

Workplace stress evaluation tools: A Snapshot Review

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Executive Summary

This Snapshot Review is an investigation of workplace stress evaluation tools. The starting point for the review is an evaluation of the Stress Satisfaction Offset Score (SSOS), which is a four-item scale developed by Shain (1999) to enable individuals to assess the impact of workplace stressors on their health. The SSOS is one of several tools that have been developed to address the four elements embedded in the Demand Control model (Karasek & Theorell, 1990) and the Effort Reward Imbalance model (Siegrist, 1996) of workplace stress.

The purpose of the review is to assess whether the SSOS is a suitable tool for inspectors to use to obtain a quick and valid initial indication of the presence of stress in a workplace. Two questions are addressed in this review:

1. Is the “Stress and Satisfaction Offset Score” tool reliable enough to be used as an initial indicator of workplace stress?
2. Are there any other tools of this type, available at no cost, which could be used for the same purpose?

A search of academic and grey literature was conducted in order to gather information relevant to workplace stress measurement tools. Specific inclusion and exclusion criteria were used to evaluate workplace stress tools.

The results of this review reveal that the SSOS has not been validated to an acceptable level for use as a workplace stress evaluation tool. While three short alternative scales developed to measure workplace stress are available in the public domain, these scales have not been validated to an acceptable level.

On the basis of this review, it is recommended that a validation study be undertaken to validate an existing scale or develop a new scale using standard psychometric techniques. The selected scale should also undergo sensitivity and specificity analysis. There are several approaches that could be taken and it is recommended that one of the following three options be pursued:

- Validate, and modify where necessary, an existing short measure of workplace stress: HSE Management Indicator Tool (First Pass); Job Stress Scale; SSOS; given the brevity of these scales it would be possible to test them all in the same study design.
- Take an existing questionnaire in the public domain that meets the content requirements of WorkSafe and reduce it to a short-form version through a standard validation process; or

- Develop a new scale and validate it.

Background/Context

The need to measure stress in the workplace has resulted in numerous scales that have arisen largely from two models of stress. The most prominent models of stress are the Job-Demand Control model developed by Karasek and colleagues (Karasek, 1979; Karasek & Theorell, 1990) and the Effort Reward Imbalance model developed by Siegrist (Siegrist, 1996). While some workplace stress scales arise directly from the Karasek model (Job Control Questionnaire) or the Siegrist model (Effort Reward Imbalance Questionnaire), some scales such as the Stress Satisfaction Offset Score (Shain, 1999) incorporate both models.

The main focus of this review is the Stress Satisfaction Offset Score (SSOS) which is a four-item scale developed by Shain (1999) to enable individuals to assess the impact of workplace stressors on their health. The four scale items were included to address the four elements embedded in the Demand Control model (Karasek, 1979; Karasek & Theorell, 1990) and the Effort Reward Imbalance model (Siegrist, 1996). The scale contains one item per domain: demand, control, effort and reward; with demand and effort representing stressors and control and reward representing satisfaction. The scoring of the SSOS results in a positive or negative score ranging from -2 through to +2 that indicates how stress and satisfaction are offset against each other. A positive score results in a net gain where satisfaction offsets stress while a negative score is a net loss where stress outweighs satisfaction.

What is required for a validated scale?

Scale development and validation is a complex issue that requires not only the initial establishment of a scale's validity, but also ongoing evidence from subsequent studies that supports the initial latent structure and reliability over time (incremental validity). This validation process requires evidence of:

- Latent structure: exploratory and/or confirmatory factor analysis; item response theory;
- Reliability: Cronbach's alpha
- Validity:
 - Content: the scale should be reviewed subject matter experts for item relevance;
 - Convergent: moderate correlations with constructs that are conceptually related;
 - Discriminant: weak/no correlations with constructs that are unrelated;
 - Criterion: correlations to constructs that are predicted by the new scale.

It is not possible to provide a full discussion of these methods in this review but DeVellis (2003) provides an extensive explanation of these concepts in his guide to scale development and validation.

Review Questions

Two questions will be addressed in this review:

1. Is the “Stress and Satisfaction Offset Score” tool reliable enough to be used as an initial indicator of workplace stress?
2. Are there any other tools of this type, available at no cost, which could be used for the same purpose?

Method

The search for validated instruments was conducted through searches of academic databases and a grey literature search. Specific inclusion and exclusion criteria were applied and are discussed below.

Peer reviewed academic research literature

The most likely source of validated measurement instruments freely available for both academic and practitioner use will be found in academic journals. Therefore, the two main databases that were searched for measures of stress in the workplace were Medline and Embase. The search was conducted for scales used to measure stress in the workplace from 1990 to the present (2011). Where scales were identified, the original paper detailing the development and validation of that scale was sourced where possible.

Scales were selected for inclusion in this review if they were: 1) explicit in their focus on measuring stress in the workplace; 2) freely available in the public domain; and 3) primary measures of workplace stress (e.g. SSOS) rather than secondary manifestations of stress (e.g. burnout).

Instruments were excluded from the review if they were: 1) designed for a specific subset of the workforce (e.g. nursing, offshore workers); 2) general measures of stress (e.g. did not explicitly address workplace issues); and 3) licenced or restricted and therefore not freely available (e.g., Occupational Stress Inventory: Osipow, 1998) or not available for commercial use (e.g., Effort Reward Imbalance: Siegrist, Starke, Chandola et al., 2004; Job Content Questionnaire: Karasek, Brisson, Kawakami et al., 1998). Additionally, scales that contained more than 150 items, such as the 224 item Generic Job Stress Questionnaire (NIOSH), were not included as the content of scales such as this goes well beyond workplace stress and they are complicated to administer.

Grey literature

The search of grey literature included information from several sources:

- National Institute of Safety & Occupational Health (NIOSH)
- World Health Organisation (WHO)
- International Labour Organisation
- Google Scholar

Search terms and procedure

Several constraints were applied to the search procedure: 1) the timeline was restricted to 1990 to the present (2011); and 2) only articles and scales written in English were considered. A search for both job stress and occupational stress in these databases resulted in approximately 1000 articles each so this search approach was modified to include the phrase factor analysis to reduce the search load. The incorporation of the word scale into a search with both job stress and occupational stress resulted in few returned articles. A more manageable search method that resulted in more targeted articles was the search term workplace stress.

Search terms:

- Stress Satisfaction Offset Score / SSOS
- Michael Shain
- Job stress AND factor analysis
- Workplace stress

Results

Stress satisfaction offset score

Searches were conducted using the Medline and Embase databases for citations of 'Stress Satisfaction Offset Score' and 'SSOS' in academic papers; however no articles were returned. An author search for Michael Shain returned 18 articles with only one article discussing the SSOS in detail (Shain, 1999). A search in Google Scholar for the SSOS returned only four articles directly referencing the scale; one of these was a peer-reviewed article (McLennan, 2005) and one an academic report (MacDonald, Evans & Armstrong, 2007). A general Google search enabled the location of the technical notes associated with the SSOS but no additional articles.

The discussion of the SSOS in Shain (1999), Burton, Shain and Szlapetis (2006) and the technical notes indicate that no formal validation or reliability analysis has been published on the scale and this is supported by the few article returns in both general and academic database searches. The technical notes describe several statistics that have been conducted with scores from the SSOS that are either correlations or cross-tabulations. These statistics have been conducted in large scale studies across a variety of Canadian public organisations; however, the results of these studies do not appear to have been published in peer reviewed literature.

The technical notes reported cross-tabulations and were conducted to investigate the relationship between the SSOS and self-reported health status, days absent in the last year, multiple health risks (e.g. low physical activity, overweight, trouble sleeping, smoking, high alcohol consumption), and a sense of fairness and respect at work in employees ($n=3400$). For all variables, positive SSOS scores were associated with better outcomes, specifically; employees in this category were more likely to report: excellent/very good health, fewer sick days, fewer health risk behaviours and a greater sense of fairness and respect at work compared to employees who attained negative SSOS scores. Similarly, a comparison of employees ($n=1176$) with negative and positive SSOS scores on symptoms that address common psychological and physical manifestations as of stress in the past year was also conducted. The psychological symptoms linked to employee workload included: frustration, irritation, anger, helplessness, exhaustion, inability to concentrate, depression, confusion and boredom. The physical symptoms included: feeling run down, headaches, muscle/joint pain, indigestion and changes in appetite. In all instances, employees with negative SSOS scores were substantially more likely to experience these symptoms *often* in the past year compared to the employees who had positive SSOS scores. No significance tests were provided for these cross-tabulations, although group differences were substantial enough that they would most likely reach significance if tested.

The SSOS has been used in a study of nurses with stress as an outcome variable (McLennan, 2005) but this study does not add useful evidence for SSOS validity. A workplace OHS study (MacDonald, Evans & Armstrong, 2007) does not explicitly test SSOS validity or reliability but some of the results may contribute to evidence of convergent validity. MacDonald and colleagues (2007) conducted several studies that used the SSOS in both correlational and regression analysis. This study reported conflicting evidence for a relationship between SSOS and measures of work-related psychosocial hazards. There was a moderate positive relationship between the Work Organization Assessment Questionnaire (WOAQ: Griffiths, Cox, Karanika, et al., 2006) and the SSOS ($r=0.61$, $p<0.01$) but not

the Copenhagen Psychosocial - Influence subscale (COPSOQ: Kristensen, Hannerz, Høgh, et al., 2005) ($r=-0.01$, $p>0.05$). The WOAQ is a more extensive measure of psychosocial work hazards that include objective constructs (e.g. work breaks) in addition to subjective constructs (e.g. management attitudes) while the COPSOQ Influence subscale focuses on interpersonal relations (e.g. influence at work). Nonetheless, despite this limited level of conflict these results suggest evidence of convergent validity for the SSOS with some components of psychosocial work hazards. It is possible that this may be driven by the inclusion of objective measures or simply because the WOAQ has captured a broad range of psychosocial hazards that are associated with increased stress. Whereas the COPSOQ Influence subscale addresses only a small component of the psychosocial construct and appears not to be directly related to the SSOS.

There were also moderate negative relationships between the SSOS and measures of physical work demands ($r=-0.53$, $p<0.01$) and discomfort/pain level at the end of a working day ($r=-0.62$, $p<0.01$) indicating that negative SSOS score are significantly associated with higher levels of discomfort at work and greater physical demands. Regression analysis revealed that the SSOS was a significant predictor of discomfort/pain at the end of the working day whereas physical demands was not a significant predictor of discomfort/pain ($Adj R^2=0.39$), which contributes to evidence of criterion validity.

Alternative workplace stress evaluation tools

In reviewing the literature on stress in the workplace there appear to be several approaches to understanding stress in the work environment: 1) direct measures that link experienced stress to workplace or job design conditions; 2) subjective measures contain constructs related to the job demand-control model or the effort-reward imbalance model; 3) general measures of stress that do not necessarily link the source of stress to the workplace; and 4) manifestations of stress (e.g. burnout; physiological responses). Scales used in workplace stress studies range from simple measures of workplace stress to complex scales that contain many subscales measuring workplace stress directly and through manifestations of stress such as burnout.

A WHO study (Leka & Jain, 2010) of psychosocial hazards in the workplace has referenced 37 instruments used in current literature, however not all of these are in English or within the public domain. Despite the large number of measures in existence, this snapshot review found 17 measures of job stress that were in English and freely available in the public domain. Of these measures, only three scales met the WorkSafe requirement of being a short (i.e. <10 items) and easy to administer scale but none met the second requirement of having been validated to a reasonable

level (i.e. latent structure, reliability, construct validity). These scales were: the HSE Management Standards Indicator Tool - First Pass (Cousins, MacKay, Clarke et al., 2004: eight items); the Job Stress scale (Lambert, Hogan, Camp, et al., 2006: five items); and the Stress in General scale (Stanton, Balzer, Smith et al. 2001: eight items).

The HSE Managements Standards Indicator Tool has two scales a short first-pass scale (8 items) and a full scale (35 items). The development and validation study (Cousins, MacKay, Clarke et al., 2004) reported validation and reliability data for the full scale but did not report any psychometric details. Using Web of Knowledge for a citation search of articles citing Cousins et al., (2004) we found that of the 31 articles citing this article no articles had used or examined the first pass tool. A Google search for citations of the tool returned a study by Main, Glozier and Wright (2005) that examined the validity of the first pass version of the indicator tool using sensitivity and specificity analysis. While this does not shed light on the latent structure or reliability it is useful in making decisions regarding the practical application of the tool and its capacity to accurately identify stress in the workplace. This study examined six of the eight items identified by Cousins, MacKay, Clarke et al., (2004) that cover all the original specified domains but it is not clear which items were selected out of the eight original items. Analysis (odds ratios) of the individual items representing demand, control, support, relationships and change indicated that they were strongly related to psychological distress and job dissatisfaction with individuals scoring highly on these indicators being more likely to report higher levels of distress. The sensitivity analysis revealed that the ability of these items to detect workplace stress was poor, particularly for the *demand* and *role* items. Specificity analysis, that is the ability to correctly reject those who are not stressed, was high, generally greater than 95% (except for *relationships* 86% and *change* 75%).

Similarly, a citation search for the study by Lambert, Hogan, Camp & Ventura (2006) returned three articles, but only one study reported psychometric properties of the Job Stress Scale (Wickramasinghe, 2010). In this study the Job Stress Scale was analysed using exploratory factor analysis, the results revealed a one-factor structure with 60% explanatory variance and the scales reliability was reported to be 0.78. No further details are available for this scale from either study. Finally, the authors of the Stress in General scale paid greater attention to the psychometric properties of their scale, which are acceptable; however, their approach to measuring workplace stress deviates from the other measures in this field. The scale focuses directly on employees' experience of stress in the workplace but the items are descriptive of emotional states experienced (e.g. hassled, overwhelming) rather than specific indicators of issues in the workplace (e.g. excessive

demands at work). This is an interesting approach to measuring workplace stress but does not assist in targeting workplace issues that are causing stress in the way scales arising from the Job-Demand-Control or Effort Reward Imbalance models do.

Table one below summarises the findings of the review of alternative measures of workplace stress. A summary table of analyses conducted on each scale can be found at Appendix one while detailed content information of each scale reviewed can be found at Appendix two.

Table 1. Summary of alternative measures of workplace stress

Review summary	N	%
Number of items		
1 to 10 items	3	17.6
11 to 20 items	10	58.8
21 or more items	9	52.9
Validation process		
Latent structure	12	70.5
Reliability	4	23.5
Construct validation	3	17.6
Validation		
Latent structure, reliability, construct validity	4	23.5
Latent structure, reliability	10	58.8
Reliability only, no validation or reliability	2	11.8
Meets WorkSafe specifications		
10 items or less	3	17.6
Fully validated	0	0.0
Overall suitability (i.e. validated, < 10 items)	0	0.0

N=17

While Table one indicates that a reasonable amount of analysis has been conducted on workplace stress scales, not all psychometric analysis has been of high quality. Setting aside the extent of the analysis (i.e. latent structure, reliability and construct validity) and looking at the reporting of the results, it is clear that the extent of the analysis is not always consistent with quality. For example, the analyses conducted on the HSE Management Indicator Tool (Full scale: Cousins, MacKay, Clarke et al., 2004) and the Job Stress Scale (Parker & DeCotiis, 1983) are less extensive than that conducted on the Workplace Assessment Stressors Questionnaire (Mahmood, Coons, Guy & Pelletier, 2010) but the analysis quality of the latter scale is distinctly poorer in quality even though it was extensively conducted (i.e. latent structure, reliability and construct validity).

Table two displays reporting of the results and acceptability of the analysis. This table shows that latent structure and construct validity are less likely to be conducted than reliability analysis. Construct validation is also more likely to be poorly conducted, or in most cases, not fully conducted compared to other analyses.

Table 2. Reporting and acceptability of analysis

Review summary	N	%
Latent structure		
Acceptable	7	41.1
Poor	0	0.0
Not reported / partially reported	10	58.8
Reliability		
Acceptable	12	70.5
Poor	0	0.0
Not reported / partially reported	5	29.4
Construct validation		
Acceptable	1	0.1
Poor	5	29.4
Not reported / partially reported	11	64.7

N=17

Discussion

The two questions addressed in this review are:

1. Is the “Stress and Satisfaction Offset Score” tool reliable enough to be used as an initial indicator of workplace stress?
2. Are there any other tools of this type, available at no cost, which could be used for the same purpose?

Stress satisfaction offset score

Shain and colleagues have used the SSOS in numerous workplace studies; however, this scale has not been used extensively in academic research. To justify its use in academic or practitioner work it is important to demonstrate that it is a valid and reliable measure of workplace stress. This means testing: latent structure (exploratory/confirmatory factor analysis), reliability analysis (Cronbach’s alpha), and construct validity (correlational analysis). No reports of exploratory or confirmatory factor analysis were reported in either peer-reviewed literature or grey literature to support the latent structure of the SSOS. Similarly, no reliability analysis has been reported to demonstrate how well consolidated the items are as a scale. Construct validity, also known by its sub groups convergent, discriminant and criterion validity, has not been explicitly tested however; some authors have conducted correlations that provide some evidence of convergent validity.

The cross-tabulations reported by Shain in the SSOS Technical Notes demonstrate a facet of validity, *known groups validity*, which is one way of testing for construct validity of new scales when there is no obvious means of testing convergent validity. If different groups with known characteristics (e.g. positive SSOS, negative SSOS) achieve predicted scores on a scale (e.g. good outcomes versus poor outcomes) then this contributes to evidence of validity for the scale. In this instance the SSOS has demonstrated that groups exhibiting common symptoms of stress (both physical and psychological) are much more likely to have a negative SSOS score than a positive score.

The use of cross-tabulations by the authors to investigate the relationships between SSOS scores suggests that negative SSOS scores appear to be associated with both physical and psychological manifestations of stress and poor health behaviours. However, the descriptive outcomes for each SSOS score appear to be over-stated and without basis. Further empirical investigations are required before the meaning of each score could be suggested with confidence.

Presently, the SSOS is a scale that has *potential* to be used for a pulse check within organisations but is not presently suitable for use as an evaluation tool. It is a short easily completed scale that is based on accepted theories of workplace stress and has associations with important psychological and physical employee outcome variables. However, to be confident about the validity and reliability of the SSOS as a measure of workplace stress it must undergo a formal validation process to investigate its latent structure, reliability and construct validity. Furthermore, it is not clear how realistic the qualitative descriptors for the SSOS outcomes are but we recommend that these descriptions of SSOS outcome scores be tested and modified according to empirical outcomes, to resolve these concerns a workplace study would need to be conducted.

Alternative workplace stress evaluation tools

This brief review of the workplace stress literature reveals a wide variety of scales and their content are largely consistent with the Job-Demand Control model (Karasek & Theorell, 1990) or the Effort Reward Imbalance model (Siegrist, 1996). There are some short scales of approximately 20 items and these focus more directly on these models (e.g. Swedish Demand-Control Questionnaire: Sanne et al., 2005); however, many scales found in the literature go beyond the presence of stress to delve into its source and its consequences.

Authors of more than half of the studies reviewed have conducted analyses to understand the latent structure and reliability of their scales and some of these scales have psychometric properties that can be considered reasonable. However, for most of the studies reviewed the psychometric analysis

has not been reported properly. The analysis is often: conducted but the results are not reported; conducted but only partially reported; conducted for an earlier version of the scale but not reported for the final scale; and in some case not conducted at all. In these instances it is not possible to comment on the quality of the analysis as it is unclear what has been done.

Time constraints specified by WorkSafe means that a useful measure of workplace stress would need to contain less than ten items which renders most of the scales reviewed here unsuitable. The results of this review show that in terms of length the best alternative scales to address this requirement are the: HSE Indicator Tool (First pass); Job Stress Scale; and the Stress in General scale. However, there is little evidence of their validity (HSE Indicator tool; Job Stress Scale) or they are less suitable due to the approach taken to measure workplace stress (Stress in General scale). In the case of the HSE Management Indicator Tool (First pass), the evidence available suggests problems with sensitivity which means its potential for use in the workplace is compromised. Despite this there is so little evidence regarding the utility and validity of this scale that it is only possible to raise concerns about its potential use rather than exclude it altogether. In the case of the Job Stress Scale, the main problem is lack of evidence. This scale appears to have good model fit and good reliability; however, like the SSOS and the HSE Indicator Tool (First pass) there is not enough evidence to recommend it as good, reliable measure of workplace stress. Given the lack of psychometric data for the SSOS, the HSE Indicator Tool (First pass) and the Job Stress Scale, these scales cannot be used without further testing and possibly adaptation in the case of the HSE Indicator Tool (First pass).

Recommendations

There are several approaches that could be taken and on the basis of this review, it is recommended that one of the following three options be pursued:

- Validate, and modify where necessary, an existing short measure of workplace stress: HSE Management Indicator Tool (First Pass); Job Stress Scale; SSOS; given the brevity of these scales it would be possible to test them all in the same study design.
- Take an existing questionnaire in the public domain that meets the content requirements of WorkSafe and reduce it to a short-form version through a standard validation process; or
- Develop a new scale and validate it.

The selection of a workplace stress scale from existing measures for validation or reduction to a short form measure will to some extent depend on the models of stress that WorkSafe considers most relevant and whether the scale in question addresses the domains that are of most interest. It

is clearly not possible to tap all stressors within a short form scale, it would be desirable that a measure of workplace stress should tap into the fundamental areas of workplace stress as specified by the dominant models of stress in this field.

To validate one of the shorter scales currently in use (HSE Management Indicator Tool - First pass; Job Stress scale; SSOS) and assess it for WorkSafe purposes would require a workplace survey which would ideally be conducted in a representative sample drawn from the Australian workforce. There would be two aims for this study, which are to: 1) fully validate the scale and make an assessment of its psychometric properties; and 2) conduct sensitivity and specificity analysis. Given the brevity of these scales it would be possible to test them all in the same study design.

To validate an existing scale it is necessary to determine the latent structure which can be established with exploratory factor analysis, confirmatory factor analysis or item response theory (e.g. Rasch analysis). Reliability of the scales would be assessed with Cronbach's alpha and correlational analysis would be conducted to determine the construct validity. There are three aspects of construct validity that would need to be assessed: *convergent validity*, the scale should be moderately correlated with conceptually related constructs, e.g. with another measure of workplace stress; *discriminant validity*, the scale should be weakly or not related to conceptually unrelated constructs; and *criterion validity*, there should be correlations to constructs that are predicted by the new scale, e.g. absenteeism or other detrimental workplace outcomes. See DeVellis (2003) for greater detail on this process. To determine sensitivity and specificity it is necessary to have a 'gold standard' to measure stress in employees that the newly validated scale would be tested against. This could be a well-developed scale administered through a survey design or it could be a more detailed diagnosis that is made by a research psychologist in combination with a survey to measure other elements of workplace stress. The purpose of the sensitivity analysis would be to determine the extent of the scales ability to correctly identify employees who experience workplace stress (sensitivity) and to correctly reject those that don't experience workplace stress (specificity).

The sample size required for such a study would depend on the extent of the analysis. While factor analysis requires a minimum of 10 participants per item, as a rule of thumb it is generally accepted that factor analysis requires sample sizes of approximately 200 to 300 participants (Comrey, 1988). Similarly, Rasch analysis requires reasonably large sample sizes (minimum of 108: Pallant & Tennant, 2007) for examining the psychometric properties of the scale. It would be ideal to test the factor structure of the preferred scale with one type of analysis (exploratory factor analysis) and confirm it in another (Rasch analysis), which would require a sample size of approximately 500 participants.

This approach allows the researcher to maximise the strengths and minimise the weaknesses of each statistical approach and provide a detailed analysis of the scale at both the scale and item level (Glockner-Rist & Hoitjink, 2003).

Developing a new scale would follow the same approach but substantial effort must go into determining the appropriate model, developing items and assessing the content validity of the scale. Earlier studies have either examined prior scales through a literature search to develop their items or have conducted focus groups and interviews to understand which are the appropriate constructs to include. Following this development process, the scale would undergo the validation process and the sensitivity and specificity analysis described above.

Conclusion

This review concludes that while the SOSS appears to have good content validity and known groups validity, it has not had sufficient psychometric testing to be used in the workplace setting at this stage. The alternative measures that are freely available are also not currently suitable. In general, most freely available surveys are too long and those that are short have not been tested properly. Those scales that are short enough to be administered quickly (HSE Management Indicator Tool - First pass; Job Stress Scale) would require further testing before use. It is recommended that use of any of these three scales not be adopted prior to an examination of their psychometric properties and that this be followed with sensitivity and specificity and specificity analysis. Alternatively, a longer existing scale could be reduced to a short form version or a new scale could be developed.

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Appendix one: Validity and reliability of workplace stress scales in the public domain

Scale Authors (Year)	Items	Item development	Dimensions	Latent structure	Reliability	Construct validation
Copenhagen Psychosocial Questionnaires Three versions: Short (n=40), Medium (n=87) & Long (n=141) Pejtersen, Kristensen, Borg & Bjorner (2010)	N=141 (Long version)	Revised from COPSOQ I through feedback from workplace studies. Additional scales and items were constructed.	Demands at work (18) Work organisation and job contents (17) Interpersonal relations & leadership (25) Work-individual interface (14) Values at workplace (15) Health & wellbeing (30) Offensive behaviour (7)	Exploratory factor analysis Separate EFA analysis conducted for each domain: results not reported. No specific analysis on medium or short form versions.	Scale reliability ranges from $\alpha = 0.50$ to $\alpha = 0.89$ with most above 0.70. Reliability not reported for medium or short versions.	Not reported.
General Nordic Questionnaire (Full version) Lindstrom, Elo, Skogstad, et al (2000)	N=112	Review of the literature and scales in use.	Control at work (9) Job demands (26) Role expectations (7) Predictability at work (12) Mastery of work (6) Social interactions (12) Leadership (8) Org culture (13) Org commitment (3) Work centrality (3) Group work (5) Work motives (6) Work-Life interaction (2)	Not reported.	Each domain is comprised of up to four subscales and reliability ranges from $\alpha = 0.60$ to $\alpha = 0.88$ with most above 0.70.	Construct validity established through CFA model but not with alternative scales. Criterion validity established between domain subscales and job involvement, job satisfaction, emotional exhaustion and distress symptoms; however these correlations were generally low.

Scale Authors (Year)	Items	Item development	Dimensions	Latent structure	Reliability	Construct validation
General Nordic Questionnaire (Short version) Lindstrom, Elo, Skogstad, et al (2000)	N=34	Based on the full version of the General Nordic Questionnaire	Based on the full version of the General Nordic Questionnaire	Not reported.	Not reported.	Not reported.
HSE Indicator Tool (First pass for initial investigation) Cousins, Mackay, Clarke et al (2004)	N=8	Derived from the full HSE Indicator Tool	Demands (1) Control (1) Relationships (2) Role (1) Change (1) Managerial support (1) Peer support (1)	Not reported.	Not reported.	Not reported.
HSE Indicator Tool (Full follow-up tool) Cousins, Mackay, Clarke et al. (2004)	N=35	Workshops with industry experts	Demands (8) Control (6) Relationships (4) Role (5) Change (3) Managerial support (5) Peer support (4)	Exploratory factor analysis Seven factors 62.6% variance	Demands $\alpha = 0.89$ Control $\alpha = 0.78$ Relationships $\alpha = 0.78$ Role $\alpha = 0.83$ Change $\alpha = 0.83$ Managerial support $\alpha = 0.87$ Peer support $\alpha = 0.81$	Not reported.

Scale Authors (Year)	Items	Item development	Dimensions	Latent structure	Reliability	Construct validation
Job Characteristics Inventory Results for sample one only. Sims, Szilagy & Keller (1976)	N=23	Based on earlier research by Hackman & Lawler	Variety (5) Autonomy (5) Feedback (3) Dealing with others (3) Task identity (4) Friendship (3)	Exploratory factor analysis Six factors % variance not reported	Variety $\alpha = 0.80$ Autonomy $\alpha = 0.74$ Feedback $\alpha = 0.79$ Dealing with others $\alpha = 0.80$ Task identity $\alpha = 0.77$ Friendship $\alpha = 0.75$	Convergent validity & discriminant validity established through multi-method multi-trait Criterion validity not reported
Job Demand & Control measure Results for sample one only. Jackson, Wall, Martin & Davids (1993)	N=22	Literature review of existing scales Interview protocols developed by authors	Timing control (n=4) Method control (n=6) Monitoring demand (n=4) Problem solving (n=3) Production responsibility (n=5)	Confirmatory factor analysis Five factors, 2 CE Sample 1 $X^2 = 424.6, df = 197, p=.88$ Sample 2 $X^2 = 395.0, df = 197, p=.85$	Sample 1 Timing control $\alpha = 0.85$ Method control $\alpha = 0.77$ Monitoring demand $\alpha = 0.73$ Problem solving $\alpha = 0.50$ Production responsibility $\alpha = 0.90$	Convergent validity & discriminant validity not reported Known groups validity reported
Job Diagnostic Survey Hackman & Oldman (1975)	N=64	Based on earlier work by: Turner & Lawrence 1965; Hackman & Lawler, 1971.	Job dimensions (21) Psychological states (10) Affective responses to the job (25) Growth need strength (18)	Not reported.	Not reported.	Not reported.

Scale Authors (Year)	Items	Item development	Dimensions	Latent structure	Reliability	Construct validation
Job Stress Lambert, Hogan, Camp & Ventura (2006)	N=5	Adapted from Crank (1995)	Job stress (5)	Confirmatory factor analysis One factor RMSEA = 0.10 No further details other than stating model fit achieved.	$\alpha = 0.82$	Not reported.
Job Stress Scale Parker & DeCotiis (1983)	N=13	Literature review Interviews with managers	Time stress (8) Job anxiety (5)	Exploratory factor analysis Two factors 77.5% variance	Time stress $\alpha = 0.86$ Job anxiety $\alpha = 0.74$	Not explicitly tested but regression analysis indicates substantial relationships between subscales and organisational stressors.
Perceived Work Characteristics Survey Haynes, Wall, Bolden et al (1999)	N=41	Based on previously developed scales. Note: one subscale is job specific*	Autonomy & control (6) Feedback (4) Influence over decisions (4) Leader support (4) Professional compromise* (4) Role clarity (5) Role conflict (4) Peer support (4) Work demands (6)	Confirmatory factor analysis Nine factors $X^2 = 17043.0$, $df = 824$ CFI= 0.92	Reliabilities provided for seven different subgroups which ranged from $\alpha = 0.70$ to $\alpha = 0.92$ with most being above 0.80.	Validity addressed through CFA to determine if subscales were factorially distinct. Known groups and criterion validity established.

Scale Authors (Year)	Items	Item development	Dimensions	Latent structure	Reliability	Construct validation
Pressure Management Indicator Williams & Cooper (1998)	N=120	Based on Occupational Stress Indicator (Cooper et al (1988)	24 subscales that fit three broad domains: Effects of pressure Sources of pressure Individual differences	Exploratory factor analyses conducted for scales but details not reported.	Reliabilities provided for seven different subgroups which ranged from $\alpha = 0.70$ to $\alpha = 0.89$.	Not reported.
Stress at Work (psychological) Frese (1985)	Not reported.	Items developed from open-ended interviews	Intensity Uncertainty Organizational problems Environmental stress	Not reported.	Sample 1 / Sample 2 Intensity $\alpha = 0.81 / \alpha = 0.81$ Uncertainty $\alpha = 0.72 / \alpha = 0.64$ Organizational problems $\alpha = 0.71 / \alpha = 0.71$ Environmental stress $\alpha = 0.73 / \alpha = 0.81$	Not reported.
Stress in General (Original version) Stanton, Balzer, Smith et al (2001)	N=15 Words & Phrases to describe job stress	Based on the Lazarus (1966) appraisal model Item pool selected from words/phrases developed by Ironson, et al (1989) Words used by employees to describe work stress	Two dimensions: Pressure (n=7) Threat (n=8)	Exploratory factor analysis Two factors % variance not reported Confirmatory factor analysis Two factors, 3 CE $X^2 = 437.7$, $df = 86$ GFI= 0.90 NFI = 0.86 NNFI = 0.85 RMSR=0.11	Pressure $\alpha = 0.88$ Threat $\alpha = 0.82$	Convergent validity established for both Threat subscale and limited validity for the Pressure subscale with Job in General and Job Stress inventory. Discriminant validity not tested. Criterion validity for Threat subscale but not Pressure subscale with Intention to quit.

Scale Authors (Year)	Items	Item development	Dimensions	Latent structure	Reliability	Construct validation
Stress in General (Revised version) Yankelevich, Broadfoot, Gillespie et al (2011)	N=8 Words Phrases to describe job stress	Revision of the 15 item scale developed by Stanton, Balzer, Smith et al (2001)	One dimension: General job stress	Item Response Theory Used for item selection Model fit not reported Confirmatory factor analysis $X^2 = 52.0$, $df = 20$ CFI= 0.94 RMSEA=0.07 SRMR = 0.05	Not reported	Convergent validity established with stress and job satisfaction scales Criterion validity Not reported
Swedish Demand-Control Questionnaire Sanne, Torp, Mykletun & Dahl (2005)	N=16	Based on Karasek (1979) Demand Control Model	Job demands (5) Decision latitude (5) Social support (6)	Exploratory factor analysis Three factors 56% variance	Job demands $\alpha = 0.73$ Decision latitude $\alpha = 0.74$ Social support $\alpha = 0.83$	Not reported
Workplace Stressors Assessment Questionnaire Mahmood, Coons, Guy & Pelletier (2010)	N=22	Literature review Focus groups	Demands Control Support Role Rewards Relationships	Exploratory factor analysis conducted but results for final scale not reported.	Results for final scale not reported.	Results for final scale not reported.

Appendix two: Scales used to measure workplace stress

Scale: Copenhagen Psychosocial Questionnaire

Reference: Pejtersen, Kristensen, Borg & Bjorner (2010)
Response: 5-point scale: various anchors (e.g. *always, often, sometimes, seldom, never/hardly ever*)
Items: Short (n=40), Medium (n=87) & Long (n=141)
Domains:

- Demands at work*
 - Quantitative demands
 - Work pace
 - Cognitive demands
 - Emotional demands
 - Demands for hiding emotions
- Work organization and job contents*
 - Influence
 - Possibilities for development
 - Variation
 - Meaning of work
 - Commitment to the workplace
- Interpersonal relations and leadership*
 - Predictability
 - Recognition
 - Role clarity
 - Role conflicts
 - Quality of leadership
 - Social support from colleagues
 - Social support from supervisors
 - Social community at work
- Work-individual interface*
 - Job insecurity
 - Job satisfaction
 - Work–family conflict
 - Family–work conflict
- Values at the workplace*
 - Mutual trust between employees
 - Trust regarding management
 - Justice
 - Social inclusiveness
- Health and well-being*
 - Sleeping troubles
 - Burnout
 - Stress
 - Depressive symptoms
 - Somatic stress
 - Cognitive stress
 - Self-efficacy
- Offensive behavior*
 - Sexual harassment
 - Threats of violence
 - Physical violence
 - Bullying

Unpleasant teasing
Conflicts and quarrels
Gossip and slander

Scale: General Nordic Questionnaire (Short form)

Authors: Lindstrom, Elo, Skogstad, Dallner, et al (2000)
Response: 5-point scale: *very seldom or never, rather seldom, sometimes, rather often, very often or always*
Items: Short (n=34)
Domains: Job demands
Quantitative demands
Decision demands
Learning demands
Role expectations
Role clarity
Role conflict
Control at work
Positive challenge at work
Control of decision
Control of work pacing
Predictability at work
Predictability during the next month
Predictability of next two years
Preference for challenge
Mastery of work
Perception of mastery
Social interactions
Support from superior
Support from coworkers
Support from friends and relatives
Bullying and harassment
Leadership
Empowering leadership
Fair leadership
Organisational culture and climate
Social climate
Innovative climate
Inequality
Human resource primacy
Work Motives
Intrinsic motivation to work
Extrinsic motivation to work

Scale: HSE Indicator Tool – First pass

Reference: Cousins, et al. (2004)
Response: 5-point scale: *never, seldom, sometimes, often, always* (except where noted with† these items are answered on a 5-point scale: *strongly agree, agree, neutral, disagree, strongly disagree*).
Items (8): I have unrealistic time pressures (Demands)
I have a choice in deciding what I do at work? (Control)
My line manager encourages me at work † (Managerial support)

I receive the respect I deserve from my colleagues at work † (Work colleague support)
I am clear what my duties and responsibilities are (Role)
I am subject to bullying at work (Relationships)
Relationships at work are strained (Relationships)
Staff are consulted about change at work † (Change)

Scale: HSE Indicator Tool – Full scale

Reference: Cousins, et al. (2004)

Response: 5-point scale: never, seldom, sometimes, often, always (except where noted with† these items are answered on a 5-point scale: strongly agree, agree, neutral, disagree, strongly disagree).

Items (35): *Demands*

I am pressured to work long hours
I have unachievable deadlines
I have to work very fast
I have to work very intensively
I have to neglect some tasks because I have too much to do
Different groups at work demand things from me that are hard to combine
I am unable to take sufficient breaks
I have unrealistic time pressures

Control

I can decide when to take a break
I have a say in my own work speed
I have a choice in deciding what I do at work?
I have a choice in deciding how I do my work?
I have some say over the way I work †
My working time can be flexible †

Managerial support

I am given supportive feedback on the work I do
I can rely on my line manager to help me out with a work problem
I can talk to my line manager about something that has upset or annoyed me about work †
I am supported through emotionally demanding work †
My line manager encourages me at work †

Work colleague support

If the work gets difficult, my colleagues will help me
I get the help and support I need from colleagues †
I receive the respect I deserve from my colleagues at work †
My colleagues are willing to listen to my work-related problems †

Role

I am clear what is expected of me at work
I am clear about the goals and objectives for my department
I know how to go about getting my job done
I am clear what my duties and responsibilities are
I understand how my work fits into the overall aims of the organization

Relationships

There is friction or anger between colleagues
I am subject to personal harassment in the form of unkind words or behaviour
I am subject to bullying at work
Relationships at work are strained

Change

Staff are consulted about change at work †
I have sufficient opportunities to question managers about change at work †
When changes are made at work, I am clear how they will work out in practice †

Scale: Job Characteristics Inventory

Reference: Sims, Szilagyi & Keller (1976)

Response: 5-point scale:

Items (30): How much variety is there in your job?
How much are you left on your own to do your own work?
How often do you see projects or jobs through to completion?
To what extent do you find out how well you are doing on the job as you are working?
How much opportunity is there to meet individuals whom you would like to develop friendship with?
How much of your job depends upon your ability to work with others?
How repetitious are your duties?
To what extent are you able to act independently of your supervisor in performing your job function?
To what extent do you receive information from your superior on your job performance?
To what extent do you have the opportunity to talk informally with other employees while at you're at work?
To what extent is dealing with other people a part of your job?
How similar are the tasks you perform in a typical work day?
To what extent are you able to do your job independently of others?
The feedback from my supervisor on how well I'm doing
Friendship from my co-workers
The opportunity to talk to others on my job
The opportunity to do a number of different things
The freedom to do pretty much what I want on my job
The degree to which the work I'm involved with is handled from beginning to end by myself.
The opportunity to find out how well I am doing on my job.
The opportunity in my job to get to know other people.
The amount of variety in my job
The opportunity for independent thought and action
The opportunity to complete work I start
The feeling that I know whether I am performing my job well or poorly
The opportunity to develop close friendships in my job
Meeting with others in my work
The control I have over the pace of my work
The opportunity to do a job from the beginning to end (i.e., the chance to do a whole job)
The extent of feedback you receive from individuals other than your supervisor

Scale: Job Demand Control Measure

Reference: Jackson, Wall, Martin & Davids (1993)

Response: 5-point scale: *not at all, a little, a moderate amount, quite a lot, a great deal.*

Items (22): *Timing control*

Do you decide on the order in which you do things?

Do you decide when to start a piece of work?

Do you decide when to finish a piece of work?

Do you set your own pace of work?

Method control

Can you control how much you produce?

Can you vary how you do your work?

Can you control the quality of what you produce?

Can you decide how to go about getting your job done?

Can you choose the methods to use in carrying out your work?

Monitoring demand

Does your work need you undivided attention?

Do you have to keep track of more than one process at once?

Do you have to concentrate all the time to watch for things going wrong?

Do you have to react quickly to prevent problems arising?

Problem solving

Do you have to solve problems which have no obvious correct answer?

Do the problems you deal with require a thorough knowledge of the production process in your area?

Do you come across problems in your job you haven't met before?

Production responsibility

Could a lapse of attention cause a costly loss of output?

Could an error on your part cause expensive damage to equipment or machinery?

Could your alertness prevent expensive damage to equipment or machinery?

Could your alertness prevent costly loss of output?

If you failed to notice a problem, would it result in a costly loss of production?

Scale: Job Stress Scale

Reference: Lambert, Hogan, Camp & Ventura (2006)

Response: 5-point scale: strongly agree, agree, uncertain, disagree, strongly disagree

Items (5): A lot of time my job makes me very frustrated or angry.

I am usually under a lot of pressure when I am at work.

When I'm at work I often feel tense or uptight.

I am usually calm and at ease when I'm working (reverse coded for index).

There are a lot of aspects of my job that make me upset.

Scale: Job Stress Scale

Reference: Parker & DeCotiis (1983)

Response: 4-point scale: anchors not specified

Items (13): Time stress

Working here makes it hard to spend enough time with my family

I spend so much time at work, I can't see the forest for the trees

Working here leaves little time for other activities

I frequently get the feeling I am married to the company

I have too much work and too little time to do it in

I sometimes dread the telephone ringing at home because the call might be job-related

I feel like I never have a day off

Too many people at my level in the company get burned out by job demands

Job related anxiety

I have felt fidgety or nervous as a result of my job

My job gets to me more than it should

There are lots of times when my job drives me right up the wall

Sometimes when I think about my job I get a tight feeling in my chest

I feel guilty when I take time off from job

Scale: Perceived Work Characteristics Survey

Reference: Haynes, Wall, Bolden, Stride & Rick (1999)

Response: 5-point scale: Various anchors.

Items (83): *Autonomy and control*

To what extent do you: 1. Determine the methods and procedures you use in your work? 2. Choose what work you will carry out? 3. Decide when to take a break? 4. Vary how you do your work? 5. Plan your own work? 6. Carry out your work in the way you think best?

Response scale: not at all, just a little, moderate amount, quite a lot, a great deal.

Feedback

1. I usually know whether or not my work is satisfactory in this job. 2. I often have trouble figuring out whether I'm doing well or poorly on this job. 3. Most people on this job have a pretty good idea of how well they are performing their work. 4. Most people on this job have trouble figuring out whether they are doing a good or bad job.

Response scale: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree.

Influence over decisions

To what extent: 1. Can you influence what goes on in your work area as a whole? 2. Does your immediate superior ask for your opinion before making decisions affecting your work? 3. Do you have the opportunity to contribute to meetings on new work developments? 4. Are you allowed to participate in decisions which affect you?

Response scale: not at all, just a little, moderate amount, quite a lot, a great deal.

Leader support

How much does your immediate superior: 1. Encourage you to give your best effort? 2. Set an example by working hard him/herself? 3. Offer new ideas for solving job-related problems? 4. Encourage those who work for him/her to work as a team?

Response scale: to a very little extent, to a little extent, to some extent, to a great extent, to a very great extent.

5. To listen to you when you need to talk about problems at work? 6. To help you with a difficult task at work?

Response scale: not at all, to a small extent, neither great nor small extent, to a great extent, completely.

Professional compromise

In your opinion, how often do staff meet the following problems in carrying out their work?

1. Having to make trade-offs between quality of patient care and cost savings. 2. Lack of clarity/agreement about the different responsibilities of doctors and nurses. 3. Being unable to achieve quality in their work because there are staff shortages. 4. Having to do an acceptable minimum of work rather than doing the best quality work possible.

Response scale: not at all, just a little, moderate amount, quite a lot, a great deal.

Role clarity

How true are the following of your job? 1. I have clear planned goals and objectives for my job. 2. I know that I have divided my time properly. 3. I know what my responsibilities are. 4.

Explanation is clear of what has to be done. 5. I know exactly what is expected of me.

Response scale: not at all, just a little, moderate amount, quite a lot, a great deal.

Role conflict

How often do you find these issues arising in carrying out your job? 1. I receive conflicting instructions from two or more people. 2. Professionals make conflicting demands of me. 3.

Managers make conflicting demands of me. 4. I do things which are accepted by one person, but not by another.

Response scale: not at all, just a little, moderate amount, quite a lot, a great deal.

Peer support

To what extent can you: 1. Count on your colleagues to listen to you when you need to talk about problems at work? 2. Count on your colleagues to back you up at work? 3. Count on your colleagues to help you with a difficult task at work? 4. Really count on your colleagues to help you in a crisis situation at work, even though they would have to go out of their way to do so?

Response scale: not at all, to a small extent, neither great nor small extent, to a great extent, completely.

Work demands

1. I do not have enough time to carry out my work. 2. I can not meet all the conflicting demands made on my time at work. 3. I never finish work feeling I have completed everything I should. 4. I am asked to do work without adequate resources to complete it. 5. I can not follow best practice in the time available. 6. I am required to do basic tasks which prevent me completing more important ones.

Response scale: not at all, just a little, moderate amount, quite a lot, a great deal.

Scale: Pressure Management Indicator

Reference: Williams & Cooper (1998)
Response: Not reported
Items (116): Job satisfaction
Organisational satisfaction
Organisational security
Organisational commitment
State of mind
Resilience
Confidence level
Physical symptoms
Energy levels
Workload
Relationships
Recognition
Organisational climate
Personal responsibility
Managerial role
Home-work balance
Daily hassles
Type A Drive
Patience-Impatience
Control
Personal influence
Problem focus
Life-work balance
Social support

Scale: Stress at Work (Psychological)

Reference: Frese (1985)
Response: Not reported:
Items: Not reported

Scale: Stress in General (Original)

Reference: Stanton, et al. (2001)
Response: 3-point scale: Yes, No, Cannot decide
Items (15): Asks respondents to indicate whether or not the items describe their job situation:
Pressure subscale
Demanding, pressured, hectic, calm, relaxed, many things stressful, pushed
Threat subscale
Irritating, under control, nerve-wracking, hassled, comfortable, more stressful than I'd like,
smooth-running, overwhelming

Scale: Stress in General (Revised)

Reference: Yankelevich, et al. (2011)
Response: 3-point scale: Yes, No, Cannot decide
Items (8): Asks respondents to indicate whether or not the items describe their job situation:

Demanding, pressured, calm, many things stressful, nerve-wracking, hassled, more stressful than I'd like, overwhelming

Scale: Stress Satisfaction Offset Score

Reference: Shain (1999)

Response: 2-point scale: agree, disagree

Items (4): I am satisfied with the amount of involvement I have in decisions that affect my work
I feel I am well rewarded (in terms of praise and recognition) for the level of effort I put out for my job
In the last six months, too much time pressure at work has caused me worry, “nerves” or stress
In the last six months, I have experienced worry, “nerves” or stress from mental fatigue at work

Scale: Swedish Demand-Control Support Questionnaire

Reference: Sanne, Torp, Mykletun & Dahl (2005)

Response: 4-point scale: anchors not reported.

Items (16): *Psychological demands*

Does your job require you to work very fast?
Does your job require you to work very hard?
Does your job require too great a work effort?
Do you have sufficient time for all your work tasks?
Do conflicting demands often occur in your work?

Decision latitude

Do you have the opportunity to learn new things in your work?
Does your job require creativity?
Does your job require doing the same tasks over and over again?
Do you have the possibility to decide for yourself how to carry out your work?
Do you have the possibility to decide for yourself what should be done in your work?

Social support

There is a quiet and pleasant atmosphere at my place of work
There is good collegiality at work
My co-workers (colleagues) are there for me (support me)
People at work understand that I may have a “bad” day
I get along well with my supervisors
I get along well with my co-workers

Scale: Workplace Stressors Assessment Questionnaire

Reference: Mahmood, Coons, Guy & Pelletier (2010)

Response: 2-point scale: agree, disagree

Items (22): *Demands*

Number of meetings
Demands affect personal relationships
Difficulty to unwind at home
Too much work
Conflicting demands
Neglected tasks
Work long hrs
Unrealistic time pressures
No space for other activities
Too much pressure

Control

Satisfaction with the amount of control
Authority in the job
Authority to implement decisions
Participation in making decisions
Discretion at work
Micromanagement

Support

Supervisor is sensitive to employees' concerns
Ability to talk to supervisor
Help by colleagues
Performance feedback
Supervisor help out with work problems

Role

Skill compatibility
Understand how role fits in the organization
Clear about the goals and objectives
Clear about duties and responsibilities

Relationships

Bullied, threatened, or harassed
Discriminated against
Too much bickering
Personality conflicts or strained relationships

Rewards

Appreciation
Efforts are rewarded as they should be
Job security
Respect from colleagues
Respect from supervisor(s)

Change

Too many changes at work
Sufficient opportunities to ask about change
Employees consulted about change