

DEVELOPMENT OF THE SOURCES OF WORK STRESS INVENTORY



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This article describes the development of the Sources of Work Stress Inventory (SWSI). Factor analyses of the generated items produced (a) a General Work Stress Scale and (b) eight Sources of Work Stress scales, namely Bureaucracy/Autonomy, Relationships, Tools and Equipment, Workload, Role Ambiguity, Work/Home Interface, Job Security and Career Advancement. Rasch rating scale analyses supported the construct validity and reliability of the scales. A multiple regression analysis confirmed the expected strong relationship between the different sources of work stress and the experience of stress in the workplace. It is concluded that the SWSI shows promise as a measure of work stress in the South African context.

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Trying to find a single, agreed-upon definition for *stress* is like trying to find the proverbial needle in a haystack. Having to consider all the possible forms of stress does not make the job any easier. For example, one could distinguish between physical stress (as in engineering), physiological stress (or the body's response to stress) and psychological stress – the type of stress on which this article will concentrate. Schlebusch (1998) conceptualised psychological stress as 'an interaction of several variables involving a particular relationship between a person and the environment, which is appraised by the person as taxing or exceeding coping resources and endangering well-being' (p. 266). The instrument developed in the present study will

be used to identify those variables that a person perceives to be taxing in his or her work environment.

Stress can have several negative individual outcomes, such as burnout (Doyle & Hind, 1998), job dissatisfaction (Beehr, 1995) and cardiovascular disease (Theorell & Karasek, 1996), but it can also have a detrimental effect on the organisations for which people work. Beehr (1995) outlined two major organisational outcomes of occupational stress, namely employee withdrawal and reduced job performance. Four types of employee withdrawal can be identified, namely lateness, absenteeism, turnover and psychological withdrawal. These are all forms of avoidance of work (Beehr, 1995).

One widely cited model of occupational stress is Karasek's (1979) Job Strain model. Karasek (1979) distinguished between two elements of the working environment that contribute to job stress, or job strain: job demands placed on the individual and the discretion the individual is allowed in deciding how to meet these demands. Karasek's (1979) Job Strain model is based on the postulate that stress at work is a result of the combined effects of the demands of the working environment and the amount of decision-making latitude an individual has. In other words, if job demands are high and job decision latitude is low, the individual will experience job strain (this is classified as a 'high strain' job). The model defines a 'low strain' job as one where job demands are low and decision latitude is high; an 'active' job as one where both job demands and decision latitude are high; and a 'passive' job as one where both job demands and decision latitude are low. In a South African study, Strydom and Meyer (2002) found that job demands and job expectations were the major sources of job stress for middle-level managers in the Western Cape.

However, there are other elements that play a role in the creation of work-related stress. These can be classified as environmental constraints – 'those aspects of the environment that prevent a person or group from coping with demands' (Jones & Fletcher, 1996, p. 34). The following are discussed below: difficulty working with, or obtaining, the relevant tools and equipment needed to complete a task properly, role ambiguity, poor relationships at work, physical working conditions, non-work factors interfering with work and the lack of opportunity for career development.

Although computers are no longer a new phenomenon in the workplace, they are mechanical instruments and are, of course, subject to mechanical faults. Computers and machines soon become obsolete in this fast-paced world of technological development, leaving the user with slow, out-dated and inefficient equipment. This could cause frustration and stress to those individuals with little technical knowledge. Schlebusch (1998) calls this kind of stress 'techno-stress' (p. 278).

Role ambiguity is one of the earliest researched causes of occupational stress in the literature (Beehr, 1995). It is generally paired with role conflict, although the two are conceptually distinct. These two concepts both have their roots in role theory and are conceptualised as features of the expectations and demands placed on the focal

person (the one being studied) by others in the particular role set (in this case, the workplace). Beehr (1995) defined role ambiguity as 'deficient or uncertain information in the environment regarding the role behaviours expected of the focal person' (p. 58). However, role conflict is defined as 'the existence of two or more sets of expectations on the focal person . . . such that compliance with one makes compliance with the other more difficult' (p. 58).

Having good relationships with colleagues and supervisors at work is essential when having to spend the entire day surrounded by these people. It is well documented that having poor interpersonal relationships at work contributes greatly to the individual's experience of work-related stress (Sutherland & Cooper, 1988). Another aspect of work relationships is the interpersonal demands placed on the individual by others in their workplace. Quick and Quick (1984) classified five types of interpersonal demands in the workplace: (a) status incongruence (actual status is not what employee believes it should be), (b) social density (lack of personal workspace), (c) abrasive personalities (people who ignore the emotional aspects of the social situation), (d) leadership style (especially authoritarian styles) and (e) group pressure to conform to social norms.

Physical demands of the work environment are considered to be an intrinsic job factor (Sutherland & Cooper, 1988). However, the experience of environmental factors is highly subjective, different people having different threshold levels in terms of temperature, noise and light. Sutherland and Cooper (1988) included the following possible environmental stressors in their conceptualisation of physical environmental demands: noise, vibration, temperature variation, ventilation and humidity, lighting and illumination levels, hygiene and climate. In South Africa, Shadwell, Schlebusch and van Niekerk (1996) investigated the effects of environmental variables in places where they could not be controlled by employees and found that many of the employees displayed symptoms indicative of sick-building syndrome when thresholds of noise and air pollution were exceeded.

Greenhaus and Parasuraman (1987) discussed three ways in which stress is compounded in a work–non-work interaction. First, work–non-work additivity assumes that the more stressful the domains experienced and the more extensive the stressors in each domain, the greater the degree of stress experienced. Second, work–non-work spillover also occurs in the work–non-work interaction, either from work to non-work, or vice versa. In other words, stress from work can affect relationships with family and friends, and personal issues (e.g., financial problems, race and family problems) can affect a person's efficiency at work, as well as increase stress. Third, work–non-work conflict can occur. This is the simultaneous occurrence of demands in both the work and non-work domains (Greenhaus & Parasuraman, 1987).

Sutherland and Cooper (1988) conceptualised 'career development' as a source of stress in terms of job insecurity, under-promotion, over-promotion and hindered ambition. In other words, it is the lack of ability to advance in one's career or reach one's career goals as desired. *Job insecurity* is best described as a fear of job loss

or redundancy, which especially manifests itself in times of high unemployment, market instability, and perhaps even new policy implementations, such as affirmative action.

STRESS IN UNIVERSITY STAFF

Academic life has often been thought to be easy or comfortable (Fisher, 1994). Studies focusing on this unique sector of the working world in South Africa have been few and far between. Even articles appearing in South African journals refer to international higher education institutions (e.g., Tytherleigh, 2003). Although much local research has focused on occupational stress in primary and high school teachers (e.g., Ngidi & Sibaya, 2002), Taris, Schreurs and van Iersel-van Silfhout (2001) found that the results from these studies could not be generalised to university teachers.

Many international studies have proposed that the cutback in higher education funding is a stressor for university staff (Fisher, 1994; Gillespie, Walsh, Winefield, Dua & Stough, 2001). However, funding cuts are not the case in South Africa. According to the 2003 budget, spending on education was up 10% from 2002, with higher education spending consuming almost 92% of the education budget (Kahn, 2003). However, major restructuring of universities and technikons is under way – part of the South African government's decision to streamline academic services to students and reduce the number of institutions in South Africa by incorporating universities and technikons so as to establish so-called comprehensive institutions. This is a major concern for personnel at some higher-level institutions: fewer institutions mean fewer jobs and it is likely that job insecurity is one of the top causes of work stress for university staff in South Africa at present.

Academic personnel in higher learning institutions often have to fulfil a number of roles simultaneously. However, there are several problems in combining the roles of teacher and researcher. Taris et al. (2001) indicated that many academics consider themselves to be researchers first and foremost. They have to 'endure' teaching and other tasks in order to be able to do research. Furthermore, a good researcher does not necessarily make a good teacher, nor does a good teacher make a good researcher. As found in their study in the Netherlands, the combination of having to do research as well as having to teach induced job strain (Taris et al., 2001).

In the United Kingdom, Doyle and Hind (1998) compared men and women academics' perspectives on individual priorities, what the university prioritises and how much time is spent on less prioritised tasks. Both men and women seemed to have the same priorities: (a) research, (b) research and teaching and (c) teaching, coinciding with what they perceived the university's priorities to be. However, both groups reported an increase in workload over the previous five years – mostly due to an increase in administrative tasks, one of the least prioritised aspects of work for academics. In other words, academics were spending more of their time on work they considered to be of little importance.

In studies comparing administrative staff and academic (teaching) staff at universities, academic personnel have continuously reported higher stress levels than their administrative counterparts (Blix, Cruise, Mitchell & Blix, 1994; Gillespie et al., 2001). Blix et al. (1994) found that university teachers mostly cited heavy workload as a reason for contemplating a change in career and that research activities were more stressful than teaching. They also found that women personnel (both administrative and academic) experienced higher stress levels than men. Gillespie et al. (2001) found job insecurity to be a major source of stress in both academic and administrative staff in their study involving 15 Australian universities. A further finding in their study suggests that academic and administrative staff share the same general sources of job stress, despite differences in the roles they fulfil. Gillespie et al. (2001) identified task overload, lack of funding, resources and support, poor leadership and management, and lack of promotion and recognition as further sources of stress.

THE SOURCES OF WORK STRESS INVENTORY

The aim of the development of the Sources of Work Stress Inventory (SWSI) was to provide a measure of occupational stress that would not only indicate a general level of stress, but would highlight possible triggers or sources of stress. These sources of stress could then be identified and addressed in order to provide a more suitable working environment for employees. In order to achieve this, the questionnaire is divided into two parts: (a) the General Work Stress Scale, which consists of questions concerning the level of stress caused by work and (b) the Sources of Stress scales, which consist of statements regarding aspects of work that may cause stress.

The first section is the General Work Stress Scale, which asks questions about the level of stress that an individual experiences at work. In other words, the items were drawn up to determine to what extent work itself is a source of stress for the individual.

The second section, the Sources of Stress scales, consists of nine sources of work stress, namely: Role ambiguity, Relationships, Working environment, Tools and equipment, Work/Home interface, Workload, Bureaucracy, Autonomy and Career advancement/Job security. These sources were chosen from a search of the literature, as well as through asking staff members at a university about what causes them stress at work. Items were drawn up for each Source of Stress and subjected to an item-sort by three intern psychologists and a qualified psychologist.

The item sort proceeded as follows: items and the proposed Sources of Stress labels were placed on index cards and the Sources of Stress cards were laid down on the table as headings. Judges were given written definitions for each Source of Stress. They then sorted the items according to the Source of Stress they thought each item best suited, placing vague items in an 'Unsure' pile. Those items that were not sufficiently clear or easily understood were removed or modified and categories that needed extra clarification were more clearly defined.

Definitions for each of the Sources of Stress scales are provided below.

Role ambiguity

Role ambiguity relates to the amount of stress experienced by an individual due to vague specifications or constant change regarding the expectations, duties and constraints that define the individual's job. Role conflict is the degree to which an individual experiences stress due to having to fulfil non-complementary roles in the workplace. These definitions were used as a basis and it was deemed appropriate to have a separate category for role ambiguity, whereas many of the other categories incorporated aspects of role conflict (e.g. Work/Home Interface and Workload).

Relationships

This dimension refers to the stress experienced as a result of having poor interpersonal relationships with colleagues and superiors as well as being subjected to interpersonal abuse.

Workload

Workload refers to the amount of stress experienced by individuals due to the perception that they are unable to cope or be productive with the amount of work allocated to them. As mentioned previously, academics have to deal with a wide range of tasks that sometimes tax the skills they have not properly developed or that create time pressure in terms of simultaneous deadlines for various tasks. These are examples of both role overload and role conflict (Fisher, 1994), which both contribute to the category labelled 'Workload'.

Autonomy

Autonomy refers to the amount of stress experienced by an individual due to a lack of empowerment in the workplace. Autonomy can also be seen as job control or job decision latitude, which forms a part of Karasek's (1979) model of occupational stress.

Bureaucracy

Bureaucracy relates to the stress experienced by an individual due to working for an institution where rules are rigidly set, and procedures and protocol must be closely followed. Bureaucracy forms a part of the structure of any large institution and especially a university. There is a distinct hierarchy and a definite 'system' or specific channels to go through with any decision or request. When this functions properly, it facilitates the flow of information, but if one does not know the correct channels to go through, it can be extremely frustrating and time-consuming.

Tools and equipment

This category relates to the stress experienced due to a lack of relevant tools and equipment needed to do a job properly, or working with inappropriate, broken, or complex machinery.

Physical environment

This category refers to the stress experienced by an individual as a consequence of their physical working environment. The physical environment can be a major contributor to the inability to concentrate or perform effectively, which in turn could be a source of stress. Constant interruptions, temperature extremes, high noise levels and poor illumination are all examples of such environmental factors (Burke, 1988).

Career advancement/Job security

Career advancement refers to the stress experienced by an individual as a result of a perceived lack of opportunity to further his or her career prospects within the organisation for which he or she works. Job security relates to an individual's uncertainty about his or her future in the current workplace. These two concepts were combined to form a single category, as item sorting indicated confusion between the two categories, suggesting a conceptual similarity between Career advancement and Job security.

Work/Home Interface

This category refers to the stress experienced by an individual as a result of a lack of social support at home or from friends and work-nonwork additivity, spillover and conflict with regard to stress within and outside the workplace.

RESEARCH OBJECTIVES

The objectives of the present study were (a) to construct a questionnaire that can be used as a predictor of work stress and (b) to identify elements that cause stress in staff at a university.

METHOD

Participants

Employees at a Gauteng university were requested to download the SWSI from the local Intranet, complete it and return it. A total of 311 responses were obtained (118 men, 165 women and 28 non-specified). Ninety-five of the academic personnel and 182 administrative or support personnel responded (34 unspecified). The university in the present study was about to enter a restructuring process, hence the need to evaluate the levels of stress experienced by the personnel.

Measures

Demographic questionnaire

The demographic questionnaire contained items relating to the respondents' age, gender, marital status and number of dependants. Items relating to job description were also included. Respondents were asked to provide the name of the department or faculty for which they worked, indicate whether they were academic or administrative (or support) staff and in which capacity they functioned at the university (e.g. top management or secretarial and professor or lecturer).

Sources of Work Stress Inventory

The main measure of work-related stress was the SWSI. As discussed above, the SWSI consists of two sections: the General Work Stress Scale and the nine Sources of Stress scales. The 15-item General Work Stress Scale asks questions about the respondents' overall level of work-related stress. Respondents answer on a five-point Likert-type scale, indicating how often they feel that way. The responses are: Never, Rarely, Sometimes, Often and Always, where 'Never' is scored as 1 and 'Always' is scored as 5. For example, Item 1 asks: 'Does work make you so stressed that you wish you had a different job?'

The Sources of Stress scales consist of nine sources of work stress, namely Role Ambiguity, Relationships, Working Environment, Tools and Equipment, Work/Home Interface, Workload, Bureaucracy, Autonomy and Career Advancement/Job Security. This section contains 79 items. Respondents are asked to indicate to what extent each Source of Stress contributes to their level of stress at work. The format is a five-point Likert-type scale, with responses ranging from 1 to 5 in the following order: none at All, Very Little, Some, Quite a Lot and Very Much. An example of a Source of Stress item is: 'Being unsure about what my job really involves' (Item 1: Role Ambiguity).

RESULTS

Factor analysis

The intercorrelations of the 79 Sources of Stress items were subjected to an unrestricted maximum likelihood factor analysis. In accordance with the proposed scoring key, nine factors were extracted and obliquely rotated according to the Promax criterion ($\kappa = 4$). The nine factors explained 62.02% of the variance in the correlation matrix. Inspection of the factor pattern matrix showed that, for the most part, items formed clusters that corresponded very well with the proposed scoring key. However, the items of the Physical Environment Scale were spread over two factors and the items of the Bureaucracy and Autonomy scales merged to define a single factor. In view of these results, an eight-factor solution was obtained, which explained 59.99% of the variance in the correlation matrix. However, five of the Physical environment items merged with the Tools and equipment items, while the remaining three had no

significant loadings on any factor. On the basis of these results, it was decided to eliminate the eight Physical Environment items.

Table 1. Promax-rotated factor pattern matrix ($k = 4$) for the Sources of Stress items

Item	Factor							
	1	2	3	4	5	6	7	8
S1	-0.08	-0.03	0.07	-0.02	0.77	0.08	0.12	-0.01
S2	0.00	-0.03	0.01	-0.10	0.86	0.09	0.06	-0.04
S3	0.03	-0.11	-0.07	0.37	0.42	-0.12	0.01	0.19
S4	0.01	-0.09	0.00	0.23	0.49	-0.03	0.01	0.12
S5	-0.02	0.02	0.06	0.03	0.86	0.00	-0.01	-0.11
S6	0.11	0.26	-0.09	-0.05	0.43	-0.03	-0.10	0.15
S7	0.02	-0.05	0.04	-0.04	0.60	0.04	0.01	0.04
S8	0.02	0.39	0.00	0.00	0.46	-0.07	0.00	0.04
S9	-0.01	0.89	-0.09	-0.06	0.05	0.03	-0.04	0.05
S10	0.02	0.80	0.02	0.03	0.02	0.02	-0.01	-0.04
S11	0.00	0.75	-0.06	0.07	-0.03	0.01	0.03	0.19
S12	0.00	0.80	0.05	0.03	0.03	-0.04	-0.06	0.02
S13	-0.04	0.75	0.10	-0.06	0.03	-0.05	-0.13	0.03
S14	-0.02	0.49	0.00	0.11	0.16	0.01	0.07	-0.08
S15	0.01	0.66	-0.08	0.14	-0.12	-0.02	0.20	-0.15
S16	-0.05	0.86	-0.03	0.00	-0.09	0.09	0.11	-0.14
S17	-0.02	0.77	0.06	0.04	0.04	-0.02	0.00	-0.03
S18	-0.02	0.89	0.05	-0.10	-0.08	0.08	-0.08	-0.06
S19	-0.01	0.42	0.10	0.13	-0.10	-0.04	0.17	0.05
S28	0.00	-0.09	0.56	-0.07	-0.12	0.18	-0.03	0.28
S29	-0.05	-0.08	0.43	-0.04	-0.19	0.11	0.07	0.27
S30	-0.02	0.03	0.77	-0.11	-0.01	0.12	-0.06	0.12
S31	-0.01	-0.05	0.52	0.02	0.05	0.01	0.01	0.02
S32	-0.12	-0.03	0.83	0.09	0.02	-0.05	0.05	0.05
S33	0.08	0.03	0.75	0.12	0.06	-0.06	-0.02	-0.02

Table 1 cont.

Item	Factor							
	1	2	3	4	5	6	7	8
S34	-0.01	0.03	0.67	-0.07	0.14	0.01	0.01	-0.08
S35	0.00	0.10	0.80	-0.07	0.07	0.07	-0.02	-0.14
S36	0.08	-0.01	0.64	0.07	0.06	-0.06	-0.01	0.07
S37	0.10	0.10	0.75	-0.06	-0.03	-0.04	0.04	-0.11
S38	0.01	-0.02	0.09	0.11	0.02	-0.05	0.08	0.63
S39	0.03	0.02	0.16	0.14	-0.05	-0.13	0.05	0.60
S40	-0.01	0.02	0.04	0.03	-0.04	-0.02	-0.03	0.90
S41	0.05	-0.13	-0.03	-0.14	0.10	0.03	0.03	0.86
S42	0.01	0.02	0.01	-0.02	0.01	0.03	0.07	0.71
S43	0.01	-0.05	0.06	-0.03	0.01	0.01	0.85	0.00
S44	0.01	0.04	0.01	-0.08	0.02	0.05	0.84	0.08
S45	-0.03	-0.01	0.01	-0.14	0.06	0.06	0.91	0.07
S46	0.00	0.05	-0.05	-0.01	0.07	0.02	0.77	0.02
S47	0.61	0.08	0.02	-0.09	0.07	-0.05	-0.01	0.10
S48	0.59	-0.08	-0.02	0.03	0.01	-0.03	-0.04	0.20
S49	0.93	-0.06	-0.04	-0.11	0.05	-0.01	-0.04	-0.07
S50	0.72	0.03	0.14	-0.04	0.04	-0.02	-0.14	0.07
S51	0.37	0.37	0.08	-0.20	0.05	0.16	-0.14	-0.01
S52	0.63	-0.24	-0.14	-0.18	-0.05	0.28	-0.01	0.05
S53	0.69	-0.15	0.18	0.21	-0.05	-0.10	0.10	-0.19
S54	0.56	-0.03	0.03	0.27	0.03	-0.09	0.06	-0.07
S55	0.66	-0.15	0.21	0.15	-0.11	-0.09	0.17	-0.19
S56	0.71	0.05	0.11	0.09	-0.05	-0.06	-0.05	0.06
S57	0.74	0.12	-0.04	-0.01	0.05	0.03	-0.07	-0.03
S58	0.68	0.13	0.05	0.04	0.01	-0.03	0.01	-0.03
S59	0.58	0.24	-0.10	0.01	-0.04	0.02	0.07	0.10
S60	0.38	0.22	-0.10	0.08	-0.06	-0.06	0.13	0.30
S61	0.65	0.12	-0.03	0.02	-0.01	0.05	0.11	-0.04
S62	0.81	0.06	-0.08	-0.04	-0.04	0.02	-0.05	0.03

Table 1 cont.

Item	Factor							
	1	2	3	4	5	6	7	8
S63	0.75	0.07	-0.04	-0.09	0.02	0.14	-0.01	0.07
S64	0.07	-0.09	-0.01	0.12	0.11	0.67	0.09	-0.10
S65	0.08	0.04	0.10	-0.01	-0.04	0.54	0.05	-0.07
S66	0.08	-0.09	-0.06	0.18	0.06	0.70	-0.02	-0.07
S67	-0.08	0.08	-0.04	0.19	0.05	0.54	-0.02	0.10
S68	-0.10	0.15	0.04	0.16	-0.05	0.59	0.02	0.09
S69	-0.08	0.07	0.09	0.00	0.08	0.60	0.06	-0.02
S70	0.03	0.11	0.07	-0.03	-0.05	0.62	0.00	0.04
S71	0.03	-0.08	0.00	0.54	0.00	0.34	-0.01	0.01
S72	0.13	-0.06	-0.18	0.65	0.03	0.12	0.03	0.08
S73	-0.07	-0.06	0.08	0.85	0.03	0.07	-0.11	-0.02
S74	-0.03	0.00	-0.05	0.91	0.05	-0.03	0.00	0.01
S75	-0.06	-0.05	0.14	0.69	0.04	0.15	-0.18	-0.03
S76	0.09	0.06	-0.14	0.61	0.06	0.07	-0.01	-0.04
S77	0.05	0.03	0.01	0.67	-0.12	0.26	-0.07	-0.05
S78	-0.13	0.13	0.02	0.93	-0.11	-0.12	0.02	-0.01
S79	0.02	0.06	0.00	0.78	-0.01	-0.06	0.01	0.03

Note: Factor loadings $\geq |.30|$ are printed in boldface.

An eight-factor solution was obtained for the 71 remaining items. This solution explained 62.36% of the variance in the correlation matrix. The Promax-rotated ($\kappa = 4$) factor pattern matrix is given in Table 1. Inspection of the factor loadings showed a psychologically interpretable solution. The factors were labelled as follows: Factor 1 (Bureaucracy/Autonomy), Factor 2 (Relationships), Factor 3 (Tools and Equipment), Factor 4 (Workload), Factor 5 (Role ambiguity), Factor 6 (Work/Home interface), Factor 7 (Job security) and Factor 8 (Career advancement). This structure differs marginally from the anticipated structure in that the Bureaucracy and Autonomy items merged to define a Bureaucracy/Autonomy factor and Job security and Career advancement split to form two separate factors.

Four items had salient factor loadings on more than one factor, namely Item 3 (factors 5 and 3), Item 8 (factors 5 and 2), Item 51 (factors 1 and 2) and Item 71 (factors

3 and 6), but in each case these items' primary loadings were on the expected factor. Nonetheless, these items are possible candidates for revision.

Table 2. Correlation matrix of the Sources of Stress factors

	BA	RL	WL	TE	RA	WH	CA	JS
BA	1.00							
RL	0.66	1.00						
WL	0.43	0.29	1.00					
TE	0.52	0.53	0.29	1.00				
RA	0.43	0.48	0.28	0.26	1.00			
WH	0.31	0.36	0.40	0.25	0.22	1.00		
CA	0.58	0.56	0.34	0.41	0.43	0.22	1.00	
JS	0.49	0.42	0.35	0.35	0.37	0.24	0.58	1.00

Notes: BA = Bureaucracy/Autonomy; RL = Relationships; TE = Tools and equipment; WL = Workload; RA = Role ambiguity; WH = Work/Home interface; JS = Job security; CA = Career advancement.

The intercorrelations between the factors are shown in Table 2. All factors were positively correlated, suggesting the presence of a general factor. The three highest intercorrelations were: Bureaucracy/Autonomy and Relationships ($r = 0.66$), Bureaucracy/Autonomy and Career advancement ($r = 0.58$) and Career advancement and Job security ($r = 0.58$). The mean correlation between the factors was 0.39.

The 15 items of the General Work Stress Scale were also subjected to an unrestricted maximum likelihood factor analysis. Here it was anticipated and desired that one general factor would sufficiently account for the variance in the correlation matrix. The first unrotated factor explained 42.75% of the variance. Inspection of the factor loadings showed that Items 12 to 15 did not have salient loadings on the factor. These items were eliminated and the analysis repeated. The first unrotated factor in the repeated analysis explained 55.97% of the variance. The scree-plot clearly showed that one factor should be extracted (see Figure 1). All items had strong loadings on the general factor, which were as follows: Item 1 (0.85), Item 2 (0.82), Item 3 (0.83), Item 4 (0.70), Item 5 (0.68), Item 6 (0.77), Item 7 (0.66), Item 8 (0.61), Item 9 (0.74), Item 10 (0.58) and Item 11 (0.63).

Rasch rating scale analysis

The items of the eight Sources of Stress scales (derived from the factor analysis) and the General Work Stress Scale were subjected to Rasch rating scale analyses (Andrich, 1978; Wright & Masters, 1982), using the Winsteps software (Linacre, 2003). According to the rating scale model, the probability that an individual will endorse a particular category of a particular item is a function of the individual's standing on

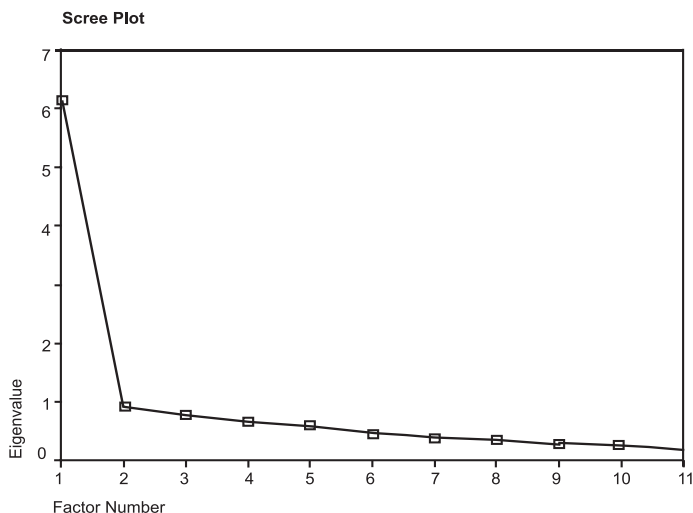


Figure 1. Plot of eigenvalues for the General Stress Scale items

the latent trait that the item measures, the overall difficulty or endorsability of the item and the difficulty in making the step to the chosen category from the preceding category (Bond & Fox, 2001). In the Winsteps programme, item parameters and person parameters are estimated using maximum-likelihood procedures. In the Rasch model it is required that all item discrimination parameters are equal. Items that violate this requirement will not fit the Rasch model well (Wright & Masters, 1982).

An advantage of the Rasch model over traditional item analysis procedures is that the former allows for a formal assessment of fit between the model and the data. The Rasch model represents a conceptual ideal and it is unlikely that any set of data will cooperate fully with its requirements. However, fit indices may be computed to indicate the extent to which data satisfies the requirements of the model (Bond & Fox, 2001). Expected values may be computed for each individual's responses to the items on the basis of the estimated parameters. The expected values may then be compared to the observed responses and, on the basis of this comparison, the fit of the items and the responses to the Rasch rating scale model can be evaluated. The INFIT and OUTFIT mean squares are commonly used fit indices. The expected value of the INFIT and OUTFIT mean squares is 1, but values ranging between 0.60 and 1.40 are generally indicative of satisfactory fit for rating scales (Linacre & Wright, 1994). Values below 1 indicate overfit, whereas values greater than 1 indicate more variation in the responses than what the Rasch model predicts. The INFIT mean square is generally regarded as more important than the OUTFIT mean square, because it is sensitive to irregular responses to on-target items, whereas the OUTFIT mean square is more sensitive to irregular responses on off-target items (Bond & Fox, 2001).

Table 3. Summary of the Rasch rating scale analysis results

Measure	RA	RL	CA	JS	BA	WH	WL	TE	GWS
INFIT low	0.63	0.76	0.67	0.59	0.74	0.91	0.63	0.84	0.70
INFIT high	1.38	1.24	1.29	1.35	1.29	1.11	1.36	1.35	1.29
Item reliability	0.95	0.98	0.89	0.93	0.92	0.99	0.91	0.93	0.95
Person reliability	0.82	0.84	0.76	0.85	0.91	0.77	0.85	0.81	0.88
Difficulty low	-0.79	-0.85	-0.41	-0.36	-0.61	-1.11	-0.29	-0.40	-0.77
Difficulty high	0.29	0.87	0.25	0.69	0.42	1.15	0.37	0.62	0.51
Item-score <i>r</i> low	0.67	0.75	0.78	0.88	0.65	0.62	0.73	0.67	0.67
Item-score <i>r</i> high	0.77	0.87	0.86	0.94	0.78	0.81	0.83	0.82	0.83

Notes: RA = Role Ambiguity, RL = Relationships, CA = Career Advancement, JS = Job Satisfaction, BA = Bureaucracy/Autonomy, WH = Work/Home Interface, WL = Workload, TE = Tools and Equipment, GWS = General Work Stress

The results of the item analyses (after elimination of unsatisfactory items) are summarised in Table 3. In this table the lowest and highest values, respectively, are given for the INFIT mean squares, the item difficulty parameters and the item-score correlations. In addition, the person separation reliabilities and the item separation reliabilities are given.

Only items with $INFIT < 1.40$ were retained in the item analysis, but very few items had to be discarded. The fit indices suggested that all scales could be regarded as essentially unidimensional. The item separation reliabilities were generally satisfactory, suggesting (a) that if the analyses were repeated with a different sample of participants, the difficulty order of the items would be expected to remain the same and (b) that the items were well separated in terms of their difficulty parameters. The person separation reliability estimates, which are analogous to Cronbach's coefficient alpha, were also satisfactory, suggesting that the items succeeded in separating individuals with different standings on the respective latent traits and that the order of the individuals on the trait would be expected to remain the same if a different sample of items were to be administered (Bond & Fox, 2001). The item-score correlations were high for all nine scales, showing that all items could be regarded as strong indicators of their respective traits.

Reliability

Cronbach alpha coefficients were computed for each of the Sources of Stress scales and the General Work Stress Scale. These coefficients were as follows: Role ambiguity (9 items), $\alpha = 0.89$; Relationships (11 items), $\alpha = 0.93$; Tools and equipment

(8 items), $\alpha = 0.91$; Job security (4 items), $\alpha = 0.93$; Career advancement (5 items), $\alpha = 0.90$; Bureaucracy/Autonomy (17 items), $\alpha = 0.95$; Work/Home interface (7 items), $\alpha = 0.86$; Workload (9 items), $\alpha = 0.93$ and General work stress (11 items) $\alpha = 0.92$.

The relations between General Work Stress and the Sources of Stress

The relations between General work stress and the Sources of stress were examined by means of a multiple regression analysis. The zero-order correlations between General work stress and the Sources of stress were as follows: Role ambiguity ($r = 0.48$), Relationships ($r = 0.37$), Tools and equipment ($r = 0.20$), Job security ($r = 0.35$), Career advancement ($r = 0.37$), Bureaucracy/Autonomy ($r = 0.42$), Work/Home interface ($r = 0.42$) and Workload ($r = 0.57$). The multiple correlation between General work stress and the Sources of stress was significant, $R = 0.66$, $R^2 = 0.44$, $F(8, 294) = 28.28$, $p < 0.01$. Only Workload ($r_{\text{partial}} = 0.38$) and Role ambiguity ($r_{\text{partial}} = 0.27$) had meaningful partial correlations with General work stress. These findings suggest that these two scales are the best predictors of General work stress.

DISCUSSION

Results from the factor analysis of the Sources of stress items showed good fit with the proposed structure for the SWSI. Strong support for the factorial validity of the following scales was found: Role ambiguity, Relationships, Tools and Equipment, Work/Home interface and Workload. The empirical structure deviated from the anticipated structure in that (a) the Autonomy and Bureaucracy items merged to form a Bureaucracy/Autonomy factor, (b) the Career advancement/Job security items split into two factors, namely Job security and Career advancement, and (c) the Physical environment items failed to define a distinct factor and were deleted from further analyses. Further investigation in other occupational domains is needed in order to fully determine whether or not Physical environment is a valid source of work stress before the scale is removed from the test entirely.

A review of the Bureaucracy and Autonomy items indicated a clear overlap of concepts. It seems likely that bureaucratic institutions (i.e., those with many rules and regulations) do not allow for a high degree of autonomy and therefore, working in such an institution is synonymous with a lack of personal discretion. On this basis, it was decided to merge the Bureaucracy and Autonomy items.

In retrospect, the splitting of the Job security and Career advancement items was not a surprising finding. Job security and Career advancement were initially intended to constitute two separate scales, but the item sorting procedure suggested that they might define a single construct. The factor analysis confirmed that they should have remained separate.

An inspection of the intercorrelation matrix of the eight-factor solution (Table 2) indicated the possible presence of a general factor. This is encouraging, as it means

that the Sources of Stress scales all measure some degree of stress. This is further attested to by the strong multiple correlation between the Sources of Stress scales and the General Work Stress Scale ($R = 0.66$). High correlations between certain factors may contain meaningful information as to the dynamics of stress in the workplace. Bureaucracy/Autonomy had the highest correlation with Relationships ($r = 0.66$), suggesting that either (a) having to work according to strict rules and protocol with little decision-making capacity has an adverse effect on relationships with others at work, or (b) poor interpersonal relationships at work (e.g., with supervisors) result in not being allowed to exercise personal judgement. The correlation between Career Advancement and Bureaucracy/Autonomy ($r = 0.58$) suggests that people working in bureaucratic institutions with low job decision latitude perceive their opportunities for promotion and advancement within the institution to be lacking. The correlation between the Career advancement and Job Security factors makes psychological sense in that both associated with the concept of job retention and development.

Overall, the obtained factor structure might be described as psychologically meaningful and psychometrically satisfactory. The reliabilities of the obtained scales were uniformly high, lending further support for the psychometric adequacy of the SWSI.

The factor analysis of the General work stress items also produced satisfactory results. Four items with less than desirable factor loadings were deleted. The remaining 11 items had strong loadings on the General work stress factor and appeared to define a psychologically coherent construct. The reliability of the General Work Stress Scale might also be described as very satisfactory ($\alpha = 0.92$).

The results of the Rasch analyses showed that the items meet the strong requirements of the Rasch model. Very few items had to be eliminated and the INFIT and OUTFIT mean squares indicated that, for the most part, the observed responses to the items matched the responses that one would have expected on the basis of the model. Furthermore, the item and person separation reliabilities indicated that the items and the persons were well separated in terms of difficulty to endorse and standing on the latent traits, respectively. Overall, the Rasch analyses suggested that the SWSI could be used to construct strong unidimensional interval-level measures of the constructs that it represents.

The relationships between the Sources of Stress scales and the General Work Stress Scale provide support for their construct validity. Individuals with higher scores on the Sources of Stress scales are assumed to perceive a greater number of stressors in their environments and to experience these stressors more intensely than individuals with lower scores. On a theoretical level one would expect individuals who perceive a greater number of stressors in their environment to experience higher levels of general stress (Greenhaus & Parasuraman, 1987). This expectation was confirmed by the strong multiple correlation between the Sources of Stress scales and the General Work Stress Scale.

As expected, the zero-order correlations between the individual Sources of Stress scales and the General Work Stress Scale ranged from moderately strong to strong and all correlations were statistically significant (the lowest correlation for the total sample was 0.20 for Tools and Equipment). Although each of the Sources of Stress scales could contribute to the prediction of General Work Stress, the best predictors were Workload and Role Ambiguity.

CONCLUSION

The results obtained in this study, lead to the conclusion that the SWSI has satisfactory psychometric properties. One should bear in mind, however, that the SWSI has not yet been validated against an existing measure of work stress and that it has only been administered in an academic environment. Further studies are needed in order to ascertain whether the SWSI provides meaningful information about work stress in other organisational domains. Further work is being done on the replicability of the SWSI in other samples.

Other areas of suggested further research are to investigate the cross-cultural utility of the instrument within South Africa and also perhaps to explore the possibility of relationship between the Sources of Stress scales and General Stress Scale and dispositional variables. These reservations aside, the SWSI shows promise as a measure of work-related stress.

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