1% less than 20 years old. Most of the participants completed either high school (35.5%), university (28.5%), vocational (7.6%) or higher vocational school (11.8%). The majority of participants worked primarily with people (39.7%), 36.6% worked primarily with things and 20.8 % worked primarily with information according to Things-Data-People taxonomy (Fine and Cronshaw, 1999). They were employed in a wide variety of sectors: industry or manufacturing (18.3%), health care and social work (20.8%), education (5.1%), construction (8.7%), government, public administration and defence (34.6%), trade (0.6%), banking, financial services and insurance (1.1%), communication (4%), accommodation and food service (3%), arts, entertainment and recreation (0.6%), professional, scientific and technical activities (2.0%), transportation (0.8%) other or not defined (7.3%). The

mean working experience was 14.7 years (SD = 12.2), the mean organizational tenure was 9.6 years (SD = 8.9). 90.2 percent of the sample worked under long-term and 9.8 percent under short-term contract.

## Results

This section consists of three parts. We begin with the presentation of categories of a pilot version of the risk assessment tool, followed by the results of the Principal Components analysis with Direct oblimin rotation. Finally, we present the results of the reliability analysis for variant scales.

### Descriptive statistics

Categories of stress related hazards with corresponding risk factors are displayed in the Table 1.

Table 1. Categories of a pilot version of the risk assessment tool.

Category	Description
ORGANISATIONAL CULTURE AND FUNCTION	Poor communication, low levels of support for problem-solving and personal development, lack of definition of organisational objectives, lack of health and safety practices of employer, discriminating practices of employer, violations of the law by employer.
ORGANISATIONAL STRUCTURE	Changes in the work organisation (restructuring, laying off employees,..), understaffed work organization, indebted work organization, complex hierarchical structure of work organization, unqualified managers.
ROLE AND RESPONSIBILITY IN THE ORGANISATION	Role ambiguity and role conflict, responsibility for people, continuously working with other people, emotionally demanding work, wrong decisions can have serious consequences.
CAREER DEVELOPMENT	Career stagnation and uncertainty, under or over promotion, poor pay, job insecurity, job uncertainty, low social value to work, precarious work.
PARTICIPATION	Low participation in decision making, lack of control over workload, work pace, working hours, excessive control over the employees by the managers.
INTERPERSONAL RELATIONSHIP AT WORK	Social or physical isolation, poor relationships with superiors, interpersonal conflict, lack of social support, competition among co-workers, bullying/harassment.
HOME-WORK INTERFACE	Conflicting demands of work and home, low support at home, work-life balance practices offered by employer, dual career problems, being engaged in other works or additional education/training besides job.



TASK DESIGN	Monotonous work, short work cycles, fragmented or meaningless work, underuse of skills, high uncertainty, changes of work procedures, task-switching.
WORKLOAD/WORK PACE	Work overload or underload, lack of control over pacing, demanding work, more than one tasks at a time, high levels of time pressure, constant deadlines, unrealistic job expectations from an employer.
WORK SCHEDULE	Shift working, rigid work schedules, unpredictable hours, long or unsocial hours, lack of breaks.
WORK ENVIRONMENT/ EQUIPMENT AND PHYSICAL STRAIN	Problems regarding reliability, availability, suitability and maintenance or repair of both equipment and facilities; inadequate working conditions due to lack of proper working space, poor lighting, and noise.
FAMILY CIRCUMSTANCES	Single parent family, caring for family member with a long term illness, relationship problems with spouse and children, changes in family.
PSYCHO-PHYSICAL HEALTH STATUS	Physical or psychological illness or proneness to illness.
PERSONALITY TRAITS	Perfectionism, fear of making mistakes, disorganisation, overestimating one's abilities, indulgence, bad working habits, poor flexibility.
ATTITUDES TOWARDS WORK	Work is important value, conflict between work and personal values, the need to prove oneself at work, the need for self-affirmation, pessimism regarding work, feeling fed up with work, lack of career goals.
SELF- CARE	Unhealthy life style, unused vacation or sick leave, lack of time for oneself, friends, leisure activities, unhealthy strategies for coping with work stress.
SOCIO-DEMOGRAPHIC BACKGROUND	Inadequate living conditions, very low income, debt, few traffic connections between work and home, difficult access to kindergartens and health institutions, increased feelings of insecurity in the society.

First seven categories (organizational culture and function, organizational structure, role and responsibility in organization, career development, participation, interpersonal relationship at work, home-work interface) refer to work-context, next four (task design, workload/work pace, work schedule, work environment/equipment and physical strain) to content of the work, while the last six categories (family circumstances, psycho-physical health status, personality traits, attitudes towards work, self-care, socio-demographic background) refer to socio-demographic factors.

The responses on all items ranged between 1 and 5. Table 2 presents the descriptive statistics for all categories of the risk assessment tool.

Table 2. Descriptive statistics for a pilot version of the risk assessment tool.

Category	Number of items	M	SD	Alpha
Organizational culture and function	10	2.77	0.86	.86
Organizational structure	7	2.35	0.68	.52
Role and responsibility in organization	8	3.19	0.77	.63
Career development	10	2.67	0.70	.72
Participation	4	2.66	0.83	.60
Interpersonal relationship at work	7	2.33	0.68	.71
Home-work interface	8	2.47	0.73	.58
Task design	6	2.57	0.67	.47
Workload/work pace	9	3.12	0.63	.69
Work schedule	6	2.26	1.04	.59
Work environment/equipment and physical strain	11	2.51	0.87	.73
Family circumstances	5	2.15	0.82	.61
Psycho-physical health status	4	2.29	0.82	.54
Personality traits	10	2.36	0.57	.59
Attitudes towards work	9	2.27	0.49	.43
Self-care	8	2.97	0.72	.57
Socio-demographic background	8	2.19	0.64	.63

Number of items on subscales ranged from 4 to 11. Answers on subscales Organizational culture and function and Work environment/equipment and physical strain were the most variable. The majority of subscales had a relatively low reliability estimates.

### Internal structure: Principal Component Analysis

PCA was conducted on risk factors category sums as to determine the content of specific factors. Using Direct Oblimin rotation, and retaining all components with eigenvalues >1, four-component solution emerged, explaining 69.9% of the total variance. It is characterized by (i) organizational context, (ii) socio-economic characteristics of the employee, (iii) job characteristics and (iv) individual characteristics of the employee (Table 3).

Table 3. Component Score Coefficient Matrix (Direct Oblimin rotation)

	Component			
	1	2	3	4
Variance (unrotated solution)	47.33	8.74	7.44	6.43
Variance (rotated solution)	36.81	22.74	26.85	23.66
Interpersonal relationship at work	<b>.27</b>	.01	<b>-.15</b>	-.02
Organizational culture and function	<b>.23</b>	-.05	.03	-.04
Organizational structure	<b>.21</b>	<b>-.15</b>	-.03	.07
Career development	<b>.22</b>	.01	-.02	-.02
Participation	<b>.21</b>	.03	.02	-.11
Family circumstances	-.07	<b>.43</b>	-.07	-.02
Home-work interface	.05	<b>.28</b>	.02	-.09
Socio-demographic background	.07	<b>.19</b>	-.10	.13
Role and responsibility in organization	-.09	-.11	<b>.39</b>	.07

Work schedule	-.02	.04	<b>.36</b>	<b>-.15</b>
Workload/work pace	.08	-.14	<b>.25</b>	.05
Task design	.01	.12	<b>.22</b>	-.06
Work environment/equipment and physical strain	.02	<b>.22</b>	<b>.15</b>	-.12
Attitudes towards work	-.05	-.06	.01	<b>.45</b>
Personality traits	.03	-.04	-.09	<b>.40</b>
Self-care	-.02	-.01	<b>.15</b>	<b>.21</b>
Psycho-physical health status	-.05	<b>.22</b>	-.09	<b>.26</b>

Coefficients with an absolute value greater than or equal to .15 are shown in bold

Component Structure shows minimal cross-loadings and all four components present core groups of risk factors for workplace stress that have been consistently observed in studies of psychosocial risk factors at the workplace. The category Work environment/equipment and physical strain showed the highest weight of the regression factor scores on the second component (socio-economic characteristics of the employee). Nevertheless, it was retained on the third component (job characteristics) on theoretical basis. Categories Organisational structure, Self-care and Psycho-physical health status also showed comparable regression weights for predicting two components, but were retained on the components with the highest weights.

Component intercorrelations were moderate, with values ranging from .20 to .45 (see Table 4).

Table 4. Component intercorrelations

Component	1	2	3
1. Organizational context			
2. Socio-economic characteristics of the employee	.35		
3. Job characteristics	.43	.28	
4. Individual characteristics of the employee	.42	.21	.33

### Internal structure: Reliability

Composite reliability was calculated for each of the resulting four components, leading to general conclusion that scales have satisfactory reliability.

Table 5. Reliability estimates of the scales.

Component	Composite reliability	Corrected Item-Total Correlation
1. Organizational context	.93	
Interpersonal relationship at work		.73
Organizational culture and function		.84
Organizational structure		.64
Career development		.80
Participation		.74
2. Socio-economic characteristics of the employee	.80	
Family circumstances		.64
Home-work interface		.61
Socio-demographic background		.57



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3. Job characteristics	.85	
Role and responsibility in organization		.53
Work schedule		.63
Workload/work pace		.63
Task design		.68
Work environment/equipment and physical strain		.57
4. Individual characteristics of the employee	.85	
Attitudes towards work		.67
Personality traits		.68
Self-care		.63
Psycho-physical health status		.55

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## Discussion

Previous research (e.g. Kopp, et al. 2007; Leka, et al. 2003; Pološki Vokić & Bogdanić 2007) suggests that a number of work-related and non-work-related factors, including specific socio-demographic and cultural settings, could contribute to the experience of work-related stress. So far, there are no instruments for stress assessment available in Slovenia (Tabanelli, et al. 2008) that would be adapted to non-English-speaking cultural settings and would cover psychosocial risks at work as well as risks arising from broader non-work related environment. Therefore in the presented study a comprehensive instrument that covers a broad spectrum of risk factors associated with job stress and its adverse negative outcomes was developed and its psychometric properties were analyzed in a sample of Slovenian employees.

The development of the risk assessment tool underwent several phases, including a literature review, an expert panel, two consecutive rounds of an online survey and a validation of the tool in a pilot sample. The final version consisted of 130 items that were qualitatively divided into 16 categories of risk factors. PCA was used to summarize the information from a given set of risk factors. A four component solution consisted of most commonly identified groups of psychosocial risk factors that contribute to the experience of stress at the workplace (e.g. Kopp, et al. 2007; Leka, et al. 2003; Pološki Vokić & Bogdanić 2007). After the rotation (Direct Oblimin with Kaiser normalization), the first component Organisational context accounted for the highest proportion (36,81%) of unexplained variance, followed by the component Job characteristics (26,85%). Both components cover work-related risks that are mostly included into existing instruments for workplace stress assessment (Tabanelli, et al. 2008). Nevertheless, the remaining two components Individual characteristics of the employee and Socio-economic characteristics of the employee explain 23,66% and 22,74% of variance, respectively. Therefore our findings indicate that the role of non-work related risk factors should not be overlooked. Moreover, since the obtained components have satisfactory composite reliability, the four component solution seems to be appropriate from the reliability point of view as well.

We also need to note some potential limitations of our study. A first potential drawback concerns a rather specific sample, which has not been randomly selected from the full range of possible occupations. The majority of the sample consisted of employees in the public administration and defence, health care and social work and industry or manufacturing. This could be of a practical relevance, because research findings (Johnson, Cooper, Cartwright, Donald, Taylor & Millet 2005) indicate that experience of work-related stress differs across occupations. Moreover, our sample was overrepresented by employees from 31 to 50 years old, and by highly educated employees with either completed high school or university. Another drawback of our study is the reliance on self-report.

The study represents an important step toward the development of a comprehensive instrument for identifying potential risk factors associated with harmful work-related outcomes, taking into account also pertinent socio-cultural and health characteristics of Slovenia. Moreover, it provides insight into non-work-related risk factors that only recently gained more research attention and may contribute to the experience of work-

related stress. Further validation of the tool in different work settings and samples is needed.



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