Development and validation of new scales for psychological fitness and work characteristics of blue collar workers

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COMMENTS

The reader is reminded of the following:

- The editorial style as well as the references referred to in this thesis follow the format prescribed by the Publication Manual (5th edition) of the American Psychological Association (APA). This practice is in line with the policy of the Programme in Industrial Psychology of the North-West University (Potchefstroom) to use APA style in all scientific documents as from January 1999.
- The thesis is submitted in the form of four research articles. The editorial style specified by the *SA Journal of Industrial Psychology* (which agrees largely with the APA style) is used, but the APA guidelines were followed in constructing tables.

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SUMMARY

Topic: Development and validation of new scales for psychological fitness and work characteristics of blue-collar workers

Keywords: work-related psychological well-being, work-related psychological fitness, work characteristics, job demands, job resources, blue-collar workers, questionnaire development, factorial validity, factorial invariance, reliability, external validity, South African context.

Over the last decade the focus has shifted to ensure a holistic view of employee well-being in organisations by focusing on both physical and psychological well-being. Previous research suggests that work characteristics and psychological work-related well-being influence both the individual (i.e. health) and organisational outcomes (i.e. commitment, safety, productivity, etc.). Moreover, the increasing importance of focusing on work-related psychological well-being of employees is evident in legislation from around the world. In South Africa the Occupational Health and Safety legislation, spesifically the Construction Regulations, also recognises the importance of the psychological well-being of employees and refers to it as "psychological fitness". However, no clear definition or instrument for psychological fitness exists. Similarly, no instrument exist to measure work characteristics of blue-collar workers.

The objectives of this research were 1) to propose a defintion for psychological fitness of blue-collar employees 2) to propose a theoretical framework to better our understanding of psychological fitness 3) to develop a psychological fitness instrument for blue-collar employees that is suitable for the South African context 4) to test the psychometric properties of the newly developed psychological fitness instrument 5) to develop a work characteristics questionnaire for blue-collar mine workers to gain insight into their work experiences, and 6) to evaluate the psychometric properties of the newly developed job demands-resources scale for blue-collar mine workers.

The empirical study consisted of two phases. During the first phase, following an extensive literature review, a definition and theoretical framework for psychological fitness was proposed. Thereafter, a new instrument for measuring psychological fitness was developed and tested. An instrument for measuring the work characteristics of blue-collar mine workers

has also been developed to further the understanding of their work experiences. During the second phase, the psychometric properties of the newly developed psychological fitness instrument were tested (i.e. factorial validity, factorial invariance, reliability and external validity; N = 2769). Furthermore, the psychometric properties of the newly developed job demands-resources scale for blue collar workers were also investigated (i.e. factorial validity, reliability and the relationship with theoretically relevant external variables; N = 361).

During the conceptualisation process, the definition of psychological fitness has been proposed based on previous work-related well-being literature. The work-related well-being concepts, distress and eustress were proposed as indicators of psychological fitness. Therefore, psychological fitness was defined as a state in which an employee display high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely. The dimensions of burnout and engagement were proposed as possible indicators of psychological fitness and included exhaustion, mental distance, cognitive weariness, vitality and work devotion. Furthermore, the underlying work-related well-being theories and models were identified as the theoretic framework to enable the development of a questionnaire for psychological fitness.

In order to ensure that the low literacy employees understand the meaning of each questionnaire close attention has been paid during the development of items. Firstly, the psychological fitness instrument (SAPFI) for blue-collar employees has been translated into all the official languages of South Africa following a multistage translation process. Secondly, the job demands-resources scale for blue collar mine workers (JDRSM) has been translated into the three most commonly spoken languages (Sesotho, isiXhosa and Setswana) by employees working in this specific mine. During this phase various problematic items were identified and eliminated from both questionnaires using the Rasch measurement model.

The final phase included the validation study where the psychometric properties of both the new instruments were investigated. The SAPFI results provided evidence for factorial validity, factorial invariance, reliability and significant relations with external variables of the distress scale. Although evidence was provided for the factorial validity, reliability and external validity of the eustress scale, factorial invariance could not be confirmed. Furthermore, the JDRSM results provided evidence for the factorial validity, reliability (except for the workload scale) and external validity.

Recommendations for future research were made.

OPSOMMING

Onderwerp: Die ontwikkeling en validering van nuwe skale vir psigologiese fiksheid en werkseienskappe van blouboordjiewerkers.

Sleutelwoorde: werksverwante psigologiese welstand, werksverwante psigologiese fiksheid, werkseienskappe, werkseise, werkshulpbronne, blouboordjiewerkers, vraelysontwikkeling, faktorgeldigheid, betroubaarheid, eksterne geldigheid, Suid-Afrikaanse konteks.

Die afgelope dekade word gekenmerk deur ‘n fokusverskuiwing wat werknemerswelstand vanuit ‘n holistiese benadering beskou, met spesifieke fokus op beide fisiese en psigologiese welstand van werknemers in die organisasie. Vorige navorsing het aangedui dat werkseienskappe en psigologiese werksverwante welstand ‘n merkwaardige invloed op beide die individu (bv. gesondheid) en organisasie-uitkomstes (bv. organisasieverbondenheid, veiligheid, produktiwiteit, ens.) kan hê. Die toenemende belangrikheid van werksverwante psigologiese welstand van werknemers kom ook duidelik na vore in wetgewing regoor die wêreld. In Suid-Afrika word die belangrikheid van werksverwante psigologiese welstand deur die Wet op Beroepsgesondheid en Veiligheidswetgewing, en meer spesifiek die Konstruksie Regulasies ook erken, daar word verwys daarna as “psigologiese fiksheid”. Daar is egter geen duidelike definisie of beskikbare instrument vir psigologiese fiksheid nie. Soortgelyk bestaan daar ook geen instrument om werkseienskappe van blouboordjiewerknemers te meet nie.

Die doelwitte van hierdie navorsing was 1) om 'n definisie daar te stel vir die psigologiese fiksheid van blouboordjiewerknemers, 2) om 'n teoretiese raamwerk voor te stel om 'n beter begrip van psigologiese fiksheid te verkry, 3) om 'n psigologiese fiksheidsinstrument te ontwikkel wat geskik is vir blouboordjiewerknemers in die Suid-Afrikaanse konteks, 4) om die psigometriese eienskappe van die nuut ontwikkelde psigologiese fiksheidsinstrument te toets, 5) om 'n werkseienskappevraelys te ontwikkel vir blouboordjiemynwerkers ten einde insig te verkry in hul werkservaringe en 6) om die psigometriese eienskappe van die nuut ontwikkelde werkseise-hulpbronne skaal vir blouboordjiemynwerkers te evalueer.

Die empiriese studie het bestaan uit twee fases. Gedurende die eerste fase is ‘n definisie en teoretiese raamwerk vir psigologiese fiksheid voorgestel wat geskoei is op ‘n uitgebreide literatuurstudie. Vervolgens is 'n nuwe instrument vir die meting van psigologiese fiksheid ontwikkel en getoets. 'n Instrument vir die meting van die werkseienskappe van blouboordjiemynwerkers is ook ontwikkel om die begrip van hul werkservaringe te bevorder. Gedurende die tweede fase is die psigometriese eienskappe van die nuut ontwikkelde psigologiese fiksheidsinstrument getoets (faktorgeldigheid, faktorekwivalensie, betroubaarheid en eksterne geldigheid; N = 2769). Verder is die psigometriese eienskappe van die nuut ontwikkelde werkseise-hulpbronne skaal vir blouboordjiemynwerkers ook ondersoek (faktorgeldigheid, betroubaarheid en die verhouding met teoreties-relevante eksterne veranderlikes; N = 361).

Gedurende die konseptualiseringsproses is die definisie van psigologiese fiksheid voorgestel, wat gebaseer is op vorige werksverwante welstandliteratuur. Die werksverwante welstandskonsepte, distres en eustres is voorgestel as aanduiders van psigologiese fiksheid. Derhalwe is psigologiese fiksheid gedefinieer as 'n toestand waarin 'n werknemer hoë vlakke van emosionele en geestelike energie en hoë vlakke van sielkundige motivering toon wat hom/haar in staat stel om veilig te werk en op te tree. Die dimensies van uitbranding en begeestering is voorgestel as moontlike aanduiders van psigologiese fiksheid en sluit uitputting, geestelike afstand, kognitiewe moegheid, energie en werkstoewyding in. Verder is die onderliggende werksverwante welstandsteorieë en -modelle geïdentifiseer as die teoretiese raamwerk om die ontwikkeling van 'n vraelys vir psigologiese fiksheid te ondersteun.

Ten einde te verseker dat die minder geletterde werknemers die betekenis van elke vraelys verstaan is die ontwikkeling van die items met omslagtigheid en versigtigheid benader. Eerstens is die psigologiese fiksheidsinstrument (SAPFI) vir blouboordjiewerknemers vertaal na al die amptelike tale van Suid-Afrika deur middel van ‘n multi-fase vertaalproses. Tweedens is n werkseise-hulpbronne skaal vir blouboordjie mynwerknemers (JDRSM) vertaal na drie van die mees algemeen gesproke tale (Sesotho, Xhosa en Setswana) van die werknemers wat in hierdie spesifieke myn werksaam is. Gedurende hierdie fase is verskeie problematiese items van beide vraelyste met behulp van die Rasch-metingsmodel geïdentifiseer en uitgeskakel.

Die finale fase het die validering van beide vraelyste behels, waartydens die psigometriese eienskappe van hierdie nuwe instrumente ondersoek is. Die SAPFI resultate verskaf bewyse vir faktorgeldigheid, faktor ekwivalensie, betroubaarheid en betekenisvolle verhoudings met eksterne veranderlikes van die distres skaal. Alhoewel bewyse vir die faktorgeldigheid, betroubaarheid en eksterne geldigheid van die eustres skaal bewys kon word, kon faktor ekwivalensie nie bevestig word nie. Verder het die JDRSM resultate bewyse vir die faktorgeldigheid, betroubaarheid (behalwe vir die werkseise skaal) en eksterne geldigheid verskaf.

Aanbevelings is gemaak vir verdere navorsing.

CHAPTER 1

INTRODUCTION

This thesis focuses on the psychological fitness and work characteristics of blue-collar workers. More specifically, psychological fitness will be conceptualised within the framework of relevant theories. Two instruments (one for psychological fitness and one for work characteristics) will be developed, evaluated and tested for factorial validity, factorial invariance, reliability and the relationship with theoretically relevant variables.

Chapter 1 focuses on the problem statement, research objectives and research methodology. Lastly, ethical considerations are explained and an overview and division of chapters are given.

1.1 PROBLEM STATEMENT

World-wide the well-being of individuals at work has become an important focus area for researchers as well as practitioners. Work-related well-being is regarded as important to accomplish cost reductions in health care, to reduce absenteeism and enhance productivity, to positively influence job satisfaction, reduce turnover and to ensure a safe workplace (Danna & Griffin, 1999; Harter, Hayes & Schmidt, 2002; Jandeska & Zapach, 2003; Schaufeli & Bakker, 2004; Siu, Phillips & Leung, 2004).

Over the last decade the importance of work-related well-being has also been emphasised in South Africa, but was unfortunately mainly focused on white-collar employees. However, the blue-collar workforce is regarded as the backbone of the South African economy and forms a significant part of the total workforce. Blue-collar employees are working in different industries in South Africa. The literacy levels of blue-collar employees vary from semi-literate to illiterate and tasks performed by them are mostly of a manual nature (Lee & Mohamed, 2006). Furthermore, blue-collar workers in different industries are constantly faced with harsh working conditions. In the mining industry blue-collar workers are exposed to high temperature levels daily, long work hours, unsafe working conditions and vast

pressure to perform (Calitz, 2004). The working conditions of blue-collar employees in the construction industry specifically are characterised by hard physical labour, static work, climate changes, noise and dust (Arndt et al., 1996).

Apart from the physical work conditions that have an impact on blue-collar employees it is also important to understand the work-related well-being and psychosocial characteristics of these employees. Research conducted among blue-collar employees in Israel concludes that poor psychological well-being influences employees' proneness to accidents just as much as the dangerous conditions in which they work (Kirschenbaum, Oigenblick & Goldberg, 2000). Furthermore, a comparative study between white- and blue-collar employees in Europe indicates that psychological distress affects white- and blue-collar employees in the same way and that the work characteristics contributing to psychological distress were similar (Toppinen-Tanner, Kalimo & Mutanen, 2002).

Research among white-collar workers showed that the work characteristics influence both employee and organisational outcomes in terms of ill-health, performance, absenteeism, turnover intension and commitment (Bakker, Demerouti & Schaufeli, 2003; Bakker, Demerouti & Verbeke, 2004; De Jonge, Reuvers, Houtman, Bongers & Kompier, 2000; Hakanen, Bakker & Schaufeli, 2006; Hakanen, Schaufeli & Ahola, 2008; Lewig, Xanthopoulou, Bakker, Dollard & Metzer, 2007; Neal, Griffin & Hart, 2000). For this reason it would be important to investigate the unique work characteristics influencing the psychological work-related well-being and ultimately the employee and organisational outcomes of blue-collar employees. Although the importance of understanding the work experiences of blue-collar employees is evident, both in terms of work-related well-being and work characteristics, very limited research could be found. This might be due to the measurement difficulties that appear when research on blue-collar employees is attempted, including low literacy levels and language difficulties (Lee & Mohamed, 2006).

Globally increasing importance is attached to work-related well-being as is reflected by legislation as well as practices (see Rothmann, Sieberhagen & Pienaar, 2009). In the Netherlands, the Dutch Working Conditions Act (WCA) stipulates that both mental and physical health, and the psychological well-being of employees should be increased. This implied that organisations should not merely focus on the negative (absence of the positive) but rather on the presence of the positive (physical and psychological well-being) (Schaufeli

& Kompier, 2001). Similarly, the Finnish Occupational Health and Safety Act (2002) is also committed to ensuring the physical and psychological well-being of their workforce to ensure accident prevention. The Health and Safety Executive in the United Kingdom (UK) implemented "Management Standards" in order to prevent the negative effect of job stress on employees (Mackay, Cousins, Kelly, Lee & McCaig, 2004). Management standards identify the characteristics in an organisational climate that reflect high levels of health, well-being and performance. If these characteristics are effectively managed, the risk of work-related stress is managed and controlled. Furthermore, key areas that are regarded as the major causes of stress are covered by these management standards, including demands, control, support, relationships, role clarity and change (Health and Safety Executive, 2007).

In South Africa the past emphasis was mainly on the physical well-being of employees, but recently it seems that legislation is moving towards acknowledging the psychological well-being of employees. This is especially evident in the construction industry where legislation has been implemented to ensure the fitness of the high risk groups in this industry (Deacon & Kew, 2006). The term psychological fitness was first introduced in South Africa by the Construction Regulations, 2003, 15(12) (a), a section included in the Occupational Health and Safety Act (Act No. 85 of 1993) and referred to work-related psychological well-being as 'psychological fitness'. By including psychological fitness, the purpose of this act was to regulate a particularly hazardous industry and to create a legal framework to ensure higher levels of health and safety (Deacon & Kew, 2006). Employees who are obliged to adhere to this act include any person who works on supported or suspended platforms, crane operators, and operators of all construction vehicles and mobile plants. Even though the act had been implemented, in practice it became clear that the physical component of employees' health is regularly assessed and attended to whilst the psychological well-being of employees is being neglected.

Researchers in the field of occupational health psychology increasingly acknowledge that a holistic approach towards well-being at work is necessary (Nelson & Cooper, 2005; Fourie, Rothmann, & Van de Vijver, 2008). A holistic approach towards work-related well-being has several important characteristics to consider. First of all, both physical and psychological well-being should be included in a holistic approach. Traditionally, physical (ill) health used to be the focus of diagnosis and intervention, while little has been done to attend to the psychological well-being of employees (Allen, Carlson, & Ham, 2007). This is despite the

fact that the World Health Organisation (2002) has defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." It seems that psychological well-being has been neglected at the cost of both the organisation and the individual (Allen et al., 2007). The reason for this seems to be that psychological well-being is often viewed as a taboo subject and associated with mental illness in the public mind (Wynne & Rafferty, 1999). Recently, more awareness concerning psychological well-being has become evident. Even medical practitioners are starting to use this term for reasons of absence from work (Wynne & Rafferty, 1999). Research also showed that the fact that employees do not demonstrate psychological well-being can have a negative effect on their health and wellness with the result that the organisation is also influenced negatively in terms of increased absenteeism, higher staff turnover and lower productivity (Rothmann et al., 2009). Psychologists proposed that employee well-being include psychological, physical and social well-being in its totality (Diener & Seligman, 2004). It is therefore clear that the individual's experiences at work (physical, mental, emotional or social) affect the person's behaviour in the workplace (Danna & Griffin, 1999).

Secondly, both positive and negative aspects of well-being should be included in a holistic model of well-being (Nelson & Cooper, 2005). One possible reason for the overemphasis on negative aspects of work is the failure of researchers and practitioners to be responsive to the needs of all potential research stakeholders (Wright & Wright, 2002). According to Spector (1997), satisfied employees (compared with those who are dissatisfied) are less absent from work and show less turnover intentions. These employees are also more punctual, cooperative, and helpful towards other workers.

Thirdly, the role of both the individual and the organisation should be considered in a holistic model of work-related well-being. In the past, the cause of employee dissatisfaction and unhappiness was typically seen as being deeply imbedded in the emotional maladjustment of the employee, as opposed to aspects of the job itself (Wright, 2003). As a result, the cure for this maladjustment usually involves some type of prevention-based employee therapy (Wright & Cropanzano, 2000). While the latter perspective provided a significant value-addition for those interested in the so-called bottom line for business success, it has been much less articulate in proposing an agenda to pro-actively assist employees in their pursuit of healthier and more meaningful lives (Wright, 2003).

Based on the above characteristics and with the aim of enhancing productivity and safety at work and to adhere to legislative requirements, it is important to measure the levels of psychological fitness of employees. However, employers, contractors and occupational health practitioners experienced great difficulty with this Act. Although the guidelines for physical fitness are clearly stated in the OHSA and a medical surveillance can be implemented to assess the employee's physical fitness, the guidelines to assess psychological fitness are unclear. According to Deacon and Kew (2006), it was never intended by the legislator to use excessive psychological evaluations to assess the psychological fitness of employees, but rather that employees who are declared psychologically fit should be in a *sound state of mind* appropriate to their level of responsibility at work.

One of the reasons for the lack of measuring psychological fitness is because the concept was never properly defined and because a conceptual model is lacking in South Africa. It is therefore difficult to diagnose the levels of psychological fitness of employees without a proper measure. For this reason, a definition for psychological fitness should be developed, based on sound theoretical theories, to enable companies to measure psychological fitness accurately and to intervene on the levels that are problematic. Therefore, if the psychological fitness of blue-collar employees can be measured reliably and the necessary remedial steps are taken it can contribute to better employee and organisational outcomes in terms of safety and productivity.

According to various international and national studies among white-collar employees different work characteristics, in terms of job demands and job resources, influence the psychological work-related well-being of employees as well as employee and organisational outcomes (Bakker et al., 2003; Fourie et al., 2008; Koekemoer & Mostert, 2006; McLain & Jarrell, 2007; Mostert, 2009; Mostert, Rothmann, Mostert & Nell, 2008; Oldfield & Mostert, 2007; Prieto, Soria, Martínez & Schaufeli, 2008; Rothmann & Essenko, 2007; Rothmann & Joubert, 2007; Schaufeli & Bakker, 2004). In South Africa it was confirmed among white-collar employees that high job demands contribute to ill-health and high job resources influence organisational commitment levels (Jackson, Rothmann & Van de Vijver, 2006; Montgomery, Mostert & Jackson, 2005; Oldfield & Mostert, 2007). Furthermore it is suggested that the effect of work characteristics in different organisations will be similar although the specific conditions contributing to employee and organisational outcomes will vary from one organisation to the next (Demerouti, Bakker, Nachreiner & Schaufeli, 2001).

Although limited research exists on investigating specifically the work characteristics that might have an influence on blue-collar workers, it is expected that particular work conditions will contribute to the well-being and organisational outcomes of blue-collar employees.

Based on different theories different instruments have been developed internationally to accurately identify the work characteristics of white-collar workers that might contribute to outcomes. In an attempt to understand the work characteristics of white-collar employees in South Africa, the Job Demands-Resources Scale (JDRS) has been developed (Jackson & Rothmann, 2005). This instrument focused on different industries including the insurance industry, engineering industry, correctional services, staff members at a university of technology and academics in higher educational institutions (Rothmann, Mostert & Strydom, 2006). Unfortunately no instrument exists to measure the work characteristics of blue-collar workers in South Africa to identify those work characteristics that might influence the work experiences of these blue-collar employees. Therefore, it would be important to develop a valid and reliable instrument measuring the job demands and job resources of blue-collar mine workers.

It is clear from the above-mentioned discussion that it is important to measure the work-related psychological well-being as well as the work characteristics of blue-collar workers. Although different measuring instruments exist that can be used to measure these concepts among white-collar employees in South Africa, no valid and reliable instrument exists to measure these concepts among blue-collar employees. It is imperative to measure the psychological work-related well-being and work characteristics because of the influence it might have on both employee and organisational outcomes.

From the above problem statement the following research questions emerged:

- How is work-related psychological fitness defined?
- Which theoretical frameworks can be utilised to better understand psychological fitness?
- What would an instrument look like that measure the work-related psychological fitness of blue-collar employees?

- What is the internal validity (i.e. factorial validity, factorial invariance, reliability) and external validity (i.e. relationship with theoretically relevant external variables) of the new work-related psychological fitness instrument?
- What would an instrument look like that measure the experiences of work characteristics of blue-collar mine workers?
- What is the internal validity (i.e. factorial validity and reliability) and external validity (i.e. relationship with theoretically relevant external variables) of the new work characteristics instrument?
- Can recommendations be made for future research and practice?

This research will make the following contributions to the subject of Industrial Psychology and the practice thereof in organisations:

- Current conceptualisation and measurement issues regarding work-related psychological fitness will be addressed. In order to better understand the importance of psychological fitness a definition and theoretical frameworks will be proposed.
- It will result in a newly developed work-related psychological fitness instrument for blue-collar employees and therefore address measurement limitations.
- It will result in a psychometrically sound measuring instrument which has been proven to be valid and reliable for the South African context.
- Measuring the psychological fitness of blue-collar employees will enhance knowledge and understanding of the work-related experiences of blue-collar workers. This will enable organisations to gain insight into the effect of the workplace on those employees.
- This study will result in a measuring instrument that will enable both practitioners and researchers to understand the perceptions of the work environment and how it could influence the work outcomes of blue-collar employees.
- It will result in a psychometrically sound measuring instrument of work characteristics, which has been proven to be reliable and valid in the South African context. This will practically provide a clear picture of the workplace experiences of blue-collar workers and focused interventions can be planned to enhance employee well-being and organisational outcomes.

1.2 RESEARCH OBJECTIVES

The research objectives consist of general objectives and specific objectives.

1.2.1 General objectives

The general objective of this research is to develop and validate a work-related psychological fitness and work characteristics instrument for blue-collar workers in South Africa.

1.2.2 Specific objectives

The specific objectives of this study are to:

- Propose a definition for work-related psychological fitness.
- Propose theoretical frameworks to understand work-related psychological fitness.
- Develop a measuring instrument to measure the work-related psychological fitness of blue-collar employees.
- Evaluate the internal validity (i.e. factorial validity, factorial invariance, reliability) and external validity (i.e. relationship between theoretically relevant external variables) of the new work-related psychological fitness instrument.
- Develop an instrument to measure the experiences of work characteristics of blue-collar mine workers.
- Investigate the internal validity (i.e. construct validity and reliability) and external validity (i.e. relationship between theoretically relevant external variables) of the new work characteristics instrument.
- Make recommendations for future research and practice.

1.3 RESEARCH DESIGN

The research method consisted of a literature review and an empirical study (quantitative research).

1.3.1 RESEARCH DESIGN

1.3.1.1 Literature review

The research design for each of the four research articles consists of a literature review and an empirical study. Separate chapters were not targeted for literature reviews and therefore the paragraphs relating to the research design focus on aspects relevant to the empirical studies conducted in each article. A thorough literature study was conducted for the purposes of each research article. These literature reviews were conducted by means of research databases including ERIC, PsychInfo, Sciencedirect, EBSCOHOST and Academic Search Premier. The search terms included work-related psychological well-being, work-related psychological fitness, eustress, distress, burnout, work engagement, Job Demands-Resources model, Conservation of Resources Theory, Effort-Recovery Theory, factorial validity, factorial invariance/equivalence, blue-collar workers, work characteristics, job demands, job resources, Rasch analysis, Confirmatory Factor Analysis (CFA).

1.3.1.2 Empirical study

The empirical study in this thesis consisted of two phases, an instrument development phase and a validation phase. During the first phase, the definition of psychological fitness and theoretical frameworks for understanding psychological fitness was proposed. Thereafter, a new instrument that measures the psychological fitness of blue-collar workers was developed and tested with a pilot study. Furthermore, a questionnaire was developed for blue-collar gold mine workers that measure their work-related experiences in terms of job demands and resources. During the second phase the psychometric properties of both the newly developed South African Psychological Fitness Index (SAPFI) and the Job Demands-Resources Scale for blue-collar mine workers (JDRSM) were examined (i.e. factorial validity, factorial invariance, reliability and external validity). The empirical study of both phases consisted of the research design, the participants, data gathering and statistical analysis.

Phase 1: Scale development and evaluation

1.3.1.2.1 Scale development procedure

During the first phase, the SAPFI as well as the JDRSM were developed following the scale development procedure as proposed by DeVellis (2003). This procedure included conceptualising the construct, item generation and evaluation, item development and item refinement. Careful attention was given to translating the scales following the correct multistage translation process (Shanahan, Anderson & Mkize, 2001). The instruments were translated by accredited language experts and back translated into English by different language experts. The SAPFI was translated by five accredited language experts into the eleven official languages of South Africa and translated back into English by five different language experts. The JDRSM was translated by three accredited language experts into Sesotho, isiXhosa and Setswana and translated back into English by three different language experts. During the development of the SAPFI, a pilot study was conducted to refine the measure by eliminating undesirable items. DeVellis (2003) suggested undertaking a pilot study with an experimental sample before finalising the questionnaire in order to examine the functioning of the items before finalising the scale.

1.3.1.2.2 Research approach

A cross-sectional survey design was used to collect data for studying the newly developed instruments. A cross-sectional design enables researchers to observe a group of people at a specific point in time, for a short period such as a day or a few weeks (Du Plooy, 2002).

1.3.1.2.3 Research participants

The development of the SAPFI study was conducted among a convenient sample (N = 2769) from different industries in South Africa. The sample consisted of mine workmen, construction workers (including height workers, operators of mobile plants and construction vehicles and crane operators), electrical supply height workers, security guards, train drivers and general municipality workers. The development of the JDRSM study was conducted among a convenient sample (N = 361) of blue-collar mine workers. The employees worked as

underground assistants, mining teams, stope drillers, scraper winch operators, locomotive operators, crew supervisors, stope team leaders, store cum first-aid attendants, surface assistants, development drillers and miners assistants were included in this study.

1.3.1.2.4 Statistical analysis

Rasch analysis was done with WINSTEPS (Linacre, 2005) in order to identify the items that functioned more desirably as well as those items that functioned less desirably and should be eliminated from the scale. Cronbach's alpha coefficients as well as person and item separation index were used to evaluate the reliability of the scales. The person and item separation index is useful to explain how items or persons differentiate along the continuum of the measured latent variable. Furthermore, fit indices were utilised to determine the validity of each dimension through identifying the items and persons that function unexpectedly and problematically (Boone & Rogan, 2005). Item fit indices indicated whether the items provided logical and useful information for all the participants and whether it would provoke the same answers from participants in another research setting. Person fit indices indicated whether the responses of the individuals were consistent. Furthermore, item fit mean square statistics (MNSQ) were utilised to identify the undimensionality of the scale and how well the item measures the intended underlying construct. Scale categories were evaluated to determine whether all the categories function sufficiently or whether some categories needed to be collapsed.

Phase 2: Investigation of the psychometric properties of the SAPFI and the JDRM

During phase 2, the psychometric properties of the SAPFI and the JDRM were investigated.

1.3.1.2.5 Research approach

A cross-sectional survey design was utilised for the purpose of this study to collect data at one point in time (Neuman, 2000). Thereafter interrelationships of variables in a population were examined (Struwig & Stead, 2001).

1.3.1.2.6 Research participants

The psychometric properties investigation study of the SAPFI was conducted among a convenient sample (N = 2769) in different industries in South Africa. The sample consisted of mine workmen, construction workers (including height workers, operators of mobile plants and construction vehicles as well as crane operators), electrical supply height workers, security guards, train drivers and general municipality workers. The JDRSM study was conducted among a convenient sample (N = 361) of blue-collar gold mine workers. The sample consisted of workmen functioning in the following job types: underground assistant, mining team, stope driller, scraper winch operator, locomotive operator, crew supervisor, stope team leader, store cum first-aid attendant, surface assistant, development driller and miners' assistant.

1.3.1.2.7 Measuring instruments

The SAPFI and the JDRSM were utilised in the respective studies. Furthermore, the ill-health questionnaire and the organisational commitment questionnaire were utilised in investigating the psychometric properties of both the SAPFI and the JDRSM.

Psychological fitness. Brand-Labuschagne and colleagues (in press) developed a 23-item questionnaire to measure the two subscales of psychological fitness. Distress was measured with the following subscales: exhaustion (five items, e.g. “After a day at work I feel tired and used up”); mental distance (five items, e.g. “When I get to work, I tend to postpone certain tasks because I just don’t feel like doing them”), cognitive weariness (five items, e.g. “I find it difficult to focus while at work”). Eustress was measured with two subscales, including vitality (four items, e.g. “When I am working I feel a lot of energy”) and work devotion (four items, e.g. “My work gives me a sense of meaning and purpose”). All items were measured on a seven-point frequency rating scale ranging from zero (“never”) to six (“always”). Higher scores on exhaustion, mental distance and cognitive weariness are indicators of distress, while higher scores on vigour and work devotion are indicators of eustress. Therefore, the indicators of psychological fitness are high levels of eustress and low levels of distress.

Work characteristics. The newly developed 30 items JDRSM scale was utilised to measure the two sub-dimensions, job demands and job resources (Brand-Labuschagne, Mostert,

Rothmann & Rothmann, in press). Job demands were measured with the following subscales: workload (three items, e.g. “I have to work very hard”), bullying by supervisors (three items, e.g. “I experience insults from my shiftboss”) and bullying by colleagues (three items, e.g. “My colleagues humiliate me in front of others”). Job resources were measured with five sub-scales, including learning opportunities (three items, e.g. “I have the opportunity to develop myself at work”), supervisory care (six items, e.g. “I feel that my shiftboss respects me”), supervisory communication (five items, e.g. “My shiftboss explains to me what to do”), supervisory integrity (three items, e.g. “I trust my shiftboss”) and colleague support (four items, e.g. “My colleagues help me to get the work done”). All items were measured on a seven-point frequency rating scale ranging from zero (“never”) to six (“always”). Higher scores on workload and bullying by colleagues/supervisors are indicators of high job demands, while higher scores on learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support, are indicators of high job resources.

Ill-health. Physical and psychological ill-health was measured with a 16-item adapted version of the Health Questionnaire developed by Jackson and Rothmann (2005). The six physical ill-health items measured physical symptoms of stress (i.e. “How often do you experience headaches?”), while the ten psychological ill-health items measured psychological ill-health symptoms of mental health (e.g. “How often do you experience panic or anxiety attacks?”; “How often do you experience constant irritability?”). All items were scored on a four-point scale ranging from one (“never”) to four (“frequently”). In South Africa acceptable internal consistencies were found for both scales: 0,78 and 0,88 respectively (Jackson & Rothmann, 2005). Following the multi-translation process these items were also translated to the eleven official languages of South Africa.

Organisational commitment. Behavioural and affective commitment was measured with an adapted nine-item version of the Organisational Commitment Scale (Jackson et al., 2006). Behavioural commitment refers to the extent to which the employee perceives the organisation to be committed to him/her (five items, e.g. “I feel valued and trusted by the organisation”), while affective commitment refers to the extent to which the employee feels committed towards the organisation (four items, e.g. “I feel proud of this organisation”). All the items were scored on a six-point scale ranging from one (“strongly disagree”) to six

("strongly agree"). Acceptable internal consistencies (α = 0,88) for organisational commitment were found in South Africa (Jackson et al., 2006; Visser & Rothmann, 2008).

1.3.1.2.8 Statistical analysis

In investigating the internal consistency of both the SAPFI and the JDRSM, confirmatory factor analyses (CFA) were utilised with AMOS structural modelling (Arbuckle, 2007). To test different hypotheses regarding both the SAPFI and the JDRSM, the hypothesised models were compared to alternative competing models. To determine the differences in statistical fit between the hypothesised and competing models the χ^2 statistics were used. Statistical support for the hypothesised model is indicated when significant differences between models are evident. The following goodness-of-fit indices were utilised to evaluate the model fit: the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), the Parsimony Goodness-of-Fit Index (PGFI), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Root Mean Square of Approximation (RMSEA) and the Closeness of Fit index (PCLOSE).

In order to minimize the risk of capitalisation on chance (and because the sample size allowed this procedure), a cross-validation approach was used for the validation of the SAPFI (MacCallum, Roznowski & Necowitz, 1992). The total sample (N = 2769) was split into two subsamples – the exploratory sample (N = 693) was a 25% random sample of the total sample and was used for model fitting purposes of the hypothesised models as well as to compare these hypothesised models with competing models as described above. The results obtained from the exploratory sample was used to cross-validate the model on the second confirmatory sample (N = 2076) including the remaining 75% of the sample.

Multi-group confirmatory factor analysis (CFA) was used to test the factorial invariance of the factor structure and the invariance of parameter estimates of the SAPFI in the confirmatory sample. Sets of parameters were evaluated in a logically ordered and increasingly restricted way. The parameters of most importance included factor loadings, factor covariances and item error variances. Following the procedure suggested by Byrne (2010), baseline models were tested for each group to ensure well-fitting models for the groups involved. These single group baseline models were then utilised to compel the multi

group baseline model, better known as the configural model or unconstrained model. The different parameters were constrained one by one in different models and then compared to the configural model in order to evaluate invariance (Byrne, 2010). Goodness-of-fit indices are used to determine whether the model shows a good fit to the data. Evidence for invariance is evident when the χ^2 difference between the configural model and the restraint model is statistically nonsignificant. Because the χ^2 difference test is regarded as unnecessarily strict, Cheung and Rensvold (2002) proposed that it would be more reasonable to base invariance analyses on CFI differences (Cheung & Rensvold, 2002). CFI differences with a probability of less than 0,01 are regarded as the guideline of invariance. Because CFI difference tests are not yet the approved SEM official method of evaluating invariance, both the CFI and χ^2 differences were examined (Byrne, 2010).

The reliability of the SAPFI and JDRSM scales was evaluated with Cronbach alpha coefficients. In addition, descriptive statistics (means and standard deviations) were used to describe the data. Product-momentum correlation coefficients were used to determine the relationships with the selected external variables (i.e. ill-health and commitment). The level of statistical significance was set at $p < 0,05$. Because statistical significance may show results that are practically of little relevance, effect sizes were used to determine the practical significance of the relationships (Cohen, 1988; Steyn, 2002). Effect sizes identify the results which are practically important (Steyn, 2002). The cut-off point for practical significance of the correlation coefficients was set at 0,30 (medium effect) and 0,50 (large effect) (Cohen, 1988).

1.4 RESEARCH PROCEDURE

Prior to administering the questionnaires, the SAPFI was translated by accredited language experts into the eleven official languages of South Africa (English, Afrikaans, isiXhosa, isiZulu, isiNdebele, Sesotho, Setswana, Sepedi, Xitsonga, Siswati and Tshivenda) following a multistage translation process (Shanahan, Anderson & Mkize, 2001). This implied that the original English questionnaire was translated into the different languages by five language experts and translated back into English by five different language experts. The back-translated versions were then compared to the original English version and problems with the back-translated versions were discussed. Consequently the questionnaires were adapted until

consensus was reached on the best version. The JDRSM was translated by three accredited language experts into Sesotho, isiXhosa and Setswana and translated back into English by three different language experts.

Following the translation of both the instruments, permission was obtained from the general management of each organisation to use the data anonymously for research purposes. Workplace assessors were recruited to function as fieldworkers in the study. Furthermore, to ensure the success of the research project, fieldworkers were trained during a one-day session on the following: the basic concepts of the questionnaires, how to administer the questionnaires and make use of the assessment tools (including flashcards as helping aid for answering the questions) and how to administer the questionnaires in a facilitation process (ask the question and wait for the participant to respond). Careful attention was given to ensure that the fieldworkers understood the importance of not leading the participants in answering the questions, to make sure that all questions have been answered and how to utilise the provided flashcards. The flashcards served as helping aids for answering questions that consisted of the rating scale categories in the form of a volume indicator which went from very small to very large. These flashcards were provided to ensure that the participants understood the frequency scale better and were available in all the language groups. Furthermore, fieldworkers were provided with example questions to assist with explaining to the participants what would be expected from them when answering the questions. The flashcards were utilised by the fieldworkers by asking the questions and participants would then indicate on the flashcard which option best described him/her.

Permission was granted by the management of each organisation to use the responses anonymously for research purposes. Prior to administering the questionnaires, the workforce was informed on the purpose of the study. Fieldworkers had to explain to the participants that their responses would be treated confidentially after which the participants provided their informed consent. Afterwards, the fieldworkers administered the questionnaires by means of facilitation in the workplace of the participants. Participants with higher literacy levels completed the questionnaire by themselves and provided the questionnaire back to the fieldworkers. The participants had between 10 and 20 minutes to complete the questionnaires.

1.5 ETHICAL CONSIDERATIONS

In the entire research project ethical considerations were taken into account in the planning and execution of the empirical study. The following paragraphs focus on relevant ethical aspects. Ethical considerations were strictly adhered to in each empirical study, although not discussed in detail in each article.

1.5.1 Potential benefits and hazards

Participants were not exposed to any potential physical, psychological or disclosure threats. Prior to the study, permission was granted by the management of all the organisations participating in the studies. Participants were only requested to participate in a survey which included questions pertaining to their work-related psychological well-being, their work environment, their general well-being and their commitment. Participants could benefit from these research results because questionnaires were developed to provide an understanding of their experiences at work and organisations could intervene accordingly. All personal information gained from participants was kept confidential and private. The participants were ensured that their responses would be used anonymously for research purposes only.

1.5.2 Recruitment and sampling procedures

Included in the questionnaire booklet was a section explaining the research and the process thereof and fieldworkers communicated this to the potential participants. Participants were informed that their participation in the research project was voluntary. Participants were also informed that if they participated in the project and completed a questionnaire they provided the researcher with their consent to use the data for research purposes only. No personal information was made available to any of the organisations or any other persons.

1.5.3 Data protection

Only the researchers involved in the study were allowed to analyse or capture the data and ensure that the data collected was kept confidential. The completed questionnaires were

protected at all times and kept in a safe, secure location, even after data capturing and analyses. Furthermore, no personal information was available that could lead to the identification of participants.

1.6 OVERVIEW OF CHAPTERS

In chapter 2, psychological fitness is defined, a theoretical framework is proposed and a new instrument is developed to measure work-related psychological fitness of blue-collar workers. Chapter 3 focuses on the psychometric properties of the newly developed South African Psychological Fitness Index, including the internal and external validity. In Chapter 4 the scale development procedure is followed to develop a job demands-resources scale specifically for blue-collar gold mine workers in South Africa. Chapter 5 deals with the psychometric properties of the newly developed Job Demands-Resources Scale for blue-collar gold mine workers in terms of reliability, internal and external validity. The discussion of conclusions, recommendations and limitations of the study follows in Chapter 6.

1.7 CHAPTER SUMMARY

This chapter discussed the problem statement, the contribution and value-add of this research and research objectives. The research design used in the empirical studies was explained, followed by a brief overview of the chapters that will follow.

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CHAPTER 2

RESEARCH ARTICLE 1

PSYCHOLOGICAL FITNESS OF BLUE-COLLAR WORKERS: THE DEVELOPMENT OF THE SOUTH AFRICAN PSYCHOLOGICAL FITNESS INDEX

ABSTRACT

Orientation: The South African Occupational Health and Safety Act, Construction Regulations of 2003 has recently introduced the term psychological fitness. However, no definition or theoretical framework was provided to promote understanding of the term psychological fitness, and no measuring instrument exists to measure psychological fitness of blue collar workers.

Research purpose: The objectives of this study were to propose a definition of psychological fitness, propose theoretical frameworks and develop and test the newly developed items of a measuring instrument, the South African Psychological Fitness Index (SAPFI) for work-related psychological fitness of blue-collar workers.

Motivation for the study: Evidence exists that the work-related psychological well-being of white-collar workers has a profound effect on the individual, in terms of ill-health, as well as the organisation, in terms of productivity, turnover intention, commitment and safety. For this reason it is important to develop an instrument that measures the psychological well-being of blue-collar workers to understand how and if it will influence both their individual and organisational outcomes in the same way as for white-collar workers.

Research design, approach and method: A cross-sectional survey design was used in a convenience sample of blue-collar workers in different industries in South Africa (N = 2769). Following scale development procedures, the SAPFI was developed measuring the psychological fitness of blue-collar workers.

Main findings: Using Rasch analyses, three items were eliminated, resulting in a 23-item instrument. Five items were retained to measure exhaustion, five items to measure mental distance, five items to measure cognitive weariness, four items to measure vitality and four items to measure work devotion.

Practical/Managerial implications: To adhere to legislation the SAPFI can be used by researchers and managers as a test of the work-related psychological fitness of blue-collar workers in South Africa.

Contribution/Value-add: This study proposes a definition of and theoretical framework for work-related psychological fitness. This study provides a measuring instrument to evaluate the work-related psychological fitness states of blue-collar workers in South Africa and to provide companies with a scientific measurement tool to understand the work-related experiences of these workers.

Key words: work-related psychological well-being, work-related psychological fitness, eustress, distress, burnout, work engagement, job demands-resources model, effort-recovery theory, conservation of resources theory

INTRODUCTION

Key focus of the study

In an attempt to emphasise the importance of work-related psychological well-being of blue-collar workers in South Africa (specifically workers in the construction industry), the Construction Regulations (2003), 15(12) (a), a section included in the Occupational Health and Safety Act (Act No. 85 of 1993), introduces the term "psychological fitness" for work. Those obliged to adhere to this act include mainly blue-collar workers who work on supported or suspended platforms, crane operators, and operators of all construction vehicles and mobile plants (Deacon & Kew, 2006). Unfortunately the concept of psychological fitness is not defined and consequently guidelines for measuring the level of psychological fitness are not provided. The focus of this study is to propose a definition, suggest theoretical frameworks for studying psychological fitness, and develop a measuring instrument of psychological fitness for blue-collar workers.

Background of the study

Worldwide and in different industries the importance of work-related psychological well-being of employees is emphasised to ensure lower accident rates, lower turnover intention, lower absenteeism, more positive attitudes, higher productivity, profitability and safety, more commitment and higher job satisfaction (Harter, Hayes & Schmidt, 2002; Murray, Fitzpatrick & O'Connell, 1997; Saks, 2006; Schaufeli & Bakker, 2004a; Siu, Phillips & Leung, 2004; Sonnentag, 2003; Sparks, Farager & Cooper, 2001). Evidently, the work-related psychological well-being of individuals has become an important focus area for both researchers and practitioners.

According to the World Health Organisation's definition of health, work-related psychological well-being is regarded as an important aspect of health, as can be seen in their definition of health: *"Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers, in their employment situation, from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological needs and capabilities; and, to summarize, the adaptation of work to man and of each man to his job."* (Stellman, 1998, p. 28).

Companies around the world are moving towards practises and legislation to include work-related psychological well-being in the overall understanding of individual behaviour in organisations (see Rothmann, Sieberhagen & Pienaar, 2009). This is evident in the legislation of different European countries including the Netherlands, Finland and the United Kingdom. In the Dutch Working Conditions Act (WCA) of 1999 it is stipulated that both mental and physical health, as well as employee well-being must be increased, with the focus not merely on the negative (absence of the positive) but rather on the presence of the positive (physical and psychological well-being) (Schaufeli & Kompier, 2001). The Finnish Occupational Health and Safety Act (2002) is also committed to ensure the physical and psychological health of employees in order to prevent accidents, while the Health and Safety Executive in the United Kingdom (UK) places tremendous emphasis on the effect of job stress on employees and implements "Management Standards" to eliminate the effect of job stress on individuals (Mackay, Cousins, Kelly, Lee & McCaig, 2004).

In a recent development in the South African legislation, the Occupational Health and Safety Act (OHSA), specifically the Construction regulation of 2003, includes psychological well-being as an important aspect of health for high risk groups in this industry (Deacon & Kew, 2006) and refers to it as "psychological fitness". Employees obliged to adhere to this act function in extremely hazardous working conditions, such as working at heights, operating cranes, construction vehicles and mobile plants. Therefore, to insure certain organisational outcomes such as higher productivity, commitment, performance and lower turnover, while ensuring the safety of these employees, it is important to evaluate and maintain the psychological fitness of these employees (Bakker, Schaufeli, Leiter & Taris, 2008; Harter et al., 2002; Saks, 2006; Schaufeli & Bakker, 2004a). Currently, South African legislation only focuses on psychological fitness of certain employees in the construction industry. However, some research has indicated that other hazardous industries such as the mining industry can also benefit from evaluating the psychological work–related well-being of their employees to ensure better safety behaviour (Paul & Maiti, 2007).

Employees functioning in the above-mentioned hazardous conditions are mostly blue-collar workers. Although much research on the work-related psychological well-being of South African employees has been conducted, the focus has mainly been on white-collar workers and included occupations such as educators, emergency medical technicians, social workers, police officers, managers and nurses, to name but a few (Jackson & Rothmann, 2005; Naudé & Rothmann, 2004a; Naudé & Rothmann, 2004b, Rothmann & Joubert, 2007; Rothmann & Malan, 2003; Storm &

Rothmann, 2003a; Storm & Rothmann, 2003b; Van der Colff & Rothmann, 2009). Currently valid and reliable measuring instruments for work-related psychological well-being of blue-collar workers in South Africa are lacking, mainly because of the difficulties associated with lower literacy levels and vast differences between white - and blue-collar workers in the nature of work.

According to Deacon and Kew (2006), it was never intended by the legislator to use excessive psychological evaluations to assess the psychological fitness of employees, but rather that employees who are declared psychologically fit should be in a *sound state of mind* appropriate to their level of responsibility at work. However, in practice it has become clear that the physical component of the blue-collar employees' health is regularly assessed and attended to whilst the psychological fitness of blue-collar employees is being neglected. This is mainly because of the uncertainty that exists among different practitioners as to how psychological fitness of these employees should be measured. Because the term psychological fitness has not been defined and no theoretical framework has been identified to guide the measurement of psychological fitness, no valid and reliable measuring instrument has been developed to measure psychological fitness of blue-collar workers.

Research objectives

Based on the above-mentioned limitations, the objectives of this study are (1) to propose a definition of psychological fitness; (2) to propose theoretical frameworks for understanding psychological fitness; and (3) to develop a measuring instrument and test the newly developed items in order to determine the psychological fitness of blue-collar workers.

Trends from the research literature

Psychological fitness

According to the APA dictionary of psychology the term *psychological* relates to the mental and emotional state of a person and refers to the collection of behaviours, traits and attitudes that are typical of an individual or a group (VandenBos, 2006). The Mosby's Medical, Nursing and Allied Health Dictionary describes the word *psychological* as the study of behaviour and the functions and processes of the mind specifically related to the social and physical environment. In addition, it also refers to the "mental, motivational, and behavioural characteristics and attitudes of an individual or group of individuals" (Anderson, Anderson & Glanze, 1994). According to the Oxford Dictionary

the term *psychological* implies that it is something that is affected or arising in the mind and is related to the mental and emotional state of an individual, having a mental rather than a physical cause (Pearsall, 1998).

In the past, the focus of studying psychological functioning was merely on mental illness. Recently the focus has shifted to a more positive psychological paradigm of enhancing human well-being (Seligman & Csikszentmihalyi, 2000). Adams, Bezner and Steinhardt (1997) proposed that psychological well-being consists of physical, spiritual, psychological, social, emotional and intellectual health. Wissing and Van Eeden (2002) argue that psychological well-being is multidimensional, consisting of both individual states (affective, cognitive, behavioural and physical) and characteristics in the situation (i.e. work). Van Horn, Taris, Schaufeli and Schreurs (2004) also state that psychological well-being is a multidimensional phenomenon comprising of affective well-being, but also cognitive, motivational, behavioural and physical symptoms of health.

Human psychic activities are usually described in terms of affective, cognitive and conative components (Plug, Louw, Gouws & Meyer, 1997). The term *affective* refers to the emotional state of an individual, while the term *cognitive* refers to cognition and implies all the processes in which knowledge is gained regarding an object or case or the awareness of the environment. *Conative* is a term which indicates aspects or functions of purposeful and arbitrary behaviour and the impulse to perform. The mind can be seen as the carrier of all experiences and behaviour (Plug et al., 1997). From the above descriptions it is evident that psychological fitness can indeed include all of the above terms, but it is a condition or state comprising of different concepts. For the purpose of this article, the term *psychological* will thus refer to a mental and emotional state that has its origin in the mind and influences different components of individual behaviour including the affective, cognitive and behavioural aspects.

The term *fit* is most commonly associated with a physical state of an individual that implies high performance capacity regarding physical activities (Westcott, 1978). The word fit can be paired with words such as physical, emotional, psychological, mental and social to create a certain meaning whilst fit can also have other meanings such as *fit to serve* or *fit to lead* (Davis, 2003). On the other hand, Steward (2000) argues that the meaning of fit is still very unclear. It was proposed that the term fit consists of three concepts. The first is the ideal body condition achieved through lifestyle change and exercise. The second is the relation to the optimal functioning of body systems

that are medically defined as fitness. The third is the fit of people to the demands of paid employment in terms of compliance to the norms of specific organisations and broader societal work values (Steward, 2000). According to Mosby's Medical, Nursing and Allied Health Dictionary, physical fitness is defined as: "the ability to carry out daily tasks with alertness and vigour, without undue fatigue, and with enough energy reserves to meet emergencies or to enjoy leisure time pursuits" (Anderson et al., 1994, p. 1216). According to the APA dictionary, fitness refers to "a set of attributes that people have or are able to achieve, related to their ability to perform physical work and to carry out daily tasks with vigour and alertness, without undue fatigue, and with ample energy to enjoy leisure pursuits" (VandenBos, 2006, p. 378). The psychological meaning of fitness according to psychological dictionaries refers to the extent to which an organism is prepared to succeed in some venture.

A psychological state can be described as short-lasting, unstable general characteristics of a person, such as momentary feelings of anxiety or sociability. State variables typically refer to conscious, verbally reported qualities such as mood. State scale items refer to a person's feelings at the time of completing the questionnaire and are usually influenced by situational feelings, whereas trait scale concerns the person's usual feelings (Matthews, Deary & Whiteman, 2003). According to Zuckerman (1976) traits are stable over time, while states fluctuate. States are also more sensitive to immediate conditions that would affect the immediate construct. There is also a notion that states influence behaviour more directly than traits (Matthews et al., 2003). From the above it is evident that psychological fitness should be regarded as a state rather than a disposition.

Psychological fitness and the relationship with work-related psychological well-being

In an attempt to understand work-related psychological well-being, Simmons and Nelson (2001) define occupational stress as two concepts, namely positive stress or eustress and negative stress or distress. Eustress refers to a positive psychological response to a stressor as indicated by a positive psychological state, while distress refers to a negative psychological response to a stressor as indicated by a negative psychological state (Simmons & Nelson, 2001). Eustress can be considered as healthy, positive and constructive while distress can be described as unhealthy, negative and destructive (Quick, Quick & Nelson, 1999). The presence or absence of these types of stressors implies that the individual will experience a positive or negative psychological state which in return will affect their behaviour at work (Quick et al., 1999). In line with this reasoning, Schaufeli and

Bakker (2004a) argue that burnout and work engagement are the main indicators of employee psychological well-being, and are the mediators in health-impairment and motivational processes.

Burnout refers to the presence of negative energy and refers to exhaustion, cognitive weariness and mental distance. Exhaustion is regarded as the core component of negative energy (Maslach, Schaufeli & Leiter, 2001; Shirom & Melamed, 2006) and refers to mental, emotional and physical exhaustion (Demerouti, Bakker, Nachreiner & Schaufeli, 2001; Shirom & Melamed, 2006) or the depletion of emotional and physical resources (Maslach et al., 2001*).* The second dimension of the distress component is cynicism and refers to feeling negative, callous, or detached from the work. This causes the individual to withdraw from the work (mental distancing) and manifests itself in alienation, disengagement or cynicism concerning the work (Demerouti et al., 2001). Building on the cognitive exhaustion dimension, Van Horn et al. (2004) proposed cognitive weariness as an analogue to emotional exhaustion. It is believed that excessive exhaustion levels are accompanied by cognitive impairment, including symptoms such as the inability to concentrate, forgetfulness and difficulty solving complex tasks (Hoogduin, Schaap, Methorst, Peters van Neyenhof & van de Griendt, 2001). In fact, recent research suggests that cognitive weariness should be included as an enhancement to the exhaustion dimension (Coetzee & Rothmann, 2004; Schaufeli, 2003).

Even though continuous stress at work can lead to burnout, the research of Schaufeli, Salanova, González-Romá and Bakker (2002) proposed that work engagement can be regarded as the opposite of burnout, operationalised and measured in its own right. When exposed to work stressors, some individuals do not show signs of burnout, but instead find pleasure in dealing with these stressors. These individuals can be described as being engaged in their work. When individuals experience work as meaningful it can lead to eustress which in turn promotes engagement, even in demanding situations (Nelson & Simmons, 2003). Schaufeli et al. (2002) defined work engagement as "a positive, fulfulling, work-related state of mind that is characterised by vigour, dedication and absorption." Vigour refers to high levels of energy and mental resilience while working, the willingness to invest effort in the work, not becoming exhausted easily, and persistence even in the face of difficulties. Dedication refers to experiencing a sense of significance from the work, by feeling enthusiastic and proud of the job done, and feeling inspired and challenged by it.

Understandably, vigour and dedication are the direct opposites of exhaustion and cynicism respectively. Absorption refers to a feeling of being totally and happily engrossed in the work and

experiencing difficulty to detach from it. Experiences of time passing quickly and forgetting everything around you, are evident of this dimension (Schaufeli & Bakker, 2001). However, in recent development in engagement research, absorption is excluded as a construct of engagement. It is argued that absorption is not part of the core concept of engagement (Schaufeli & Bakker, 2001) and, although absorption is regarded as playing a relevant role in engagement, some researchers indicated that it is less critical and questioned the relevancy of including absorption in the definition and measurement of work engagement (González-Romá, Schaufeli, Bakker & Lloret, 2006; Montgomery, Peeters, Schaufeli & den Ouden, 2003). In South Africa some of the internal consistencies of absorption were not acceptable (Naudé & Rothmann, 2004a). A two-factor construct consisting of vigour and work devotion was confirmed in various studies (Coetzer & Rothmann, 2007; Jackson, Rothmann & van de Vijver, 2006; Rothmann & Jorgensen, 2007; Rothmann & Pieterse, 2007).

Based on the conceptual overlap between the term "psychological fitness", the nature of the burnout and work engagement dimensions, and their relationship with desired organisational outcomes, it seems that the term psychological fitness is compatible with the concepts of burnout and work engagement. Therefore, and drawing from the existing burnout and engagement literature, we propose that work-related psychological fitness can be defined as *a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely.*

Burnout and work engagement are not two opposite poles, function relatively independently from each other, are moderately negatively related and share around one-quarter to one-third of their variance (Schaufeli & Salanova, 2007; Schaufeli et al., 2002). Although these constructs are related, they can be discriminated from each other empirically. Instead of one undifferentiated, common employee well-being factor, previous studies have confirmed a structure that differentiates work-related well-being into two components, namely burnout and work engagement (Schaufeli et al., 2002; Schaufeli, Taris & Van Rhenen, 2008).

Based on these results, one can reason that work-related psychological fitness also consists of two dimensions that act as mediators in the health impairment and motivational processes at work. Guided by existing work-related psychological well-being literature (i.e. Demerouti et al, 2001; Maslach & Jackson, 1986; Maslach, Jackson & Leiter, 1996; Sandström, Rhodin, Lundberg, Olsson

& Nyberg, 2005; Schaufeli & Bakker, 2001; Schaufeli & Bakker, 2004a; Van Horn et al., 2004), the following dimensions of work-related psychological fitness are therefore proposed:

Distress (burnout) dimensions:

- **Exhaustion (EX)** refers to the incapability to perform because all energy has been drained.
- **Cognitive weariness (CW)** refers to the inability to concentrate and focus on and at work.
- **Mental distance (MD)** refers to negative feelings towards work-related aspects that result in withholding effort as a protection mechanism.

Eustress (work engagement) dimensions:

- **Work devotion (WD)** refers to a strong involvement in one's work, accompanied by feelings of loyalty, dedication, enthusiasm and significance, a sense of pride and inspiration (providing meaning).
- **Vitality (VI)** refers to the availability of energy, vigour and resilience and the willingness to invest effort in one's work.

Distress (burnout) becomes evident when employees experience extremely high exhaustion levels (both on a mental and emotional level) because of high job demands, limited resources and insufficient effort-recovery. As a result employees develop a mental distance which implies that they become negative and withhold effort as a protection mechanism. When individuals become very exhausted they develop some negativity and distance themselves in terms of the work. Longitudinal research on the relationships between the burnout dimensions confirmed that cynicism/depersonalisation develops as a result of exhaustion and can be regarded as a negative coping strategy (Taris, Le Blanc, Schaufeli & Schreurs, 2005). On the other hand, eustress (work engagement) is a positive work-related state which refers to the level of meaning and significance that employees experience at work and that provokes the willingness to perform.

Although no evidence exists, it is hypothesised that these dimensions can have serious implications in terms of safety for blue-collar employees working in hazardous environments. If exhaustion, mental distance and cognitive weariness become evident and vitality and work devotion are lacking, it might negatively influence workers and even contribute to accidents, injuries and safety violations. For example, an employee working at heights and who is too exhausted to follow the required safety procedures, may injure himself by falling. In the mining environment, workers who

suffer from high exhaustion levels, might neglect to wear the required safety equipment because they do not have the energy to put it on and an accident might occur as a result. Similarly, because of mental distance employees in the mining industry might not report a gas leak which can pose serious safety risks. With regard to cognitive weariness, train drivers, drivers of mobile plants and construction vehicles for example, might have problems to concentrate on the task at hand, resulting in an accident. High levels of exhaustion, mental distance and cognitive weariness might seriously impair the health of blue-collar employees. High vitality and work devotion combined with low exhaustion, mental distance and cognitive weariness will contribute to higher psychological fitness.

Theoretical frameworks for understanding work-related psychological fitness

It has been argued that work-related psychological fitness is an analogue to work-related psychological well-being and is therefore logically rooted in the same theoretical foundations. The following section is a summary of the theoretical models that are applicable to psychological fitness, namely the Job Demands-Resources (JD-R) model (Demerouti et al., 2001), Effort-Recovery (E-R) theory (Meijman & Mulder, 1998) and Conservation of Resources (COR) theory (Hobfoll, 1998).

The JD-R model

Demerouti et al. (2001) developed the JD-R model and argued that everyday work has its own set of risk factors associated with work-related psychological well-being. These factors can mainly be divided into two categories, namely Job Demands and Job Resources, so that this model could be applied to various occupational settings. *Job demands* refer to those physical, emotional and organisational aspects of work that require employees to invest physical and mental energy and in return is associated with physical and psychological costs (Demerouti et al., 2001). *Job resources* refers to those physical, emotional and organisational aspects of work that enable employees to achieve work goals, to reduce the physical and psychological costs of high job demands and to ensure the personal growth and development of employees (Demerouti et al., 2001). Although the main function of job resources is to curb the effect of job demands, they are also important in their own right (Bakker & Demerouti, 2007). Job resources are categories in terms of job specific resources (i.e. variety of tasks, adequate job information, etc.), organisational resources (i.e. the opportunity to advance in a career, etc.) and social resources (e.g. support form colleagues and supervisors) (Demerouti et al., 2001).

One of the main assumptions of the JD-R model is that the relationship between job demands/job resources and psychological well-being (burnout and engagement) is driven by two very distinct processes. The first of these processes is hypothesised as a *health impaired process* that links job demands with health problems via burnout. This implies that when high job demands are present, it overstretches psychological and physical resources and may lead to negative job strain (burnout), turning into health problems (i.e. cardiovascular problems) and negative organisational outcomes (i.e. turnover) (Demerouti et al., 2001). The second is the *motivational process* where lacking resources prevent effectively dealing with high job demands, which foster mental withdrawal and disengagement, causing the depletion of performance (Bakker, Demerouti, De Boer & Schaufeli, 2003; Bakker, Demerouti & Schaufeli, 2003; Schaufeli & Bakker, 2004a). On the other hand, high job resources are associated with higher engagement levels which in turn contribute to higher commitment levels (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2007).

The E-R theory

Meijman and Mulder (1998) developed the E-R theory and suggested that recovery and unwinding plays a central role in ensuring work-related psychological well-being and health. According to the E-R theory the exposure to job demands requires effort, which is associated with the development of short term psychophysiological reactions (e.g. increased heart rate and mood changes) or load reactions (e.g. fatigue). These psychophysiological reactions are adaptive and reversible, implying that when individuals are no longer confronted by demands the psychophysiological systems previously affected by these demands, return to the pre-demand level and recovery can occur (Meijman & Mulder, 1998). As a result, fatigue and other effects of the stressful situation are reduced.

However, the exposure to high job demands will not necessarily have negative consequences as long as sufficient recovery takes place. If employees are continuously exposed to high work demands and have insufficient recovery opportunities, they do not recover from demands. Still in a sub-optimal state, employees therefore need to invest additional effort to cope with high job demands, resulting in increasing intensity of the negative load reaction and placing higher demands on the recovery process (Geurts et al., 2005). In the long run, insufficient recovery might seriously jeopardise the health (e.g. psychosomatic health problems, sleep loss) and well-being of employees specifically in terms of higher exhaustion levels (linked to burnout) and lower levels of work engagement (Åkerstedt, 2006; Sluiter, Frings-Dresen, Van der Beek & Meijman, 2001; Van Hooff

et al., 2005). However, Sonnetag (2003) confirmed that when sufficient effort recovery takes place higher levels of work engagement are evident. This implies that sufficient recovery will ensure that individuals will be better enabled to confront stressful situations, have enough resources to become involved in their work and will be able to concentrate fully on the job and ignore irrelevant cues (Sonnetag, 2003).

The COR theory

The COR theory implies that an adverse work situation threatens or harms a person's resources, such as the work-related psychological well-being, health and even functioning in other domains of life. When employees are working long hours, vigour decreases and fatigue and tension increase. In order to restore resources the individual needs to invest additional resources, such as social support and additional time (Hobfoll, 1998). The main assumption of the COR theory is that people strive to obtain, retain and protect their resources (Hobfoll, 1998), assuming that stress will occur when resources are threatened or lost or when the investment of resources exceeds the gain of resources (Sonnentag, 2001). In the light of this theory resources are referred to as "objects, personal characteristics, and energies that are either themselves valued for survival, directly or indirectly, or that serve as a means to achieving these resources" (Hobfoll, 1998, p.45).

Negative outcomes such as burnout, turnover intentions and health complaints occur when valued resources are lost or threatened or insufficient to meet the demands (Taris, Schreurs & Van Iersel-Van Silfhout, 2001). Research was conducted applying the COR theory to burnout, and it was found that job demands and job resources are potential sources of job stress and convert into physical and emotional exhaustion. On the other hand, resources overcome the need for defensive coping, enhance self-efficacy and thus counteract burnout (Hobfoll & Freedy, 1993). On a more positive note, a recently conducted longitudinal study indicated that higher job resources contribute to employees feeling more engaged in their work but also that engaged workers tend to recognise, activate or create resources more easily (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2009).

The potential value added by the study

This study has the potential value of clarifying the conceptualisation and current measurement issue of work-related psychological fitness. Apart from providing insight into the work-related psychological fitness states of blue-collar workers in South Africa, it also provides companies with a scientific measurement tool to understand the work-related experiences of these workers.

What will follow

The study consists of two sections. In the first section the scale development process will be described including the pilot study. In section two the items for the newly developed work-related psychological fitness measurement instrument are evaluated utilising the Rasch model analysis.

RESEARCH DESIGN

Research method: Phase 1 (Questionnaire development)

Scale development procedure

The procedure of scale development suggested by DeVellis (2003) was followed and included the conceptualisation of the construct, item generation and evaluation, item development and item refinement.

Conceptualisation of the construct

Work-related psychological fitness has been defined as: "a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely".

Item generation

During the next stage, items from a preliminary item pool were identified (60 items) tapping into existing research scales measuring work-related psychological well-being (Demerouti, Bakker, Vardakou & Kantas 2002; Maslach & Jackson, 1986; Pines & Aronson, 1988; Schaufeli & Bakker, 2004a; Schaufeli & Bakker, 2004b; Schaufeli et al., 2002; Schaufeli, Leiter, Maslach & Jackson, 1996; Shirom, 2003). With the target population in mind the following criteria were used to evaluate each item (DeVellis, 2003): 1) each item should reflect the definition of the construct/dimension it is intending to measure; 2) each item should be clear and concise in terms of problematic wording; and 3) the appropriate grammatical structure and word choice for each item are important. During the item evaluation process a panel of subject experts (i.e. researchers in the area of work-related psychological well-being) rated each item in categories high, moderate or low using the evaluation criteria mentioned above. Where moderate to low ratings were indicated these judges (subject experts) were asked to propose an alternative to the specific item. The ratings of

these judges were then discussed, items were adapted where necessary, and items were identified for the process to be followed. During this process 33 items were identified for use in the new scale based on the evaluation criteria.

Item development

During the item development phase, items were carefully scrutinised and further developed and adapted where necessary to ensure that they fit the proposed definitions of the constructs/dimensions, and were written in English that was accessible and reader-friendly. Additional items were also developed for the constructs that were not represented in the initial item pool (e.g. cognitive weariness). It is proposed that five- to seven-point frequency-based category scales are the ideal number of categories to be used (Green & Frantom, 2002). Items that did not fit the particular seven-point frequency-based format scale were adapted. Responses vary from never (0), almost never (1), infrequently (2), sometimes (3), quite frequently (4), regularly (5) and always (6). Items were categorised in five dimensions: vitality (eight items), work devotion (eight items), exhaustion (nine items), mental distance (eight items) and cognitive weariness (seven items).

Item evaluation and refinement

Following the item development process, a panel of five researchers (all Industrial Psychologists) affiliated with the Workwell Research Unit of the North-West University were asked to judge the items. The judges were provided with the definitions of each of the constructs and the items had to be categorised according to the definitions of the different dimensions. The judges were also asked to evaluate the item clarity and to point out any uncertainties. Afterwards the judges reported that all the items were correctly categorised, some suggestions were made regarding item wording. Based on these inputs, changes were made to refine the items.

All the items were translated into the eleven official languages of South Africa by five accredited language experts following a multistage translation process (Shanahan, Anderson & Mkize, 2001). The English questionnaire was translated into the other ten languages by five accredited language experts and then translated back to English by five other language experts. The translators were clearly informed on the type of person who was going to participate and that the translations had to be done in a clear, reader-friendly form. The ten back-translated questionnaires were then compared to the original English questionnaire. Where the back-translated version did not relate well to the

original version the problems were discussed and the questionnaires were adapted until the best fit was reached. The questionnaire was then finalised in all eleven official languages of South Africa.

After the item development was completed, the items were administered to a convenience pilot sample of mine workers (*n*=265*)* in South Africa. The majority of the sample were males (70,31%) and nearly sixty per cent (59,76%) of the respondents indicated African languages as their preferred language. Most of the respondents were African (61,72%), while 25,39% were White. The majority of the sample had at least a grade-12 qualification (48,44%), while 40,23% were between the ages of 20 and 29 (40,23%). Only 5,08% were older than 50.

During this process of identifying poorly performing items, specific guidelines were followed from existing literature (DeVellis, 2003; Curbow, Spratt, Ungaretti, McDonell & Breckler, 2006; Foxcroft & Roodt, 2005). These guidelines included the evaluation of item mean scores, standard deviation, item variance, inter-item correlations and item-total correlations. In order to eliminate poor items the following criteria were followed: 1) Mean item scores near the centre of the range (value of four) were more desirable; 2) standard deviations lower than 1,00 were required; 3) item variance with relatively high values were more desirable; 4) inter-item correlation was more desirable if items had a strong correlation with all the other items and a minimum significance level of 0,05 (items not correlating sufficiently were removed from the scale); and 5) positive item-total correlations indicated that the item measured the construct it intended to measure; values near zero did not discriminate between high and low scores.

Items not meeting these guidelines were eliminated from the final questionnaire. After completing the elimination process, 26 items were retained to measure the following dimensions: exhaustion (five items), mental distance (five items), cognitive weariness (six items), vitality (five items) and work devotion (five items). The scale development literature indicates that shorter scales are more sufficient because they place less of a burden on respondents (DeVellis, 2003). This implied that further elimination of items was needed. The main objective of the item evaluation study was to evaluate the performance of the remaining items of the newly developed scale, so that the items that function poorly can be eliminated from the scale and the items that function more desirably can be retained for further validation. The elimination of items was based on the Rasch model analysis (Rasch, 1960).

Research method: Phase 2 (Item evaluation with Rasch analysis)

Research approach

A cross-sectional survey design was utilised to reach the third objective of this study (to test the newly developed items of the SAPFI) (Struwig & Stead, 2001). With a cross-sectional design, data can be collected on more than one incident at a single point in time and analysis can be done to detect patterns of relationships (Bryman & Bell, 2003).

Research participants

This study was conducted amongst a convenience sample (N = 2769) from different industries in South Africa. The participants consisted of mine workmen, construction workers (including height workers, operators of mobile plants and construction vehicles and crane operators), electrical supply height workers, security guards, train drivers and general municipality workers. The characteristics of the participants are provided in Table 1.

Table 1

Demographic Characteristics of the Participants (N = 2769)

Item	Category	Frequency	Percentage
Gender	Male	2295	82,90
	Female	474	17,10
Race	African	2058	74,32
	White	520	18,78
	Coloured	122	4,41
	Indian	65	2,35
	Other	4	0,14
Age groups	Younger than 20	5	0,18
	20-29	925	33,41
	30-39	895	32,32
	40-49	537	19,39
	50-59	323	11,66
	60 and older	84	3,03
Marital status	Single	1435	51,80
	Married	1152	41,60
	Divorced	89	3,20
	Engaged	66	2,40
	Widowed	27	1,00
Language	isiZulu	548	19,80
	English	491	17,70
	Afrikaans	483	17,40
	Sepedi	276	10,00
	Sesotho	254	9,20
	Setswana	248	9,00
	isiXhosa	242	8,70
	SiSwati	71	2,60
	Xitsonga	65	2,30
	Tshivenda	41	1,50
	isiNdebele	39	1,40
	Other	11	0,40
Province	Mpumalanga	740	26,72
	Northwest province	518	18,71
	Limpopo	455	16,43
	Kwa-Zulu Natal	298	10,76
	Free State	250	9,03
	Eastern Cape	208	7,51
	Gauteng	194	7,01
	Western Cape	64	2,31
	Northern Cape	42	1,52
Educational level	No qualification	53	1,90
	Grade 1-3	29	1,00
	Grade 4-7	94	3,40
	Grade 8	226	8,20
	Grade 9	111	4,00
	Grade 10	216	7,80
	Grade 11	296	10,70
	Grade 12	922	33,33
	Other	754	27,20
Industry	Electrical	1101	39,76
	Construction	780	28,17
	Mining	491	17,73
	Government	180	6,50
	Transport	114	4,12
	Security	33	1,19
	Other	70	2,53

The sample included male (82,90%) and female (17,10%) participants. Most of the participants were single (51,80%) or married (41,60%). The racial groups included in the study were mainly African (74,32%) but also comprised of White (18,78%), Coloured (4,41%) and Indian (2,35%) racial groups. The majority of the participants were isiZulu speaking (19,80%) but the study also included the other official language groups in South Africa: English (17,70%), Afrikaans (17,40%), Sepedi (10,00%), Sesotho (9,20%), Setswana (9,00%), IsiXhosa (8,70%), Siswati (2,60%), Xitsonga (2,30%), Tshivenda (1,50%) and IsiNdebele (1,40%). Most of the participants were between the age groups 20-29 (33,41%) and 30-39 (32,32%). A total of 63,95% of the respondents had some form of high school education of which only 33,33% had a grade 12 qualification. The majority of the respondents worked as electrical height workers in the Electrical industry (39,76%), and construction workers (height workers, operators of mobile plants and construction vehicles, crane operators) in the Construction (28,17%) industry.

Research procedure

Permission was granted by the management of each organisation for conducting the research and using the data anonymously for research purposes. During a one-day training session, field workers were trained in administering the instrument by means of facilitation. This method of administering a questionnaire requires that the fieldworker would ask the question and wait for the participant to respond. During the training session field workers were equipped with the necessary skills and research tools to successfully administer the questionnaire. Careful attention was given to ensure that the fieldworkers were trained regarding the basic concepts of the questionnaire, how to make use of the provided assessment tools (including flashcards to serve as helping aid for answering the questionnaire) and not to lead the participants in answering the questions.

Flashcards consisted of the rating scale categories in the form of a volume indicator which went from very small to very large, in order to assist the participants in understanding the frequency scale. Flashcards for all the language groups were available. The fieldworkers were provided with example questions which they could utilise to explain to the participants what would be expected from them when answering the questions. The fieldworkers utilised the flashcards by asking the questions and participants would then indicate on the flashcard which option best described him/her.

Furthermore, prior to administering the questionnaire the workforce was informed of the purpose of the research and their informed consent was provided. Lower literacy participants were assisted in completing the questionnaire by means of facilitation. However, the participants with higher literacy levels completed the questionnaire on their own and provided the completed questionnaire back to the fieldworker. The participants had between 10 and 20 minutes to complete the questionnaire.

Statistical analysis

Rasch analysis was conducted utilising the WINSTEPS program (Linacre, 2005). The Rasch model assumes that the relationship between person ability and item difficulty can be modelled as a probabilistic function, implying that if the ability level of a person increases on a specific latent trait the probability of scoring higher on each item increases as well (Fox & Jones, 1998). This implies that the whole continuum of the latent trait is evaluated through the items and invariantly for all groups or individuals (Hagquist, 2007).

Rasch analysis was performed on all the items to evaluate the validity and reliability of each dimension and to evaluate the rating scale categories of each dimension. Reliability of the rating scale is determined by both the item (item separation index and item reliability index) as well as the person (person separation index and person reliability index). Person and item separations refer to the distribution of the items or people over the continuum of the measured latent trait. Both person and item separation indexes should be at least 2,00 for an instrument to be regarded as useful (Fox & Jones, 1998). Higher values on separation indicate greater distribution of items or people along the measured latent trait (Green & Frantom, 2002).

Person separation reliability is comparable to the traditional internal consistency reliability, Cronbach's alpha coefficients, which estimate the true person variance. Rasch's reliability estimates have the advantage that neither the sample size or sample specifics influence the reliability. This implies that it measures a person's ability according to the responses on the specific test regardless of the sample that they belong to (Boone & Rogan, 2005). Fox and Jones (1998) propose that the person separation index should be used as an alternative to person reliability as it is bounded by zero and one and is more useful for comparing reliability across different analyses of the same data.

Item reliability indicates how well difficulty levels of the item are distributed along the measured latent variable. This is calculated by dividing the true variance by the observed variance when utilising Winsteps (Fox & Jones, 1998). The values for item separation reliability vary between zero to one (Cervellione, Lee & Bonanno, 2009). The higher the item reliability index, the better the chance of replicating the item placement in other samples (Bond & Fox, 2007). The reliability of a measure is negatively influenced when the distribution of the items are too narrow and the standard errors are too big (Boone & Rogan, 2005).

Fit statistics is utilised to evaluate the validity of each dimension through identifying individuals and items that function differently than is expected, identifying problematic items as well as the persons whose responses are idiosyncratic (Boone & Rogan, 2005). Chi-square values are used to determine how well the data fits the prescribed model. These chi-square values are provided in infit and outfit mean square statistics divided by their degree of freedom with an expected value of +1 and ranges from zero to positive infinity (Fox & Bond, 2007). In order to evaluate the unidimensionality of the scale, item fit mean squares statistics (MNSQ) are utilised. These statistics indicates how well the item measures the intended underlying construct and the ideal value is one. Infit and outfit are used to measure the fit of the data (Cervellione et al., 2009). Infit statistics is less sensitive than the outfit statistics when extreme responses are evident (Green & Frantom, 2002).

Item fit refers to whether the items provide logical and useful information for all the participants, thus if the item would provoke the same answers for participants in another setting. Reasons for item misfit can be found in the complexity of the item, confusion from participants or if the item does not measure the construct it is supposed to measure (Green & Frantom, 2002). Person fit refers to the responses of individuals to items in a consistent manner. Misfit might be evident due to different reasons such as being bored with the task, when confusion occurs or when the item evokes a different answer from the individual than was expected (Green & Frantom, 2002). When items or persons underfit it means that they cause noise or eradication performance and are not sufficiently predictable to make the Rasch model useful. This is detected when the fit statistics is higher than the cut-off point of 1,30. Overfit occurs when the items are not independent and provide the same information and no new information to the measured variable. This is detected when the fit statistics is lower than the cut-off point of 0,70 (Bond & Fox, 2007).

Evaluating the rating scale categories guides the researcher in deciding whether the categories are sufficient or whether some categories should be collapsed. A very basic way of examining the rating scale is by examining the category frequencies indicating how many respondents chose a particular rating category. In addition average measures can give useful information about the rating categories. Average measures refer to the average ability estimate for all the respondents in the sample who chose that particular response category. These average measures are expected to increase in size as the measured variable increases (Bond & Fox, 2007). Another way to investigate the rating scale categories are through the fit statistics. Linacre (1999) suggests that outfit statistics higher than 2,00 indicate more misinformation than information. These categories might need to be collapsed with broader categories.

RESULTS

Table 2 indicates the internal consistency of the measurement in terms of the item separation index and reliability, person separation index and reliability, person reliability in terms of Cronbach's alpha coefficients, the average measure of each dimension per person and item, as well as the infit and outfit statistics for each dimension in terms of the person and item infit and outfit statistics for each dimension.

Table 2

Person and Item Summary Statistics

Dimension	Average Measure (SD)	Infit (SD)	Outfit (SD)	Separation	Reliability	α
Exhaustion						
Person	-1,05 (1,03)	0,98 (0,76)	0,98 (0,85)	1,95	0,79	0,81
Item	0,00 (0,51)	1,00 (0,07)	0,98 (0,06)	24,74	1,00	-
Mental Distance						
Person	-0,50 (0,57)	0,99 (0,80)	1,00 (0,80)	1,01	0,50	0,77
Item	0,00 (0,13)	1,00 (0,14)	1,00 (0,12)	9,69	0,99	-
Cognitive Weariness						
Person	-0,53 (0,55)	1,04 (0,79)	1,02 (0,86)	1,23	0,60	0,68
Item	0,00 (0,30)	1,01 (0,22)	1,02 (0,22)	22,00	1,00	-
Vitality						
Person	1,26 (0,95)	0,99 (0,81)	1,00 (0,97)	1,49	0,69	0,71
Item	0,00 (0,43)	1,08 (0,30)	1,01 (0,23)	20,14	1,00	-
Work Devotion						
Person	1,09 (0,83)	1,02 (0,79)	0,97 (0,75)	1,18	0,58	0,81
Item	0,00 (0,29)	1,01 (0,23)	0,97 (0,21)	14,63	1,00	-

Table 2 shows acceptable item reliability for all five dimensions, indicating that these items differentiated well among the measured variable (equal to or greater than 0,80). The item separation for all the dimensions were sufficient compared to the guideline of at least 2,00 as indicated by Bond and Fox (2007). The person separation index for all the dimensions were somewhat lower than the proposed guideline (>2,00). Cronbach's alpha coefficients for all dimensions were acceptable, except for cognitive weariness (0,68) that was somewhat lower than the cut-off point of 0,70. The vitality dimension shows the highest person average measure (1,26, SD = 0,95) and the cognitive weariness dimension the lowest average measure (-0,53, SD = 0,55). The mean item fit and person fit was acceptable. It is evident that, on average, the responses do not underfit or overfit.

Table 3 shows the functionality of the rating scale categories of all five dimensions.

Table 3

Rating Scale Categories for all Five Dimensions

Dimension	Rating Category	Category Frequency	Average measure	Infit	Outfit
Exhaustion	0	3025	-2,15	1,00	1,00
	1	1871	-1,61	0,89	0,87
	2	1367	-0,92	0,89	0,83
	3	4177	-0,54	1,04	1,04
	4	648	0,25	0,84	0,84
	5	423	0,75	1,05	0,97
	6	204	1,27	1,29	1,39
Mental distance	0	4748	-0,83	1,05	1,03
	1	2550	-0,69	0,66	0,95
	2	1244	-0,34	0,83	0,73
	3	2277	-0,17	0,84	0,78
	4	596	-0,01	0,71	0,62
	5	580	0,09	0,85	0,84
	6	980	0,02	1,28	1,42
Cognitive Weariness	0	6140	-0,95	0,98	1,01
	1	3163	-0,71	0,94	1,03
	2	1849	-0,37	0,96	0,78
	3	3562	-0,21	0,88	0,80
	4	757	0,02	0,76	0,70
	5	705	0,10	1,06	1,16
	6	1194	0,17	1,32	1,46
Vitality	0	191	-0,57	1,65	2,06
	1	281	-0,31	1,17	1,23
	2	504	0,01	0,95	0,96
	3	2124	0,49	1,04	1,04
	4	1425	0,81	0,76	0,62
	5	2940	1,42	0,87	0,86
	6	4050	2,05	1,04	1,03
Work Devotion	0	304	-0,28	1,55	1,55
	1	306	-0,24	1,01	1,01
	2	427	0,04	0,89	0,82
	3	1548	0,40	0,98	0,95
	4	1333	0,64	0,83	0,65
	5	2920	1,20	0,86	0,95
	6	4792	1,63	1,09	1,04

As can be seen in Table 3, the above table indicates that the seven-point frequency-based scale functioned satisfactorily for all five dimensions. Of some concern, is that certain categories were under-utilised. This is evident for the last three categories (4, 5 and 6) of exhaustion and the first three categories (0, 1 and 2) of vitality and work devotion. None of the categories, in any of the dimensions, showed outfit statistics higher than 2,00, indicating that the categories provide good information and function sufficiently.

Table 4 indicates the item fit statistics for all five dimensions in terms of measurement intensity of each item and the infit mean square and outfit mean square for each item.

Table 4

Item Fit Statistics for the Five Different Dimensions

Dimension	Item	Measure (θ)	Infit Mean Square	Outfit Mean Square
Exhaustion	EX1	-0,06	0,99	0,99
	EX2	-0,26	0,97	0,95
	EX3	0,91	1,13	1,10
	EX4	-0,65	0,98	0,96
	EX5	0,06	0,93	0,91
Mental distance	MD1	-0,03	0,88	0,85
	MD2	-0,14	0,85	0,86
	MD3	-0,11	1,19	1,14
	MD4	0,07	1,14	1,04
	MD5	0,21	0,95	1,10
Cognitive Weariness	CW1	0,20	0,91	0,90
	CW2	0,10	0,83	0,86
	CW3	0,14	0,92	0,89
	CW4	0,04	0,84	0,87
	CW5	0,18	1,11	1,11
	CW6	-0,65	1,45	1,48
Vitality	VI1	0,36	0,88	0,88
	VI2	0,03	0,72	0,69
	VI3	0,11	1,00	0,92
	VI4	0,32	1,22	1,22
	VI5	-0,82	1,57	1,31
Work Devotion	WD1	0,14	0,94	1,00
	WD2	-0,25	0,89	0,83
	WD3	-0,21	0,87	0,82
	WD4	-0,18	0,88	0,83
	WD5	0,50	1,48	1,37

The results of the exhaustion items indicate that EX3 has the highest measurement intensity (θ = 0,91) and EX4 has the lowest measurement intensity (θ = -0,65). The infit and outfit statistics for all five exhaustion items are satisfactory. MD5 shows the highest measurement intensity (θ = 0,21) and MD3 the lowest intensity (θ = -0,11). The infit and the outfit statistics for the mental distance items are also acceptable. With regards to the cognitive weariness items, the results show that CW1 has the highest intensity (θ = 0,20) and CW6 the lowest intensity (θ = -0,65). Regarding the infit and outfit statistics all the dimensions proved to be acceptable except for CW6 (Infit = 1,45, Outfit =

1,48). This implies that the information for CW6 can be regarded as redundant and it does not show homogeneity.

The vitality item with the highest measurement intensity was VI1 (θ = 0,36) and the item with the lowest measurement intensity was VI5 (θ = -0,82). Regarding the infit and outfit statistics all the items showed good fit except for VI5 (Infit = 1,57, Outfit = 1,31). This item was regarded as an under fitting item and did not provide information consistent with the other vitality items. The work devotion item with the highest measurement intensity was WD5 (θ=0,50) and the item with the lowest measurement intensity was WD2 (θ=-0,25). The infit and outfit of the work devotion items were satisfactory for all the items except for WD5 (Infit = 1,48, Outfit = 1,37). This item also under fits and does not provide information consistent with the other work devotion items.

Because of the weaker fit for CW6, VI5 and WD5 respectively, it was decided to remove these items from the scale because these items do not demonstrate homogeneity. Table 5 shows the renewed person and item summary statistics for the dimensions cognitive weariness, vitality and work devotion when these items are removed.

Table 5

Person and Item Summary Statistic with Removed Items

Dimension	**Average Measure (SD)**	**Infit (SD)**	**Outfit (SD)**	**Separation**	**Reliability**	**α**
Cognitive Weariness						
Person	-0,65 (0,63)	1,02 (0,93)	1,03 (0,94)	1,12	0,56	0,73
Item	0,00 (0,07)	1,01 (0,16)	1,03 (0,15)	4,57	0,95	-
Vitality						
Person	1,14 (1,03)	0,98 (0,79)	0,97 (0,78)	1,49	0,69	0,72
Item	0,00 (0,16)	1,00 (0,20)	0,97 (0,20)	7,44	0,98	
Work Devotion						
Person	1,35 (1,03)	0,98 (0,91)	0,98 (0,91)	1,25	0,61	0,83
Item	0,00 (0,21)	1,03 (0,03)	0,98 (0,05)	8,94	0,99	-

When the three weaker items (VI5, WD5 and CW6) are removed, the item separation and reliability stay acceptable. The person separation index remained unchanged for vitality, improved for work

devotion and is somewhat lower for cognitive weariness (>2,00). The Cronbach's alphas of all three dimensions improved significantly (>0,70).

Table 6 shows the item fit statistics for cognitive weariness, vitality and work devotion in terms of the measurement intensity for each item, the infit item mean squares and outfit item mean squares when weaker items are removed.

Table 6

Item Fit after Items Removed

Dimension	Item	Measure (θ)	Infit Mean Square	Outfit Mean Square
Cognitive Weariness	CW1	0,09	1,03	1,03
	CW2	-0,04	0,88	0,91
	CW3	0,01	0,99	0,99
	CW4	-0,11	0,86	0,86
	CW5	0,05	1,30	1,29
Vitality	VI1	0,18	0,90	0,90
	VI2	0,20	0,75	0,73
	VI3	0,11	1,07	0,98
	VI4	0,13	1,29	1,28
Work Devotion	WD1	0,36	1,07	1,06
	WD2	-0,17	1,00	0,93
	WD3	-0,17	1,00	0,94
	WD4	-0,08	1,05	0,98

The above table illustrates that when CW6, VI5 and WD5 are removed, the infit and outfit statistics of the remaining items improved.

DISCUSSION

Work-related well-being has become a major focus in most organisations around the world. Research showed that work-related well-being of employees can influence accidents and injuries at work (Siu, Phillips & Leung, 2004). Although different studies focused on the work-related well-being of white-collar workers, no research could be found on the measurement of psychological fitness of blue-collar workers in South Africa. The construction regulations of South Africa (2003) included psychological fitness as an important attribute to ensure the safety of construction workers

whose work is particularly hazardous by nature. Unfortunately the legislator did not define the term psychological fitness and great uncertainty remains in terms of measuring this construct. In an attempt to address these limitations, a definition for and relevant theoretical models related to work-related psychological fitness at work was proposed. A measuring instrument, the SAPFI, was developed to measure work-related psychological fitness levels of blue-collar employees.

Firstly the definition of work-related psychological fitness was operationalised building on previous research regarding work-related well-being of employees (i.e. Demerouti et al., 2001; Maslach & Jackson, 1986; Maslach et al., 1996; Maslach et al., 2001; Sandström et al., 2005; Schaufeli & Bakker, 2004a; Van Horn et al., 2004). The concepts of distress as negative work-related state and eustress as a positive work-related state were identified as possible indicators of psychological fitness. Psychological fitness was defined as a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely. Following a thorough literature review, the dimensions of burnout and engagement concepts were identified as possible indicators of psychological fitness and included exhaustion (being drained from all energy), mental distance (withholding effort and developing negative feelings), cognitive weariness (finding it difficult to focus and concentrate), vitality (presence of positive energy) and work devotion (inspired, motivated and involved in work).

Different theories and models of psychological work-related well-being were identified as the theoretical framework for this study. The JD-R assumes that high job demands and low job resources will negatively influence the psychological fitness and ultimately employee health. However, if job demands and job resources are balanced it will ensure the psychological fitness of employees and contribute to higher commitment levels. The COR theory implies that employees will strive to retain and protect their resources. Therefore, when resources are threatened distress will occur contributing to burnout, turnover and ill-health of employees. When resources are protected, work engagement will likely be enhanced. The E-R model suggests that for individuals to cope with high job demands sufficient effort-recovery needs to be insured. If insufficient recovery takes place, exhaustion levels will increase and work engagement will decrease.

Based on instruments measuring burnout and work engagement, items were identified from various questionnaires that measure the relevant dimensions. Close attention was paid to the wording of items during the development phase, because the work experiences of blue-collar workers, their

work conditions and level of education differ considerably from those of white-collar workers. Furthermore, the scale development procedure was strictly adhered to in the development of the items (DeVellis, 2003). Specific attention was given to the conceptualisation of the different constructs, item generation and evaluation, item development, item refinement and the correct translation process to include all eleven official languages of South Africa. After items had been developed and refined during the pilot study, the Rasch model was used to evaluate items and to eliminate poorly functioning items. The Rasch measuring model, as a function of the item response theory, was used in various research settings but has become very popular in the psychometric evaluation of outcome scales (Tennant & Conaghan, 2007). Furthermore, the Rasch measurement model was utilised because it assumes that all items are part of a unidimensional scale and these items are examined across an entire continuum of a specific latent (Hagquist, 2007; Rasch, 1960).

By utilising the Rasch analysis the optimal number of rating scale categories for each construct was examined. All the rating scales seemed to function sufficiently. However, some rating scale categories for the exhaustion, vitality and work devotion dimensions were under utilised. With the exhaustion dimension the categories indicating high exhaustion levels (quite frequently, regularly and always) were under utilised. With vitality and work devotion the three rating categories indicating low vitality and work devotion (never, almost never and infrequently) were under utilised. This can imply that the seven-point rating scale might be too complex for low literacy employees and that a four-point scale (never, almost never, sometimes, always) might have been more sufficient. Another reason might be that the respondents misunderstood the items and that they were reluctant to answer with the relevant intensity.

In order to evaluate the reliability of each construct, both the internal consistency reliability (as indicated by Cronbach's alpha coefficients) and the person separation index were calculated by using Rasch analysis. The Rasch person separation index is thought to be similar to the Cronbach's alpha coefficient and provides the means to differentiate persons on the same construct or indicates whether the placement of people on other items measuring the same construct will be the same (Fox & Jones, 1998). No problems were identified concerning item separation and reliability. This indicates that items were able to discriminate well across the investigated variables and that items will probably be stable if conducted in another sample or research setting. Furthermore, based on the alpha coefficients, the reliability of the scales was sufficient. However, the person separation indexes for all the dimensions were somewhat less reliable, implying that the dimensions could

have discriminated better amongst respondents with different abilities. Furthermore, it might be that different items targeted the same ability excessively. Possible reasons for the lower person separation were that the respondents misunderstood some items or might have been reluctant to answer with the required intensity. Therefore, if the wording and intensity of the items are explored and adapted this might ensure better person separation.

One of the most important functions of utilising the Rasch analysis in instrument development is to identify problematic items through evaluating the item fit statistics (Boone & Rogan 2005). During this analysis three problematic items were identified and eliminated based on the infit and outfit statistics of these items – item six of the cognitive weariness dimension, item five of the vitality dimension and item five of the work devotion dimension. All three items were causing an underfit of the model and were insufficient in its prediction of the specific dimension. Item six of cognitive weariness and item five of vitality showed the lowest item measures, indicating the high endorsement of the items by participants. However, they seemed to underfit (based on infit statistics), indicating the unpredictability of these items. This could be because these two items were longer compared to the rest of the items. The wording could have also been problematic for the lower literacy employees – i.e. it was difficult for them to understand the exact meaning of these items. As a result, the items did not measure what they were supposed to measure (Green & Frantom, 2002). Furthermore, item five of the work devotion dimension showed the highest item measures (indicating low endorsement of items by participants) but seemed to underfit, meaning that this item did not provide information consistent with the other items measuring work devotion. After these three problematic items were discarded from the scale, the fit of the remaining items as well as the person separation index and item reliability index improved. Consequently, the fit of the entire measure improved.

The current study proposed a definition of psychological fitness and provided a theoretical framework for understanding psychological fitness. Following the scale development procedure, the SAPFI has been developed to measure psychological fitness. Furthermore, Rasch analysis was utilised for preliminary identification and elimination of problematic items. From this study it was evident that the development of the SAPFI is founded in a strong theoretical foundation and has the potential to provide researchers and practitioners with a measurement instrument to evaluate the psychological fitness of blue-collar workers. Furthermore, the SAPFI will contribute to the field of

Industrial Psychology in terms of better understanding of the work experiences and work-related psychological fitness of blue-collar workers in South Africa.

Although the findings of this study area are a valuable contribution to the measurement of work-related psychological fitness, there were limitations to the study. The focus of this study was the development of a new instrument for psychological fitness and therefore the psychometric properties (factorial validity, reliability etc.) were not tested. Also, the SAPFI was translated into all the other official languages of South Africa, however the cultural sensitivity of the SAPFI was not tested. It is therefore important to investigate the item bias and factorial invariance of this instrument because blue-collar employees in South Africa are very diverse and represent various cultural and language groups.

The results from this study were obtained using only self-reporting questionnaires. Method bias also known as "common method - variance" or nuisance, might therefore become problematic when utilising this method. This implies that the investigated phenomenon becomes difficult to differentiate from measurement artifacts (Avolio & Bass, 1991; Hufnagel & Conca, 1994). Different researchers indicate that this type of bias can negatively influence the results of a study when using self-reported questionnaires although the severities thereof have not been confirmed (Crampton & Wagner, 1994; Spector, 1987). Few alternative methodologies are proposed as alternatives to self-reporting measures since the employee is regarded as the most important source to offer information regarding the work (Frese & Zapf, 1999). Also, although subjective methods including observers' ratings might be a good alternative, they are not without problems (i.e. observer's bias, halo and stereotyping effects) of their own.

Despite the limitations, recommendations for future studies regarding the use of the newly developed SAPFI can be made. The primary focus of this study was to develop items and eliminate poorly functioning items. Extensive analyses examining other psychometric properties of the SAPFI were not conducted. However, it is recommended that the psychometric properties of the SAPFI should be examined including the internal validity (i.e. factorial validity and invariance), reliability, external validity (i.e. the relationships with consequences of psychological fitness), etc. In evaluating the psychometric properties of the scale, it can be determined whether the items measure what they were intended to measure and whether the SAPFI items measure the same construct across different language groups. Furthermore, in evaluating the external validity valuable

information regarding the relationship between psychological fitness and theoretically relevant variables can be identified.

It is also recommended that the cultural sensitivity of the SAPFI should be ensured for all cultural and language groups in South Africa. Consequently in ensuring cultural sensitivity, researchers can ensure that all the items are understood in the same way and that the same construct is measured across different language and cultural groups. In order to evaluate construct equivalence, data obtained from the different cultural and language groups can be explored with either exploratory or confirmatory factor analysis. If major changes are evident, the instrument can be tailored to the cultural context. Furthermore, cross-cultural Rasch analysis can be used in the future to ensure the cultural sensitivity of the SAPFI (Van de Vijver & Tanzer, 2004), thus ensuring more reliable information in terms of psychological fitness for all blue-collar workers in South Africa. Therefore, studies focusing on bias and equivalence in future can contribute to the study of psychological fitness of blue-collar employees.

Based on the information regarding the items and rating scale categories of this study, it is recommended that additional items for all the different dimensions should be further explored. While considering the low literacy levels of these employees, careful attention should be given to the structuring of these items. It is evident that shorter items function better than items consisting of long sentences. Furthermore, research should also consider replacing the seven-point frequency scale with a four-point frequency scale. It may be possible that the participants' abilities to discriminate meaningfully between the seven categories have been influenced. This may also be because of problematic wording in terms of different meanings in different language groups. DeVellis (2003) proposes that when respondents find it difficult to discriminate meaningfully between too many options, the number of options needs to be reduced. It is therefore more useful to have a shorter scale than to have a long scale in which some categories are under-utilised.

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CHAPTER 3

RESEARCH ARTICLE 2

THE PSYCHOMETRIC PROPERTIES OF THE SOUTH AFRICAN PSYCHOLOGICAL FITNESS INDEX

ABSTRACT

Orientation: Recently, a new instrument (the South African Psychological Fitness Index, SAPFI) has been developed to measure the work-related psychological fitness of blue-collar workers in South Africa. However, no information is available on the psychometric properties of this instrument.

Research purpose: The objectives of this study were to investigate the internal validity (i.e. factorial validity, factorial invariance and reliability) and relationships of the SAPFI with relevant external variables.

Motivation for the study: Work-related psychological fitness is a key focus area specifically evident in the Occupational Health and Safety Act, Construction regulations in South Africa. In order to evaluate the work-related psychological fitness of blue-collar employees, evidence of a psychometrically sound instrument is of great importance.

Research design, approach and method: A cross-sectional survey design was used for the populations of blue-collar workers in various industries in South Africa (N = 2769).

Main findings: The results provided evidence of the factorial validity of the two SAPFI subscales (distress and eustress) – a three-factor structure consisting of exhaustion, mental distance and cognitive weariness for distress and a two-factor structure consisting of vitality and work devotion for eustress. Although structural invariance (factor correlations) for distress was not confirmed, measurement invariance (invariance of the factor loadings) was confirmed for the distress subscale across six language groups. However, structural and measurement invariance was not confirmed for the eustress subscale. All scales showed acceptable reliability. All dimensions correlated strongly with external variables in the expected direction.

Practical/Managerial implications: This newly developed instrument can be used by researchers and managers to measure the level of work-related psychological fitness of blue-collar employees. If work-related psychological fitness can be measured validly and reliably, it will provide managers with usable insight into the psychological well-being of their blue-collar workforce and evidently interventions can be put into place to assist employees where the psychological well-being is under threat. Unfortunately the eustress dimension did not show factorial invariance. This implies that the measurement of eustress will not provide valid results among different language groups. Therefore, it would be important to further investigate the factorial invariance of the eustress dimension across different language groups.

Contribution/Value-add: This study provides information on the factorial validity, factorial invariance and reliability of the SAPFI, a new instrument that measures the work-related psychological fitness of blue-collar employees.

Key words: factorial validity, factorial invariance, reliability, work-related psychological well-being, work-related psychological fitness, blue-collar workers.

INTRODUCTION

Key focus of the study

Ensuring the work-related psychological well-being of the entire workforce, including white- and blue-collar workers, is beneficiary to organisations. In a study among blue-collar workers in the foundry industry in India, Mohan, Elangovan, Prasad, Kirshna and Mokkapati (2008) found that high levels of work-related psychological well-being are related to higher productivity. It is also believed that employees displaying higher work-related psychological well-being in organisations demonstrate higher levels of customer satisfaction and loyalty, higher productivity and lower turnover intention (Karunka, Kubicek, Schaufeli & Hoonakker, 2009). Although a variety of studies focused on the measurement of work-related psychological well-being of white-collar workers in South Africa (Coetzer & Rothmann, 2007; Jackson, Rothmann & Van de Vijver, 2006; Marais, Mostert & Rothmann, 2009; Rothmann & Jorgensen, 2007; Rothmann, Steyn & Mostert, 2005; Rothmann & Pieterse, 2007), no instrument exists that measures work-related psychological well-being of South African blue-collar workers.

In a recent attempt to address this limitation, Brand-Labuschagne, Mostert, Rothmann & Rothmann (in press) have developed an instrument, the South African Psychological Fitness Index (SAPFI) that measures the work-related psychological fitness of blue-collar workers. The SAPFI is a new instrument that addresses the conceptual and measurement restrictions associated with psychological fitness of blue-collar workers. However, the psychometric properties of this instrument were not investigated. The current study is an effort to demonstrate the factorial validity, factorial invariance and reliability of the SAPFI.

Background to the study

Worldwide the importance of work-related psychological well-being for organisations and individuals is clear. Numerous researchers have studied the work-related psychological well-being of white-collar workers to ensure both organisational outcomes (low turnover intention, low absenteeism, positive attitude, productivity, profitability, safety, commitment, job satisfaction) and individual outcomes (psychological and physical health) (Harter, Schmidt & Hayes, 2002; Johnson et al., 2005; Saks, 2006; Schaufeli & Bakker, 2004; Sonnentag, 2003; Sparks, Farager & Cooper, 2001).

Blue-collar workers can be found in industries characterised by extremely hazardous working conditions. Blue-collar workers in South Africa mainly refer to unskilled or semi-skilled workers that perform work of a manual nature (Lee & Mohamed, 2006), including the mining, construction, electrical, transport and security industries. Most of these industries are regarded as particularly dangerous. For instance, the mining industry is regarded as an extremely hazardous industry because of constant exposure to the risk of accidents or injuries (Maiti, 2003). Some evidence was found that when the psychological well-being of mineworkers is negatively influenced it has an effect on their safety behaviour and accident proneness (Paul & Maiti, 2007). In another study among a group of general blue-collar workers it was also confirmed that negative psychological well-being has an influence on accident proneness (Kirschenbaum, Oigenblick & Goldberg, 2000).

In recent development in the South African legislation the importance of measuring psychological work-related well-being of blue-collar workers is emphasised. This is especially evident in the legislation concerning blue-collar construction workers who are required to demonstrate both physical and psychological fitness to be declared fit for work. Even though it is important to investigate, limited research could be found on measuring the work-related experiences of blue-collar workers in South Africa, specifically with regard to their psychological fitness. To address this limitation, Brand-Labuschagne et al. (in press) have developed the SAPFI. Based on work-related well-being literature, specifically burnout and work engagement, they draw on three theoretical frameworks, namely the Job Demands-Resources (JD-R) model (Demerouti, Bakker, Nachreiner & Schaufeli, 2001a), Effort-Recovery (E-R) theory (Meijman & Mulder, 1998) and Conservation of Resources (COR) theory (Hobfoll, 1998) and proposed that work-related psychological fitness can be defined as *a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely.*

Two sub-dimensions were identified namely distress (burnout) and eustress (work engagement). The distress dimension of the SAPFI consists of exhaustion, mental distance and cognitive weariness. *Exhaustion* refers to the depletion of all energy and the incapability to perform. *Mental distance* refers to experiencing negative feelings towards work aspects resulting in withholding effort as a protection mechanism. *Cognitive weariness* refers to the incapability to focus and concentrate while at work and during work activities. The eustress dimension of the SAPFI consists of work devotion and vitality. *Work devotion* refers to a

strong involvement that individuals experience in their work which is accompanied by feelings of loyalty, dedication, enthusiasm, significance, a sense of pride and inspiration, while *vitality* refers to the energy and willingness to invest effort in their work.

Although these dimensions are related to the burnout and work engagement dimensions of the MBI-GS and UWES, new items have been developed specifically with the focus on blue-collar employees. Close attention was given to procedures of scale development as described in the literature (DeVellis, 2003). All items were rated on a seven-point frequency scale from zero (never) to six (always). Items were carefully evaluated, utilising the Rasch rating scale analysis, and three items were eliminated in order to retain the best performing items. In the final instrument a total of 23 items have been retained. Distress was measured by the level of exhaustion (five items), mental distance (five items) and cognitive weariness (five items). Eustress was measured by the level of vitality (four items) and work devotion (four items).

Research objectives

The objective of this study was to determine the psychometric properties of the newly developed psychological fitness instrument (SAPFI) for blue-collar employees. More specifically, the factorial validity, factorial invariance, reliability and the relationship with theoretically relevant variables (ill-health and commitment) of the SAPFI will be investigated.

Trends from the research literature

The work-related psychological well-being of employees has been emphasised in the last decade. This is mainly because poor psychological well-being has a negative impact on the employee in terms of health conditions (Melamed, Shirom, Toker, Shapira, 2006; Melamed, Shirom, Toker, Berliner & Shapira, 2006) and on the organisation in terms of accidents, turnover, productivity, absenteeism and commitment (Harter et al., 2002; Murray, Fitzpatrick & O'Connell, 1997; Saks, 2006; Siu, Phillips & Leung, 2004). When the concept of burnout emerged it was believed that only individuals employed in the human service occupations could suffer from burnout. As a result, the Maslach Burnout Inventory (MBI) was developed to measure burnout in this context (Maslach, 1993). In the following years the focus of burnout research has expanded to include other occupations rather than merely focusing on the helping professions. As a result the Maslach Burnout Inventory – General Survey (MBI-GS) was developed. Work engagement was proposed as the direct opposite of the burnout

(Maslach & Leiter, 1997). However, Schaufeli, Salanova, González-Romá and Bakker (2002) suggested that engagement should be measured independently as a construct in its own right which has resulted in the development of the Utrect Work Engagement scale (UWES).

As mentioned above, the dimensions measured by the SAPFI are based on the MBI and the UWES dimensions. However, Van Horn, Taris, Schaufeli and Schreurs (2004) proposed that cognitive weariness can be included as a dimension of burnout. Therefore, cognitive weariness was included as a construct in the distress sub-dimension of the SAPFI and additional items were developed for this purpose. Furthermore, it has been confirmed in South Africa that cognitive weariness can be regarded as a construct of burnout (Coetzee & Rothmann, 2004; Marais et al., 2009).

The Maslach Burnout Inventory-General Survey (MBI-GS)

Internationally, the factorial validity of the MBI-GS in different industries and amongst different occupations was confirmed by a three-factor model of burnout consisting of exhaustion, cynicism and professional efficacy (Bakker, Demerouti & Schaufeli, 2002; Kitaoka-Higashiguchi et al., 2004; Leiter & Schaufeli, 1996; Richardsen & Martinussen, 2004; Schutte, Toppinen, Kalimo & Schaufeli, 2000; Taris, Schreurs & Schaufeli, 1999). Similarly, the majority of South African studies also confirmed this three-factorial burnout structure (Coetzer & Rothmann, 2007; Campbell & Rothmann, 2005; Naudé & Rothmann, 2004b; Storm & Rothmann, 2003a). However in a study amongst educators, Jackson and Rothmann (2005) found a slightly different three-factorial burnout model consisting of exhaustion, mental distance (consisting of depersonalisation and cynicism) and professional efficacy. In this context, mental distance was regarded as developing negative feelings towards work and withholding effort from work tasks as a protection mechanism. Marais et al. (2009) confirmed a four-factor burnout structure composed of exhaustion, cynicism, cognitive weariness and professional efficacy. However, in recent studies professional efficacy has been excluded from the burnout measure for various reasons. Firstly, professional efficacy shows less significant relationships with other variables and is perceived as the weakest burnout dimension (Lee & Ashforth, 1996; Schaufeli, 2003). Secondly, research indicated that personal efficacy develops independently whereas cynicism develops in response to exhaustion (Leiter, 1993). Thirdly, some researchers regard personal efficacy as a personality trait rather than part of the burnout dimension or as a possible

consequence of the core negative emotional experience of burnout (Cordes & Dougherty, 1993; Shirom, 1989).

The scales of the MBI-GS were found invariant in different occupations across three different countries (Germany, France and the Netherlands) (Enzmann, Schaufeli & Girault, 1995). This was also confirmed in a study among nurses in eight countries (U.S., Canada, the U.K., Germany, New Zealand, Japan, Russia and Armenia) (Poghosyan, Aiken & Sloane, 2009). Bakker et al. (2002) found evidence that the three dimensions of burnout (exhaustion, cynicism and professional efficacy) are equal across eight different occupations in the Netherlands, indicating that the MBI-GS can be utilised in different occupations. Research in South Africa also confirmed the factorial invariance of the MBI-GS in different language groups including the Afrikaans, African and English groups (Coetzer & Rothmann, 2007; Jackson & Rothmann, 2005). However, these questionnaires were only administered in English. Only in one study was the factorial invariance of translated versions of the MBI-GS, including the cognitive weariness scale, evaluated. Although factorial validity was found, this study found that the Afrikaans, English and Setswana translations were not totally successful and problematic items that were not invariant between the three language groups were identified (Marais et al., 2009).

Schaufeli, Leiter, Maslach and Jackson (1996) found satisfactory internal consistency for exhaustion, with Cronbach alphas ranging between 0,87 and 0,89, cynicism ranging between 0,76 and 0,84 and professional efficacy ranging between 0,76 and 0,84. In South Africa, acceptable internal consistency was found for the original three-factor structure of burnout consisting of exhaustion (alphas ranging between 0,79 and 0,92), cynicism (alphas ranging between 0,70 and 0,78) and professional efficacy (alphas ranging between 0,66 and 0,81) (Buys & Rothmann, 2010; Coetzee & Rothmann, 2004; Jackson & Rothmann, 2005; Rothmann & Barkhuizen, 2008; Storm & Rothmann, 2003a). In two studies the combined cynicism/depersonalisation scale labelled mental distance, the alpha coefficients have been acceptable ranging from 0,74 to 0,76 (Buys & Rothmann, 2010; Jackson & Rothmann, 2005). Van Horn et al. (2004) reported a sufficient internal consistency for the cognitive weariness scale of 0,92, which was confirmed by a South African study where the internal consistency of cognitive weariness was 0,76 (Coetzee & Rothmann, 2004). Furthermore, the translated version of the MBI-GS showed the following internal consistency for three language groups: English (exhaustion 0,88; cognitive weariness 0,79; cynicism 0,69 and professional efficacy

0,71), Afrikaans (exhaustion 0,85; cognitive weariness 0,75; cynicism 0,72 and professional efficacy 0,74) and Setswana (exhaustion 0,78; cognitive weariness 0,59; cynicism 0,69 and professional efficacy 0,72) (Marais et al., 2009).

Utrecht Work Engagement Scale (UWES)

The authors of the UWES originally hypothesised that work engagement should be regarded as a three-factor structure consisting of vigour, dedication and absorption (Schaufeli et al., 2002a). Indeed, the three-factor structure was confirmed in various studies across different countries (Schaufeli et al., 2002a; Schaufeli, Bakker & Salanova, 2006; Schaufeli, Martinez, Pinto, Salanova & Bakker, 2002). Although the three-factor structure was also confirmed in South Africa among academic staff of higher educational institutions (Barkhuizen & Rothmann, 2006) some studies reported that the internal consistency of absorption was not acceptable (Naudé & Rothmann, 2004a). This is consistent with arguments that the core of engagement consists of vigour and dedication (see Schaufeli & Bakker, 2001). Consequently some studies also excluded absorption as a construct of work engagement (González-Romá, Schaufeli, Bakker & Lloret, 2006; Montgomery, Peeters, Schaufeli & Den Ouden, 2003). Based on findings in engagement research in South Africa a two-factor structure consisting of vigour and dedication was hypothesised and confirmed in various studies (Coetzer & Rothmann, 2007; Jackson et al., 2006; Rothmann & Jorgensen, 2007; Rothmann & Pieterse, 2007).

Studies on the factorial invariance of the UWES scale concluded that the three-factor structure is similar between countries and across different nations, including between Spain, the Netherlands and Portugal (Schaufeli et al., 2002b), between Spain and the Netherlands (Llorens, Bakker, Schaufeli & Salanova, 2006), and between Australia, Belgium, Canada, Finland, France, Germany, the Netherlands, Norway, South Africa and Spain (Schaufeli et al., 2006). Likewise in South Africa the factorial invariance was also confirmed in different racial groups in a study among members of the police services, including white, black, coloured and Indian racial groups (Storm & Rothmann, 2003b). Some studies confirmed the factorial invariance across different occupations, including Dutch health care professionals and white-collar employees (Schaufeli & Bakker, 2004). In Finland evidence was found for the factorial invariance of the UWES between health care workers, educators, and white and blue-collar workers (Seppälä et al., 2009).

The internal consistency of the three subscales of the UWES has been confirmed in various international studies with Cronbach alpha coefficients for vigour ranging between 0,68 and 0,88, dedication ranging between 0,71 and 0,96 and absorption ranging between 0,73 and 0,98 (Demerouti, Bakker, De Jonge, Janssen & Schaufeli., 2001; González-Romá et al., 2006; Hakanen, Bakker & Schaufeli, 2006; Langelaan, Bakker, van Doornen & Schaufeli, 2006; Salanova & Schaufeli, 2008; Schaufeli et al., 2002b; Schaufeli et al., 2006). In South Africa acceptable internal consistency was found for vigour (alphas ranging between 0,70 and 0,78) and dedication (alphas ranging between 0,79 and 0,89) (Jackson et al., 2006; Pienaar & Willemse, 2008; Rothmann & Joubert, 2007; Storm & Rothmann, 2003b). Although Storm and Rothmann (2003b) found evidence of internal consistency for absorption (0,78) some South African studies reported insufficient internal consistency (alphas ranging from 0,55 to 0,69) (Naudé & Rothmann, 2004a; Pienaar & Willemse, 2008).

Burnout and engagement and the relationship with external variables

According to Schaufeli and Bakker (2004) high burnout levels are strongly related to physical and psychological symptoms of stress-related ill-health. On the other hand high levels of engagement are strongly related with organisational commitment. This assumption was also confirmed in South Africa among educators (Jackson et al., 2006). Physical ill-health can be divided in short-term and long-term physical reactions, where long-term physical ill-health refers to physical illnesses and short-term ill-health refers to physiological reactions (Frese & Zapf, 1999). Long-term physical reactions to burnout can include illnesses such as cardiovascular diseases and hypertension (Melamed et al., 2006a), while short-term physiological reactions can include hypertension and suppression of immune responses (Jackson & Rothmann, 2006). Psychological reactions can include symptoms such as anxiety or panic attacks, irritability, difficulty to make decisions, constant tiredness, etc. (Jackson & Rothmann, 2006). National and international research confirmed that physical and psychological reactions can result because of burnout (Ahola, Toppinen-Tanner, Huuhtanen, Koskinen & Väänänen, 2009; Barkhuizen, Rothmann & Tytherleigh, 2008; Hakanen et al., 2006; Lewig, Xanthopoulou, Bakker, Dollard & Metzer, 2007; Maslach, Jackson & Leiter, 1996; Pienaar & Willemse, 2008).

Organisational commitment can be divided into behavioural, affective and continuous commitment (Meyer, Stanley, Herscovitch & Topolnytsky, 2002). For the purpose of this study the focus will be on behavioural and affective commitment. Behavioural commitment

refers to a perceived obligation towards the organisation, while affective commitment can be defined as the level of emotional attachment, identification with and involvement in the organisation (Meyer & Allen, 1984). Different studies indicated that high work engagement contributes to organisational commitment, and that high burnout can negatively influence the organisational commitment of employees (Hakanen et al., 2006; Jackson et al., 2006; Jorgensen & Rothmann, 2008; Llorens et al., 2006).

Potential value-add of the study

DeVellis (2003) recommends that the psychometric properties of a newly developed instrument should be well-established by evaluating the validity and reliability of the measurement. This study aims to provide information on the validity, invariance and reliability of the two dimensions (distress and eustress) of the SAPFI. No psychometrically sound instrument that measures work-related psychological fitness exists for blue-collar workers in South Africa. Consequently blue-collar employees who experience work-related difficulties are either ignored or intervened on based on consensus. The results of this study will provide information on the extent to which the SAPFI can be used to scientifically measure the work-related psychological fitness of blue-collar employees, thereby gaining insight into how the workplace is affecting those employees. On the practical side it will provide companies and managers with a true reflection of their blue-collar employees, providing them with evidence for focused interventions.

What will follow

The following hypotheses will be evaluated to reach the objective of the study:

Objective 1: Factorial validity

Hypothesis1a: The distress (burnout) component of the SAPFI is a three-dimensional construct, consisting of exhaustion, mental distance and cognitive weariness.

Hypothesis1b: The eustress (engagement) component of the SAPFI is a two-dimensional construct, consisting of vitality and work devotion.

Objective 2: Factorial Invariance

Hypothesis 2a: The distress (burnout) component of the SAPFI is invariant for the Afrikaans, English, Sepedi, Sesotho, Setswana, isiZulu and isiXhosa language groups.

Hypothesis 2b: The eustress (engagement) component of the SAPFI is invariant for the Afrikaans, English, Sepedi, Sesotho, Setwana, isiZulu and isiXhosa language groups.

Objective 3: Reliability

Hypothesis 3: All the dimensions of the SAPFI (exhaustion, mental distance, cognitive weariness, vitality and work devotion) are reliable (i.e. Cronbach alpha coefficients $\geq 0{,}70$).

Objective 4: External validity

Hypothesis 4a**:** The distress dimensions have a strong and positive relationship with physical ill-health and psychological ill-health.

Hypothesis 4b**:** The eustress dimensions have a strong and positive relationship with behavioural commitment and affective commitment.

RESEARCH DESIGN

Research approach

For the purpose of this study a cross-sectional survey design was utilised, where data is collected at one point in time (Neuman, 2000) and after which interrelationships of variables in a population are examined (Struwig & Stead, 2001).

Research method

Research participants

The target population consisted of a convenient sample (N = 2769) of employees in different industries in South Africa. Several blue-collar workers participated in the study, including mine workmen, construction workers, power supply height workers, security officers, train drivers and general workers in a government institution. The characteristics of the participants are displayed in Table 1.

Table 1

Demographic Characteristics of the Participants (N = 2769)

Item	Category	Frequency	Percentage
Gender	Male	2295	82,90
	Female	474	17,10
Race	African	2058	74,32
	White	520	18,78
	Coloured	122	4,41
	Indian	65	2,35
	Other	4	0,14
Age groups	Younger than 20	5	0,18
	20-29	925	33,41
	30-39	895	32,32
	40-49	537	19,39
	50-59	323	11,66
	60 and older	84	3,03
Marital status	Single	1435	51,80
	Married	1152	41,60
	Divorced	89	3,20
	Engaged	66	2,40
	Widowed	27	1,00
Language	isiZulu	548	19,80
	English	491	17,70
	Afrikaans	483	17,40
	Sepedi	276	10,00
	Sesotho	254	9,20
	Setswana	248	9,00
	isiXhosa	242	8,70
	SiSwati	71	2,60
	Xitsonga	65	2,30
	Tshivenda	41	1,50
	isiNdebele	39	1,40
	Other	11	0,40
Province	Mpumalanga	740	26,72
	Northwest province	518	18,71
	Limpopo	455	16,43
	Kwa-Zulu Natal	298	10,76
	Free State	250	9,03
	Eastern Cape	208	7,51
	Gauteng	194	7,01
	Western Cape	64	2,31
	Northern Cape	42	1,52
Educational level	No qualification	53	1,90
	Grade 1-3	29	1,00
	Grade 4-7	94	3,40
	Grade 8	226	8,20
	Grade 9	111	4,00
	Grade 10	216	7,80
	Grade 11	296	10,70
	Grade 12	922	33,33
	Other	754	27,2
Industry	Electrical	1101	39,76
	Construction	780	28,17
	Mining	491	17,73
	Government	180	6,50
	Transport	114	4,12
	Security	33	1,19
	Other	70	2,53

The majority of the sample consisted of males (82,90%) while only 17,10% of the sample were female. The sample included the following race groups: African (74,32%), White

(18,78%), Coloured (4,41%), Indian (2,35%) and other race groups (0,14%). The following language groups were presented: isiZulu (19,80%), English (17,70%), Afrikaans (17,40%), Sepedi (10,00%), Sesotho (9,20%), Setswana (9,00%), isiXhosa (8,70%), SiSwati (2,60%), Xitsonga (2,30%), Tshivenda (1,50%) and isiNdebele (1,40%). Most of the participants were between the age groups 20-29 (33,41%) and 30-39 (32,32%). A total of 63,95% of the respondents had some form of high school education of which only 33,33% had a grade 12 qualification. In total, 39,76% of the respondents worked as electrical supply height workers in the electrical industry, 28,17% worked as construction height workers, operators of mobile plants and crane operators in the construction industry, 17,73% worked as underground workmen in the mining industry, 6,50% worked as general workers in a government institution, 4,13% worked as train drivers in the transport industry, 1,19% worked as security officers in a security company and 2,53% worked in other industries.

Measuring instruments

Psychological fitness. The newly developed 23-item SAPFI (Brand-Labuschagne et al., in press) was utilised in this study. The SAPFI measures two sub dimensions. Distress was measured with the following subscales: exhaustion (EX, five items, e.g. "After a day at work I feel tired and used up"); mental distance (MD, five items, e.g. "When I get to work, I tend to postpone certain tasks because I just don't feel like doing it") and cognitive weariness (CW, five items, e.g. "I find it difficult to focus while at work"). Eustress was measured with the vitality (VI, four items, e.g. "When I am working I feel a lot of energy") and work devotion (WD, four items, e.g. "My work gives me a sense of meaning and purpose") subscales. All items were measured on a seven-point frequency rating scale ranging from zero ("never") to six ("always"). Higher scores on exhaustion, mental distance and cognitive weariness are indicators of distress (burnout), while higher scores on vigour and work devotion are indicators of eustress (work engagement). Therefore, the indicators of psychological fitness are high levels of eustress (work engagement) and low levels of distress (burnout).

Ill-health. Physical and psychological ill-health was measured with a 16-item questionnaire developed by Jackson and Rothmann (2005). The six physical ill-health items measured physical symptoms of stress (i.e. "How often do you experience headaches"), while the ten psychological ill-health items measured psychological ill-health symptoms of mental health (e.g. "How often does it happen that you experience panic or anxiety attacks"; "How often do

you experience constant irritability"). All items were scored on a four-point scale ranging from one ("never") to four ("frequently"). In South Africa acceptable internal consistencies were found for both scales: 0,78 and 0,88 respectively (Jackson & Rothmann, 2005). Following the multi-translation process these items were also translated into the eleven official languages of South Africa.

Organisational commitment. Behavioural and affective commitment was measured with an adapted nine-item version of the Organisational Commitment Scale (Jackson et al., 2006). Behavioural commitment refers to the extent to which the employee perceives the organisation to be committed to him/her (five items, e.g. "I feel valued and trusted by the organisation"), while affective commitment refers to the extent to which the employee feels committed towards the organisation (four items, e.g. "I feel proud of this organisation"). All the items were scored on a six-point scale ranging from one ("strongly disagree") to six ("strongly agree"). Acceptable internal consistencies (α = 0,88) for organisational commitment were found in South Africa (Jackson et al., 2006; Visser & Rothmann, 2008).

Research procedure

Prior to administering the questionnaire, language experts translated the SAPFI into the eleven official languages of South Africa (English, Afrikaans, isiXhosa, isiZulu, isiNdebele, Sesotho, Setswana, Sepedi, Xitsonga, Siswati and Tshivenda). Following a multistage translation process (Shanahan, Anderson & Mkize, 2001) the original English questionnaire was translated into the different languages by six language experts. The ten translated questionnaires were then back translated into English by six other language experts and compared to the original English version. Problems with the back-translated versions were then discussed and the questionnaires were adapted until consensus was reached on the best version.

Following the translation of the SAPFI, permission was obtained from the general management of each organisation to use the data anonymously for research purposes. During a one-day session fieldworkers were trained on the basic concepts of the questionnaire, how to administer the questionnaire and make use of the assessment tools (including flashcards as a helping aid for answering the questions). Fieldworkers were trained to administer the questionnaire in a facilitation process (ask the question and wait for the participant to respond). The fieldworkers would then fill in the response of the participant on the answer

sheet. Careful attention was given to ensure that the fieldworkers understood the importance of not leading the participants in answering the questions, to make sure that all questions have been answered and how to utilise the provided flashcards. Flashcards consisted of the rating scale categories in the form of a volume indicator which went from very small to very large, in order to assist the participants in understanding the frequency scale. Flashcards for all the language groups were available. The fieldworkers were provided with example questions which they could utilise to explain to the participants what would be expected from them. The fieldworkers utilised the flashcards by asking the questions and participants would then indicate on the flashcard which option best describes him/her.

Furthermore, prior to administering the questionnaire the workforce was informed of the purpose of the study, after which they provided their informed consent. Illiterate and semi-literate participants completed the questionnaire with the help of the trained fieldworkers by means of facilitation. However, literate participants could complete the survey on their own and provided the completed questionnaire back to the fieldworkers. The participants had between 10 and 20 minutes to complete the questionnaire.

Statistical analysis

Confirmatory factor analysis (CFA) was used to examine the factorial validity of the SAPFI with the AMOS structural modelling software (Arbuckle, 2007). CFA was preferred above exploratory factor analysis (EFA) because existing theory and empirical research is already available, which provided knowledge on the latent factors. Furthermore, CFAs have the advantage of statistically testing a hypothesised structure based on the postulated relationship between the observed measure and underlying factors (Byrne, 2010).

To test the factorial validity of the distress scale, the three-factor model was compared with four competing models to evaluate the relationship between the 15 items. Model 1 anticipated that all 23 items would load on one latent variable. Model 2 proposed a two-factor model consisting of a combined dimension for exhaustion and cognitive weariness as one factor and mental distance as the second factor. Model 3 suggested another two-factor model in which exhaustion and mental distance form one factor and cognitive weariness the other factor. Model 4 proposed another two-factor model where mental distance and cognitive weariness were combined in one factor and exhaustion formed the other factor. Model 5 of the hypothesised model suggested that distress can be explained by three separate dimensions,

including exhaustion, mental distance and cognitive weariness. To test the factorial validity of the eustress sub-scale, the two-factor model was compared with one competing model to evaluate the relationship between the eight items. Model 1 proposed that all eight items load on one latent variable. Model 2, the hypothesised model, suggested that the two eustress dimensions, vitality and work devotion can be distinguished from one another.

To determine the differences in statistical fit between the hypothesised and competing models the χ^2 statistics were used. Statistical support for the hypothesised model is indicated when significant differences between models are evident. However, the χ^2 statistic is regarded as somewhat problematic because of sensitivity to sample size and therefore, additional to the χ^2 statistics, the following goodness-of-fit indices were utilised to evaluate the model fit: the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), the Parsimony Goodness-of-Fit Index (PGFI), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Root Mean Square of Approximation (RMSEA) and the Closeness of Fit index (PCLOSE). The rule of thumb for the two absolute indices of fit, GFI and AGFI is that values close to 1,00 are indicative of a good fit. PGFI is characterised with lower threshold values than for other indices of fit. Mulaik et al. (1989) suggested that nonsignificant χ^2 values and goodness-of-fit indices in the 0,90s, accompanied by a PGFI in the 0,50s are not uncommon. TLI range from zero to 1,00 and values close to 0,95 for large samples are regarded as indicative of a good fit to the data. CFI is considered the index of choice and although values greater than 0,90 indicate a relatively good fit, values close to 0,95 are regarded as a better fit (Byrne, 2010). RMSEA values smaller than 0,08 indicate an acceptable fit, while model rejection can be assumed with values greater than 0,10 (MacCallum, Browne & Sugawara, 1996). The cut-off point for PCLOSE should be larger than 0,50 to indicate that the RMSEA fits well in the specific population (Jöreskog & Sörbom, 1996). In addition, the Hoelter index was investigated to determine the adequacy of the sample size. This index suggests that the value should exceed 200 for the model to be regarded as adequately representative of the sample data (Byrne, 2010).

In order to minimize the risk of capitalisation on chance, a cross-validation approach was used (MacCallum, Roznowski & Necowitz, 1992). Therefore, the total sample (N = 2769) was split into two subsamples. The exploratory sample (N = 693) was a 25% random sample of the total sample and was used for model fitting purposes of the hypothesised three-factor

distress and two-factor eustress models as well as to compare these hypothesised models with competing models as described above. The results obtained from the exploratory sample were used to cross-validate the model on the second confirmatory sample (N = 2076) including the remaining 75% of the sample. The confirmatory sample was also used to evaluate the invariance of the parameter estimates (i.e. factor loadings, factor covariances and item error variances) across different language groups. Only six language groups had a sufficient number of responses that could be used to compare with each other. As a result, the Afrikaans, English, Sepedi, Sesotho, Setswana, isiZulu and isiXhosa language groups were used to test for invariance of the parameter estimates.

Multi-group confirmatory factor analysis (CFA) was used to test the factorial invariance of the factor structure and the invariance of parameter estimates. To evaluate the invariance of the distress and eustress constructs, sets of parameters were evaluated in a logically ordered and increasingly restricted way. The parameters of most importance included factor loadings, factor covariances and item error variances. Following the procedure suggested by Byrne (2010), baseline models were tested for each group to ensure well-fitting models for the groups involved. These single group baseline models were then utilised to compel the multi group baseline model, better known as the configural model or unconstrained model. Configural models ensure that all the imposed parameters are evaluated simultaneously between the different groups. The different parameters are then one by one constrained in different models and then compared to the configural model in order to evaluate invariance (Byrne, 2010). Goodness-of-fit indices are used to determine whether the model shows a good fit to the data. Evidence for invariance is evident when the χ^2 difference between the configural model and the restraint model is statistically nonsignificant. Because the χ^2 difference test is regarded as unnecessarily strict, Cheung and Rensvold (2002) proposed that it would be more reasonable to base invariance analyses on CFI differences (Cheung & Rensvold, 2002). CFI differences with a probability of less than 0,01 are regarded as the guideline of invariance. Because CFI difference tests are not yet the approved SEM official method of evaluating invariance, both the CFI and χ^2 differences were examined (Byrne, 2010).

The reliability of the SAPFI scale was evaluated with Cronbach alpha coefficients. In addition, descriptive statistics (means and standard deviations) were used to describe the data.

Product-momentum correlation coefficients were used to determine the relationships between the subscales of the SAPFI and the selected external variables (i.e. ill-health and commitment). The level of statistical significance was set at $p < 0,05$. Because statistical significance may show results that are practically of little relevance, effect sizes were used to determine the practical significance of the relationships (Cohen, 1988; Steyn, 2002). Effect sizes identify the results which are practically important (Steyn, 2002). The cut-off point for practical significance of the correlation coefficients was set at 0,30 (medium effect) and 0,50 (large effect) (Cohen, 1988).

RESULTS

Factorial validity of the distress and eustress scales of the SAPFI (Hypothesis 1)

First, the factorial validity of the distress scale was tested in the exploratory sample. The hypothesised three-factor model was tested and compared with the alternative models. The final model was then tested in the confirmatory sample. Table 2 shows the results of these analyses.

Table 2

Comparison of Factorial Models for Distress

Model	χ^2	*df*	*p*	GFI	AGFI	PGFI	TLI	CFI	RMSEA	PCLOSE	HOELTER 0,05	HOELTER 0,01
Exploratory sample												
M1 One-factor model	712,81	90	0,00	0,86	0,82	0,65	0,84	0,86	0,10	0,00	110	121
M2 Two-factor model (exhaustion/cognitive weariness and mental distance)	592,14	89	0,00	0,89	0,85	0,66	0,87	0,89	0,09	0,00	131	144
M3 Two-factor model (exhaustion/mental distance and cognitive weariness)	643,41	89	0,00	0,87	0,83	0,65	0,85	0,88	0,10	0,00	121	133
M4 Two-factor model (mental distance/cognitive weariness and exhaustion)	496,99	89	0,00	0,91	0,88	0,67	0,89	0,91	0,08	0,00	156	172
M5 Hypothesised three-factor model	416,75	87	0,00	0,93	0,90	0,67	0,91	0,93	0,07	0,00	183	201
M6 Three-factor model with MD5 deleted	289,86	74	0,00	0,94	0,92	0,67	0,94	0,95	0,07	0,00	227	252
M7 Three-factor model with MD5 deleted and error correlations between CW2 and CW4	233,62	73	0,00	0,95	0,93	0,66	0,95	0,96	0,06	0,09	279	309
M8 Three-factor model with MD4 and MD5 deleted and error correlations between CW2 and CW4	156,75	61	0,00	0,97	0,95	0,65	0,97	0,97	0,05	0,65	355	396
Confirmatory sample												
M9 Final three-factor model	375,22	61	0,00	0,97	0,96	0,65	0,95	0,96	0,05	0,51	444	496

As can be seen in Table 2, it is evident that M5 (the hypothesised three-factor model) fitted the data significantly better compared with M1 (one-factor model, $\Delta\chi^2 = 296{,}06$; $\Delta df = 3$; $p < 0{,}05$), M2 (exhaustion/cognitive weariness and mental distance; : $\Delta\chi^2 = 175{,}39$; $\Delta df = 2$; $p < 0{,}05$), M3 (exhaustion/mental distance and cognitive weariness; $\Delta\chi^2 = 226{,}66$; $\Delta df = 2$; $p < 0{,}05$) and M4 (mental distance/cognitive weariness and exhaustion; $\Delta\chi^2 = 80{,}24$; $\Delta df = 2$; $p < 0{,}05$). Although M5 showed reasonable fit to the data, inspection of the fit indices, factor loadings and modification indices suggested that M5 could be improved in several respects. First, the results showed that two mental distance items (MD4 and MD5) had unacceptably high standardised residual covariances with several of the other items. Second, the modification indices indicated that two cognitive weariness items (CW2 and CW4) have highly correlated error terms, suggesting overlapping content between these items. Because model respecification is commonly conducted in SEM (Byrne, 2010), it was decided to omit MD4 and MD5 and to allow CW2 and CW4 to correlate. However, it should be noted that the analyses shifted to exploratory mode, rather than a confirmatory mode. After these items were deleted in a step-wise procedure (first deleting MD5, then allowing the correlated error between CW2 and CW4 and finally deleting MD4), the final model (M8) fits exceptionally well, and significantly better compared to the original hypothesised model (M5, $\Delta\chi^2 = 260{,}00$; $\Delta df = 26$; $p < 0{,}05$). As can be seen in Table 2, when cross-validated in the confirmatory sample, this model also fits exceptionally well. As a result, support was found for Hypothesis 1a.

Next, the factorial validity of the eustress scale was tested in the exploratory sample. The hypothesised two-factor model was tested and compared with a one-factor model. Thereafter, the final model was tested in the confirmatory sample. Table 3 shows the results of these analyses.

Table 3

Comparison of Factorial Models for Eustress

Model	χ^2	*df*	p	GFI	AGFI	PGFI	TLI	CFI	RMSEA	PCLOSE	HOELTER 0,05	HOELTER 0,01
Exploratory sample												
M1 One-factor model	164,20	20	0,00	0,94	0,89	0,52	0,91	0,94	0,10	0,00	133	159
M2 Hypothesised two-factor model	124,07	19	0,00	0,96	0,92	0,50	0,93	0,96	0,09	0,00	169	202
M3 Two-factor model (VI1 and VI2 error correlation)	88,65	18	0,00	0,97	0,94	0,48	0,95	0,97	0,08	0,00	226	272
M4 Two-factor model (VI and V2 error correlation and WD4 deleted)	27,10	12	0,01	0,99	0,98	0,42	0,99	0,99	0,04	0,69	537	670
Confirmatory sample												
M5 Final two-factor model	51,28	12	0,00	0,99	0,98	0,43	0,98	0,99	0,04	0,93	851	1061

As can be seen in Table 3, it is evident that M2 (the hypothesised two-factor model) fitted the data significantly better compared with M1 (one-factor model, $\Delta\chi^2 = 40{,}13$; $\Delta df = 3$; $p < 0{,}05$). Although M2 showed reasonable fit to the data, the goodness-of-fit indices showed that the model could be improved. Inspection of the fit indices, factor loadings and modification indices suggested that M2 could be improved in several respects. First, the results showed that two vitality items (VI1 and VI2) have highly correlated error terms, suggesting overlapping content between these two items. Second, the modification indices indicated that two work devotion items (WD3 and WD4) have highly correlated error terms, also suggesting overlapping content between these items. Further investigation of these items revealed that there was no reason for item overlap between the two work devotion items, but rather that a systematic measurement error caused the high correlated error. It was therefore decided to delete WD4 and to allow VI12 and VI2 to correlate. Again, it should be noted that the analyses shifted to exploratory mode, rather than a confirmatory mode. After the model was re-specified in a step-wise procedure (first allowing the correlated error between VI1 and VI2 and then deleting WD4), the final model (M5) fit exceptionally well, and compared significantly better to the original hypothesised model (M2, $\Delta\chi^2 = 96{,}97$; $\Delta df = 7$; $p < 0{,}05$). As can be seen in Table 3, when cross-validated in the confirmatory sample, this model also fits exceptionally well. As a result, support was found for Hypothesis 1b.

Factorial invariance of the distress and eustress scales of the SAPFI (Hypothesis 2)

Next, the factorial invariance of the two dimensions of the SAPFI was tested. First, the three-factor distress scale was tested in the confirmatory sample. The results of the baseline models are reported first, thereafter the results of the invariance analyses.

Table 4

Baseline models	χ^2	***df***	**GFI**	**AGFI**	**PGFI**	**TLI**	**CFI**	**RMSEA**	**PCLOSE**	**HOELTER 0,05**	**HOELTER 0,01**
Afrikaans	130,43	61	0,94	0,91	0,63	0,95	0,96	0,06	0,10	188	210
English	152,60	61	0,94	0,91	0,63	0,90	0,92	0,06	0,05	205	229
Sepedi	110,15	61	0,94	0,91	0,63	0,93	0,95	0,06	0,23	178	199
Sesotho	105,03	61	0,91	0,87	0,61	0,92	0,94	0,07	0,11	126	140
Setswana	121,07	61	0,92	0,88	0,62	0,92	0,94	0,07	0,03	128	143
isiZulu	96,51	61	0,96	0,95	0,65	0,97	0,98	0,04	0,91	331	369
isiXhosa	118,73	61	0,91	0,87	0,61	0,88	0,90	0,07	0,04	126	140

Goodness-of-Fit Statistics in the Determination of Baseline Models for Distress

Table 4 indicates that the specified baseline models for all six language groups show acceptable fit to the data in terms of the goodness-of-fit indices of the different baseline models. Therefore, the same configural model (multi-group baseline model) was used for further comparisons (the model tested in the confirmatory sample discussed above). In order to investigate the invariance of the parameter estimates for distress between the six language groups, the fit of the configural model was compared with the constraint measurement model (where factor loadings, item error covariance and factor covariance were constrained). The results are shown in Table 5.

Table 5

Goodness-of-Fit Statistics for Tests of Multigroup Invariance for Distress

Model description	Models	χ^2	df	$\Delta\chi^2$	Δdf	*p*	CFI	ΔCFI
M1 Configural model: No equality constraints imposed	-	834,84	427	-	-	-	0,95	
M2 All factor loadings, item error variance and factor covariance constrained	M2 vs. M1	959,71	511	124,87	84	0,00	0,94	0,01
M3 All factor loadings, item error variance and factor covariance constraint equal, except for factor covariance among exhaustion and mental distance (not equally constrained)	M3 vs. M1	948,72	505	113,88	78	0,01	0,94	0,01
M4 All factor loadings constraint equal, factor covariance constrained equally except for factor covariance among exhaustion and cognitive weariness, and mental distance and cognitive weariness	M4 vs. M1	939,65	499	104,81	72	0,01	0,94	0,01
M5 All factor loadings and item error variances equally constrained, no factor covariance constrained	M5 vs. M1	916,47	493	81,63	66	0,09	0,94	0,01

As can be seen in Table 5, the comparison of χ^2 values for the configural model and constraint measurement model was significant, indicating non-invariance for the distress scale. Therefore, subsequent steps have focused on identifying which parameters in the model contribute to these non-invariant findings. As can be seen in Table 5, when the constraint model was compared with the configural model with the factor covariances not equally constrained, the χ^2 differences was not significant, indicating that the factor loadings and item error variance are invariant for the six language groups. These results provide partial support for Hypothesis 2a.

Next, the factorial invariance of the two-factor eustress scale was tested in the confirmatory sample. As with the distress scale, the results of the baseline models are reported first, then the results of the invariance analyses.

Table 6

Baseline models	χ^2	*df*	GFI	AGFI	PGFI	TLI	CFI	RMSEA	PCLOSE	HOELTER 0,05	HOELTER 0,01
Afrikaans	32,74	12	0,97	0,94	0,42	0,96	0,98	0,08	0,08	196	245
English	21,14	12	0,98	0,96	0,42	0,98	0,99	0,04	0,58	387	483
Sepedi	33,06	12	0,97	0,92	0,41	0,90	0,95	0,09	0,05	156	194
Sesotho	10,01	12	0,98	0,96	0,42	1,01	1,00	0,00	0,86	345	430
Setswana	14,22	12	0,98	0,95	0,42	0,99	0,99	0,03	0,67	286	356
isiZulu	30,54	12	0,98	0,95	0,42	0,96	0,98	0,06	0,20	274	341
isiXhosa	25,56	12	0,96	0,91	0,41	0,95	0,97	0,08	0,12	153	190

Goodness-of-Fit Statistics in the Determination of Baseline Models for Eustress

Table 6 indicates that the specified baseline models for all six language groups show acceptable fit to the data in terms of the goodness-of-fit indices of the different baseline models. As with distress, the same configural model (multi-group baseline model) has been used for further comparisons (the two-factor model tested in the confirmatory sample discussed above). In order to investigate the invariance of the parameter estimates for distress between the six language groups, the fit of the configural model was compared with the constraint measurement model (where factor loadings, item error covariance and factor covariance were constrained). The results are shown in Table 7.

Table 7

Goodness-of-Fit Statistics for Tests of Multigroup Invariance for Eustress

Model description	Model	χ^2	df	$\Delta\chi^2$	Δdf	*p*	CFI	ΔCFI
M1 Configural model: No equality constraints imposed	-	167,30	84	-	-	-	0,98	
M2 All factor loadings and item error variance equally constrained with factor covariance not constrained	M2 vs. M1	237,40	120	70,10	36	0,00	0,97	0,01
M3 All factor loadings constraint equal, with item error variance and factor covariance not constrained	M3 vs. M1	224,05	114	56,75	30	0,00	0,97	0,01
M4 Factor loadings constraint equal except for WD2 and WD3 (not constrained), item error variance and factor covariance not constrained	M4 vs. M1	193,97	102	26,67	18	0,08	0,98	0,00

As can be seen in Table 7, the comparison of χ^2 values for the configural model and constraint measurement model was significant, indicating non-invariance for the eustress scale. Subsequent steps therefore have focused on identifying which parameters in the model contribute to these no invariant findings. As can be seen in Table 7, when the constraint model was compared with the configural model with the factor covariances, item error covariance and two work devotion items (WD2 and WD3) not equally constrained, the χ^2 differences were not significant, indicating that the factor loadings of the vitality dimension and item error variance are invariant for the six language groups. Table 7 provided evidence of poor fit in evaluating the validity of the multi-group configural model and therefore further analyses has focused on identifying the source of the problem (Byrne & Van de Vijver, 2010).

Table 8

Configural and Constraining Model Comparisons between Two Language Groups at a time for Eustress

Model description	χ^2	df	$\Delta\chi^2$	Δdf	*p*	CFI	ΔCFI
Afrikaans/English comparison							
Configural model: No equality constraints imposed	53,89	24	-	-	-	0,98	
Invariant model: All factor loadings, item error variances and covariances constrained equally	62,69	31	8,80	7	0,27	0,98	0,00
Afrikaans/Sepedi comparison							
Configural model: No equality constraints imposed	65,81	24	-	-	-	0,97	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	79,22	31	13,41	7	0,06	0,96	0,01
Afrikaans/Sesotho comparison							
Configural model: No equality constraints imposed	42,74	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	55,45	31	12,71	7	0,08	0,98	0,00
Afrikaans/Setswana							
Configural model: No equality constraints imposed	46,96	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	56,63	31	9,67	7	0,21	0,98	0,00
Final invariant model: No constraints on covariances and item error variances	51,45	29	4,49	5	0,48	0,98	0,00
Afrikaans/isiZulu							
Configural model: No equality constraints imposed	63,28	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	79,04	31	15,76	7	0,03	0,97	0,01
Final model: No constraints on covariances and VI3	67,86	29	4,58	5	0,47	0,98	0,00
Afrikaans/isiXhosa							
Configural model: No equality constraints imposed	58,31	24	-	-	-	0,97	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	88,13	31	29,82	7	0,00	0,96	0,01
Final model: No equality constraints imposed on covariances, item errors variances and WD2	66,98	28	8,67	4	0,07	0,97	0,00
English/Sepedi							
Configural model: No equality constraints imposed	54,23	24	-	-	-	0,97	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	56,98	31	2,75	7	0,91	0,98	0,01
English/Sesotho							
Configural model: No equality constraints imposed	31,16	24	-	-	-	0,99	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	46,14	31	14,98	7	0,04	0,99	0,00
Final invariant model: No equality constraints imposed on covariance, WD2 and WD3	35,17	28	4,01	4	0,40	0,99	0,00
English/Setswana							
Configural model: No equality constraints imposed	35,37	24	-	-	-	0,99	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	49,31	31	13,94	7	0,05	0,98	0,01
English/IsiZulu							
Configural model: No equality constraints imposed	51,68	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	66,39	31	14,71	7	0,04	0,98	0,00
Final invariant model: No equality constraints imposed on covariances	57,70	30	6,02	6	0,42	0,98	0,00

Table 8 (continued)

Model description	χ^2	df	$\Delta\chi^2$	Δdf	*p*	CFI	ΔCFI
English/isiXhosa							
Configural model: No equality constraints imposed	46,73	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	73,93	31	27,20	7	0,00	0,97	0,01
Final invariant model: No equality constraints imposed on covariances and item error variances	54,84	29	8,11	5	0,15	0,98	0,00
Sepedi/Sesotho							
Configural model: No equality constraints imposed	43,06	24	-	-	-	0,97	-
Final invariant model: All factor loadings, item error variances and covariances constrained equally	56,84	31	11,78	7	0,11	0,96	0,01
Sepedi/Setswana							
Configural model: No equality constraints imposed	47,28	24				0,97	
Invariant model: All factor loadings, item error variances and covariances constrained equally	65,08	31	17,80	7	0,01	0,96	0,01
Final invariant model: No equality constraints imposed on covariances and WD3	56,00	29	8,72	5	0,12	0,96	0,01
Sepedi/isiZulu							
Configural model: No equality constraints imposed	63,61	24	-	-	-	0,97	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	79,02	31	15,41	7	0,03	0,96	0,01
Final invariant model: No equality constraints imposed on covariances	69,37	30	5,76	6	0,45	0,97	0,00
Sepedi/isiXhosa							
Configural model: No equality constraints imposed	58,62	24	-	-	-	0,96	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	84,87	31	26,25	7	0,00	0,94	0,02
Final model: No equality constraints imposed on covariances and item error variances	65,85	29	7,23	5	0,20	0,96	0,00
Sesotho/Setswana							
Configural model: No equality constraints imposed	24,23	24	-	-	-	1,00	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	36,94	31	12,71	7	0,08	0,99	0,01
Sesotho/isiZulu							
Configural model: No equality constraints imposed	40,54	24	-	-	-	0.99	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	62,49	31	21,95	7	0,00	0,97	0,02
Final invariant model: No equality constraints imposed on covariances, WD2 and WD3	44,25	28	3,71	4	0,45	0,99	0,00
Sesotho/isiXhosa							
Configural model: No equality constraints imposed	35,56	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	60,59	31	25,03	7	0,00	0,96	0,02
Final invariant model: No equality constraints imposed on covariance and item error variances	45,52	29	9,96	5	0,08	0,98	0,00
Setswana/isiZulu							
Configural model: No equality constraints imposed	44,76	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	59,27	31	14,51	7	0,04	0,98	0,00
Final invariant model: No equality constraints imposed on covariances	56,32	30	11,56	6	0,07	0,98	0,00
Setswana/isiXhosa							
Configural model: No equality constraints imposed	39,78	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	57,22	31	17,44	7	0,01	0,97	0,01
Final invariant model: No equality constraints imposed on covariances	50,97	30	11,19	6	0,08	0,98	0,00
isiZulu/isiXhosa							
Configural model: No equality constraints imposed	56,11	24	-	-	-	0,98	-
Invariant model: All factor loadings, item error variances and covariances constrained equally	73,11	31	17,00	7	0,02	0,97	0,01
Final invariant model: No equality constraints imposed on covariance and item error variances	66,72	29	10,61	5	0,06	0,97	0,01

The above table indicates that when all the factor loadings, item error variances and factor covariances are constrained, invariance is only evident for seven of the 21 two-group comparisons. In addition, 14 of the two-group comparisons are invariant when the factor covariances are not constrained equally. With regard to the invariance of factor loadings it seems that one vitality item (VI3) and two work devotion items (WD2 and WD3) operated somewhat differently in the measurement of the intended content between some of the groups. Based on these results, Hypothesis 2b is rejected.

Reliability and relationships with external variables (Hypotheses 3 and 4)

Following the invariance analysis, the reliability and correlations with ill-health and commitment were determined. The results are reported in Table 9.

Table 9

Descriptive Statistics and Product Moment Correlations of the SAPFI dimensions, Physical Ill-Health, Psychological Ill-Health and Organisational Commitment

Item	***M***	***SD***	***A***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Exhaustion	1,88	1,12	0,79	-	-	-	-	-	-	-	-
2. Mental distance	1,62	1,45	0,71	0,48^{+*}	-	-	-	-	-	-	-
3. Cognitive weariness	1,45	1,12	0,71	0,57^{+**}	0,58^{+**}	-	-	-	-	-	-
4. Vitality	4,54	1,16	0,66	-0,42^{+*}	-0,42^{+*}	-0,43^{+*}	-	-	-	-	-
5. Work devotion	5,07	1,15	0,77	-0,33^{+*}	-0,35^{+*}	-0,35^{+*}	0,64^{+**}	-	-	-	-
6. Physical ill health	1,95	0,64	0,74	0,49^{+*}	0,41^{+*}	0,45^{+*}	-0,32^{+*}	-0,21^{+}	-	-	-
7. Psychological ill health	1,69	0,57	0,84	0,52^{+**}	0,50^{+**}	0,56^{+**}	-0,42^{+*}	-0,32^{+*}	0,68^{+**}	-	-
8. Behavioural commitment	4,57	1,12	0,80	-0,34^{+*}	-0,34^{+*}	-0,29^{+}	0,46^{+*}	0,45^{+*}	-0,26^{+}	-0,33^{+*}	-
9. Affective commitment	4,71	1,03	0,73	-0,31^{+*}	-0,35^{+*}	-0,28^{+}	0,45^{+*}	0,43^{+*}	-0,28^{+}	-0,35^{+*}	0,69^{+**}

+ Statistically significant ($p < 0,05$); * Correlation is practically significant $r > 0,30$ (medium effect); ** Correlation is practically significant $r > 0,50$ (large effect)

Table 9 indicates sufficient reliabilities for exhaustion, mental distance, cognitive weariness and work devotion ($\alpha > 0,70$, Nunnally & Bernstein, 1994). However, the Cronbach alpha of vitality ($\alpha = 0,66$) was below the cut-off point of 0,70, and was somewhat less reliable. Caution should therefore be taken in interpreting this dimension. These results provide partial support for Hypothesis 3.

The three distress dimensions (exhaustion, mental distance and cognitive weariness) were statistically and practically significantly associated with vitality (-0,42, -0,42 and -0,43 respectively) and work devotion (-0,33, -0,35 and -0,35 respectively). All the correlations between the distress dimensions and ill-health were statistically and practically significant, with medium effects for the relationship with physical ill-health and a large effect on the relationship with psychological ill-health. Although exhaustion and mental distance were also significantly related to behavioural and affective commitment, these correlations were not as strong as those with ill-health. Vitality and work devotion were also positively and strongly related to behavioural and affective commitment. These results provide support for Hypothesis 4a and 4b.

DISCUSSION

Internationally the importance of measuring psychological well-being to ensure better organisational and employee outcomes has been widely emphasised (Harter et al., 2002; Johnson et al., 2005; Saks, 2006; Melamed et al., 2006a; Melamed et al., 2006b; Schaufeli & Bakker, 2004; Siu et al., 2004; Sonnentag, 2003; Sparks et al., 2001). In South Africa the importance of measuring and understanding the psychological well-being of employees and the impact thereof on employee and organisational outcomes have also been recognised (Coetzer & Rothmann, 2007; Jackson et al., 2006; Rothmann & Jorgensen, 2007; Rothmann et al., 2005; Rothmann & Pieterse, 2007).

Although the emphasis was mainly on understanding the work-related psychological well-being of white-collar employees, the focus has shifted to also include blue-collar employees. This is evident from the Occupational Health and Safety legislation in which it is stipulated that specific employees functioning in extremely hazardous industries should be declared both physically and psychologically fit. One of the main concerns pertaining to this legislation was the lack of a scientific measuring instrument for psychological fitness. In an attempt to address this limitation, Brand-Labuschagne et al. (in press) have recently developed an instrument (the SAPFI) for

measuring psychological fitness in terms of distress (exhaustion, mental distance and cognitive weariness) and eustress (vitality and work devotion). The objective of this study has been to provide evidence for the factorial validity and equivalence, the reliability and external validity (relationships with relevant outcomes) of the SAPFI.

The first objective was to evaluate the factorial validity of the SAPFI. It was hypothesised that distress (conceptualised based on the burnout literature) is a three-factor construct (exhaustion, mental distance and cognitive weariness), and that eustress (conceptualised based on the engagement literature) is a two-factor construct (vitality and work devotion). These hypotheses were tested utilising CFA. Following a cross-validation approach to decrease the risk for capitalisation on change, the sample was randomly split into two groups, an exploratory sample and a confirmatory sample. Using the exploratory sample, the hypothesised three-factor model of distress (burnout) and the hypothesised two-factor model of eustress (engagement) were tested and compared with competing models.

With regard to distress, the results showed that the three-factor hypothesised model describes the association between the items significantly better compared to the competing models that were tested. Although this provided support for Hypothesis 1a, further investigation of the modification indices and factor loadings revealed that two mental distance items (MD 4 and MD5) have unacceptably high standardised residual covariances with several of the other items, while two cognitive weariness items (CW2 and CW4) showed high overlapping content and therefore have very high correlated error terms. Although these items were worded differently they essentially asked the same question. CW2 asks the respondent whether his/her thoughts wander while working and CW4 asks whether the respondent thinks of other things while working. Therefore, both items measured absent-mindedness. After the model has been respecified with these items deleted and the error between CW2 and CW4 allowed to correlate, the model fitted the data acceptably well. The remaining 13 items were cross-validated in the confirmatory sample and revealed a final three-factor model with an acceptable fit, even better than with the exploratory sample. The final distress construct therefore consisted of five exhaustion items, three mental distance items and five cognitive weariness items. In line with previous research these findings confirm a three-factor construct of distress (Coetzer & Rothmann, 2007; Campbell & Rothmann, 2005; Naudé & Rothmann, 2004b; Storm & Rothmann, 2003a).

With regard to the factorial validity of eustress, two competing models (a one-factor and two-factor model) were tested in the exploratory sample. The results indicated that the two-factor hypothesised model, consisting of vitality and work devotion, explained the association between the items significantly better compared to the one-factor eustress model. Although this provided support for Hypothesis 1b, further investigation of the modification indices suggested a high covariance between two vitality items (VI1 and VI2) as well as between two work devotion items (WD1 and WD4). When the item content of the two vitality items was investigated, it was evident that some content overlap existed between these two items. Although these items were worded differently they essentially asked the same question. WD1 asked whether the respondent perceives that the work that he/she does is valuable and WD4 asked whether the respondent feels that his/her work is really contributing. It was therefore decided to allow the two items to correlate. However, the content of the two work devotion items did not show any signs of content overlap. These items possibly showed systematic measurement errors rather than content overlap. The reason for the development of systematic measurement errors might be due to characteristics specific to either the item or the respondents and is therefore not a random error (Aish & Jöreskog, 1990). Based on these results, it was decided to delete one item, namely WD4. After the two-factor model was re-specified, the model fitted exceptionally well to the data. The remaining seven items were cross-validated in the confirmatory sample. The results showed excellent fit to the data. The final eustress construct therefore consisted of four vitality and three work devotion items. These findings support previous research on the psychometric properties of the eustress scale (Coetzer & Rothmann, 2007; Jackson et al., 2006; Rothmann & Jorgensen, 2007; Rothmann & Pieterse, 2007).

The second objective of the study was to determine the factorial invariance of the SAPFI dimensions. Invariance of factorial loadings, factorial covariances and error variances were evaluated in a logically ordered and increasingly restricted way among six language groups (Afrikaans, English, Sepedi, Sesotho, Setswana, isiZulu and isiXhosa). The analyses of the distress dimension revealed that the factor loadings and correlated item error between CW2 and CW4 are invariant across the six language groups. However, the factor covariances were not invariant. A previous study in South Africa regarding the factorial invariance of translated versions of the MBI-GS confirms the no invariance of factor covariances across three different language groups (Marias et al., 2009). These results imply that the relationships between the three distress dimensions (exhaustion, mental distance and cognitive weariness) are not similar across the six different groups, most probably because of cultural differences.

The invariance of the eustress scale could not be established. Further investigation was done where two groups were compared at a time to determine the problematic parameters. Stepwise comparisons were done to identify the specific problematic groups. During these comparisons the factor loadings were first equally constrained, thereafter the item error variances and lastly the covariances. The following group comparisons proved to be the most problematic in terms of factor invariance: Afrikaans vs. Setswana, isiZulu and isiXhosa, English vs. Sesotho, isiZulu and isiXhosa, Sepedi vs. Setswana, isiZulu and isiXhosa, Sesotho vs. isiZulu and isiXhosa; Setswana vs. isiZulu and isiXhosa and isiZulu vs. isiXhosa. Furthermore, it was evident that the item error variances differed for the following group comparisons: Afrikaans vs. Setswana and isiXhosa; English vs. isiXhosa, Sepedi vs. isiXhosa, Sesotho vs. isiXhosa and isiZulu vs. Xhosa. It seems that the isiZulu and isiXhosa groups were the most problematic concerning the invariance of the factor covariances and item error variance. These results imply that the relationships between vitality and work devotion and the relationship between the two vitality items are not similar across these specific groups.

The results on the invariance of factor loadings indicated that one vitality item (VI3) was not invariant for the Afrikaans and isiZulu group and two work devotion items were not invariant; WD2 was problematic for the Afrikaans/isiXhosa, English/Sesotho and the Sesotho/isiZulu groups, while WD3 was problematic for the English/Sesotho, Sepedi/Setswana and the Sesotho/isiZulu groups. These problematic factor loadings might indicate differences in the measurement of the intended content between the compared groups. Furthermore, during the translation of these items the intended meaning of these items might have been compromised. Although the multistage translation process is widely accepted in psychological research, some researchers are of the opinion that this process does not guarantee valid results because of the difficulties of evaluating the quality of translations (Cheung & Thumboo, 2006). Previous research in South Africa only focused on the invariance of an engagement scale on racial groups (Storm & Rothmann, 2003b) therefore it would be necessary to investigate these finding further in the future.

The third objective was to determine if all the scales functioned reliably. It was anticipated that all scales show acceptable reliability with Cronbach alpha coefficients higher than 0,70. Hypothesis 3 was accepted because acceptable Cronbach alpha coefficients were obtained for exhaustion, mental distance, cognitive weariness and work devotion (EX, $\alpha = 0,79$; MD, $\alpha = 0,71$; CW, $\alpha = 0,71$; WD $\alpha = 0,77$). However, a lower Cronbach alpha coefficient was obtained for vitality (VI, $\alpha = 66$). Kline (1999) points out that when dealing with psychological constructs, values below 0,70 can,

realistically, be expected because of the diversity of the constructs being measured. The SAPFI can therefore be regarded as a reliable instrument that measures psychological fitness accurately. These findings confirm previous research on the reliability of these dimensions (Buys & Rothmann, 2010; Coetzee & Rothmann, 2004; Jackson & Rothmann, 2005; Jackson et al., 2006; Pienaar & Willemse, 2008; Rothmann & Joubert, 2007; Storm & Rothmann, 2003b).

The final objective was to provide evidence of external validity for both the SAPFI sub-dimensions. It was hypothesised that distress is significantly and positively related to ill-health. The results confirmed these relationships, which imply that employees who experience high distress levels (exhaustion, mental distance and cognitive weariness) are more likely to develop physical and psychological ill-health symptoms. In addition, although to a lesser extent, employees with high distress levels will also feel less committed to the organisation and perceive the organisation as less committed to them. With regards to eustress the results indicated that high levels of eustress (vitality and work devotion) are positively related to organisational commitment (behavioural and affective). This implies that employees who experience high levels of eustress will feel more committed towards the organisation and will perceive the organisation as more committed towards them. These findings confirm previous research concerning the relationship between distress/eustress, ill-health and organisational commitment (Hakanen et al., 2006; Jackson et al., 2006; Jorgensen & Rothmann, 2008; Llorens et al., 2006).

In conclusion, this study contributes to the research on psychological work-related well-being of blue-collar workers by validating the SAPFI instrument. Evidence of internal validity (i.e. factorial validity and reliability) as well as external validity (i.e. relationships with relevant external variables) of the SAPFI was reported. The study furthermore identified that distress items can be regarded as invariant across six different language groups but also that the work devotion items of eustress were not equivalent across the six language groups.

Although the findings of this study make a valuable contribution to the measurement of work-related psychological fitness, there were limitations to the study. Firstly, invariance of the eustress scale could not be confirmed during this study. Although the multi-stage translation process was followed, the quality of the translations could not be established and the meaning of these items might have been jeopardised during the translation process (Cheung & Thumboo, 2006). Van de Vijver and Tanzer (2006) argued that from a psychological point of view the quality of items might

still be poor although grammatically correctly translated. It is therefore important that the factorial invariance of the eustress subscale should be further investigated in future research.

Secondly, the information in this study was gathered utilising self-report questionnaires which could have resulted in common method variance. Shared bias might become evident when two or more variables are measured using the same method (Spector, 2006). However, some researchers are of the opinion that common method variance are not as big a threat as might be anticipated (Dollard & Winefield, 1998; Semmer, Zapf & Grief, 1996; Spector, 1987; Spector, 2006; Wall, Jackson, Mullarkey & Parker, 1996). Spector (2006) suggests that if common method variance were such a big threat it would have been easily detected with multi-method studies where observed correlations are larger with single methods than with multi-methods and argues that this is not the case.

Thirdly, although the SAPFI was translated in all eleven official languages of South Africa, invariance was only evaluated for six of the eleven languages. These six languages were chosen based on their representation in the sample. According to Byrne and Van de Vijver (2010) smaller sample size per group can contribute to higher variability which implies that data will be less likely to be multivariate normally. It is therefore important to include samples representative of the other language groups to evaluate for factorial invariance across all languages groups in South Africa.

Despite the limitations, recommendations can be made for future studies regarding the use of the newly developed SAPFI. As mentioned above, all the language groups were not included in evaluating the invariance of the SAPFI across groups because the groups were not all representative. It is therefore recommended that future research should include representative samples of the other language groups in order to test for invariance of all language groups in South Africa. Furthermore, the eustress scale did not demonstrate invariance across the six language groups and should therefore be further investigated. Although much effort has been invested in the translation of the questionnaires, alternatives to the multistage translation process should be explored to ensure even higher quality of translations (i.e. involve psychologists of the different language groups to provide quality control of translated items).

Finally, the SAPFI can preliminarily be recommended to identify the psychological fitness levels of blue-collar employees. The distress scales (exhaustion, mental distance and cognitive weariness) and vitality scale of eustress can be interpreted with surety. However, caution should be taken when

interpreting work devotion. Work devotion should especially be treated with care when the SAPFI is assessed amongst different language groups. Nonetheless, considering the evidence that work-related psychological well-being has a positive effect on white-collar employees the psychological fitness levels of blue-collar employees should be investigated and enhanced to ensure good individual and organisational outcomes. The SAPFI will provide organisations with information regarding those employees who need urgent interventions to enhance their psychological fitness levels. If organisations can measure the level of psychological fitness of their blue-collar employees and identify employees with problematic psychological fitness levels, the safety risk can be reduced and productivity can be enhanced.

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CHAPTER 4

RESEARCH ARTICLE 3

DEVELOPING A JOB DEMANDS-RESOURCES QUESTIONNAIRE FOR BLUE–COLLAR MINE WORKERS

ABSTRACT

Orientation: Although the importance of measuring work characteristics is evident in the literature and measuring instruments were developed to measure the impact of work characteristics among white-collar workers, no instrument exists to evaluate the work characteristics of blue-collar workers.

Research purpose: The purpose of this study was to develop a work characteristics questionnaire for blue-collar mine workers.

Motivation for the study: Evidence exists that work characteristics influence employee and organisational outcomes in terms of ill-health, performance, turnover, absenteeism, commitment, amongst others. For this reason it is important to develop an instrument to measure the work characteristics of blue-collar workers to determine the antecedents of employee and organisational outcomes.

Research design, approach and method: A cross-sectional survey design was used in a convenience sample of blue-collar workers in a gold mine in South Africa (N = 261). Following scale development procedures, the job demands-resources scale has been developed measuring the work characteristics of blue-collar workers.

Main findings: Using the Rasch analysis 30 items were retained for use in the newly developed instrument. Three items were retained for measuring work load, six items for measuring bullying by colleagues and supervisors, four items for measuring colleague support, six items for measuring supervisory care, five items for measuring supervisory communication, three items for measuring supervisory integrity and three items for learning opportunities.

Practical/Managerial implications: The newly developed instrument shows promise to be used to evaluate and understand the work characteristics that impact on the blue-collar employee and on individual (i.e. ill-health) and organisational outcomes (i.e. safety).

Contribution/Value-add: This study provides researchers with an instrument that can possibly be used to evaluate the work characteristics of blue-collar employees in the gold mine industry in South Africa. This study can contribute for the first time to understanding how these employees view their organisational climate.

Key words: work characteristics, job demands, job resources, blue-collar mine workers, Job Demands-Resources model, Rasch analysis

INTRODUCTION

Key focus of the study

In recent years the effect of the work climate on the employee has gained a great deal of attention as evidence exists that the work environment can influence both the employee and organisation in terms of ill-health, work-related psychological well-being, commitment, productivity and safety behaviour (Bakker, Demerouti & Schaufeli, 2003; Dollard, Winefield, Winefield & De Jonge, 2000; Joksimovic, Starke, Van der Knesebeck & Siegrist, 2002; McLain & Jarrell, 2007; Neal, Griffin & Hart, 2000; Prieto, Soria, Martínez & Schaufeli, 2008; Schaufeli & Bakker, 2004; Van Yperen & Snijders, 2000). Several South African studies investigated the impact of the work climate on employee well-being and organisational outcomes (Fourie, Rothmann & Van de Vijver, 2008; Koekemoer & Mostert, 2006; Mostert, 2009; Mostert, Rothmann, Mostert & Nell, 2008; Mostert & Rathbone, 2001; Oldfield & Mostert, 2007; Rothmann & Essenko, 2007; Rothmann & Jorgensen, 2007; Rothmann & Joubert, 2007). However, no studies could be found that investigated the work environment of blue-collar mine workers. This lack of research could be ascribed to measurement difficulties, not only because of practical difficulties such as access to these employees, but also in terms of literacy levels (Lee & Mohamed, 2006). Furthermore, no instrument could be found that measures specific work characteristics of South African blue-collar mine workers in a valid and reliable way. Since it is reasonable to expect that blue-collar mine workers experience different work characteristics compared to white-collar mine workers, the focus of this study was to develop a survey that measures the experience of work characteristics of blue-collar mine workers.

Background to the study

The mining industry is regarded as the hub of the South African economy. Gold and platinum mines are critically important for the economy as these industries are the two largest exporters in South Africa, where gold mines accounted for R48,5 billion of foreign currency earnings (Chamber of Mines, 2008). For the period 2008/2009 the mining industry employed 518 585 workers of which 166 421 were employed in gold mines. Although the number of blue-collar mine workers is unknown, the total number of blue-collar workers in South Africa is estimated at one-third of the total workforce (Statistics South Africa, 2004).

In South Africa, blue-collar workers are regarded as contributing significantly to industrial and mining industries (Lee & Mohamed, 2006). However, the working conditions for blue-collar workers in the mining industry are regarded as extremely dangerous, mainly because underground workers are constantly faced with unfavourable working conditions in terms of high humidity and temperature levels, high noise levels, dust, etc. (Paul & Maiti, 2005). These conditions pose serious risks for the safety and health of mine workers (Paul & Maiti, 2005). An injury rate of 3,2% in the mining industry during the period 2008/2009 confirms the extremely dangerous nature of this industry (Department of Minerals and Energy, 2009). During this period 171 fatalities occurred of which 115 fatalities were evident in the gold mines (Chamber of mines, 2008).

Although the physical conditions within the gold mines might have profound negative effects on both the individual and organisational outcomes, it is also important to investigate and understand other work characteristics that might influence organisational and safety outcomes. In a study among blue-collar employees in a multinational forest industry, it was found that supervisory and co-worker support influences the sickness absence of employees, implying that employees who experience strong work-related social resources will take less sick leave (Väänänen, et al., 2003). Another study amongst blue-collar workers in different industrial companies evaluated whether job autonomy, skill discretion, work load and job satisfaction influence ill-health and subsequently sickness absenteeism (Pousette & Hanse, 2002). The findings showed that when blue-collar workers experience work as non-stimulating or boring it contributes to a higher perceived workload, which influences the employee's health and ultimately absenteeism ascribed to sickness.

The importance of work characteristics and its influence on employee and organisational outcomes in different industries have been emphasised in various national and international studies (Bakker et al., 2003a; Bakker, Demerouti, De Boer & Schaufeli, 2003; Bakker, Demerouti & Verbeke, 2004; Jackson, Rothmann & Van de Vijver, 2006; Lewig, Xanthopoulou, Bakker, Dollard & Metzer, 2007; Montgomery, Mostert & Jackson, 2005; Jackson & Rothmann, 2005; Schaufeli & Bakker, 2004; Schaufeli, Bakker & Van Rhenen, 2009). Numerous research studies have been conducted internationally on work characteristics in terms of work load, emotional load, feedback, received social support, supervisory support, sense of autonomy, etc. Furthermore, evidence was found that these work characteristics influence the employee and ultimately employee outcomes including

safety, ill-health, performance, absenteeism, turnover intention and organisational commitment (Bakker et al., 2003a; Bakker et al., 2004; De Jonge, Reuvers, Houtman, Bongers & Kompier, 2000; Hakanen, Bakker & Schaufeli, 2006; Hakanen, Schaufeli & Ahola, 2008; Jackson et al., 2006; Lewig et al., 2007; Neal et al., 2000). Although the effect of job demands and job resources are similar in different organisations, the specific work conditions in each organisation contributing to employee outcomes differ (Demerouti, Bakker, Nachreiner & Schaufeli, 2001). Studies conducted among blue-collar mine workers in India and Israel concluded that organisational factors influence the safety behaviour and accident proneness of mine workers (Kirschenbaum, Oigenblick & Goldberg, 2000; Paul & Maiti, 2007).

Very little research exists in South Africa that is specifically focused on the workplace characteristics experienced by blue-collar mine workers in general. Only a few studies could be found that focus on the demands and resources of mine workers in South Africa (Geldenhuys, 2005; Rothmann & Joubert, 2007). In the study of Geldenhuys (2005) on white-collar mine workers in South Africa, it was shown that the work characteristics with the most influence on the employee were workload, working conditions, job security, working hours, supervision, task freedom, support, pay and benefits, opportunities to grow and resources available (Geldenhuys, 2005). However, blue-collar workers were excluded from this sample.

It is reasonable to expect that work characteristics will differ between white and blue-collar workers. Schreuder, Roelen, Koopmans and Groothoff (2008) studied the effect of physical and psychological demands in a comparative study among white and blue-collar workers, and found that blue-collar workers experience more physical demands, while white-collar workers experience more psychological demands. In an attempt to understand the workplace characteristics of blue-collar workers in South Africa, Lee and Mohamed (2006) conducted a qualitative study. The outcomes of this study proposed that the blue-collar workforce foster the importance of humanity and social support (both supervisory and colleague relationships). This implied that blue-collar workers appreciate civilised attitudes towards them, that they value good supervisory support and the maintaining of healthy colleague relationships.

From the above discussion it is evident that different job demands and job resources influence not only employees from various industries differently but also differ for white and blue-

collar workers. Even though the impact of work characteristics is studied thoroughly for white-collar workers, no study could be found using a valid and reliable instrument that measures the experiences blue-collar mine workers in South Africa have of work.

Research objective

The purpose of this study was to develop a questionnaire that measures the experience of work characteristics of blue-collar workers in the gold mining industry.

Trends from the research literature

Models and theories of work characteristics

Over the years different models and theories were developed to understand different work characteristics and the influence thereof on employees and organisations. Amongst the most well-known models and theories of work characteristics are the Job Demands-Control (JD-C) model (Karasek, 1979), the Work Characteristics model (Hackman & Oldham, 1980) and the Job Demands-Resources (JD-R) model (Demerouti et al., 2001a).

The JD-C model of Karasek

In an attempt to understand the different work characteristics influencing both employee and organisational outcomes in different industries, the JD-C model was developed by Karasek (1979). The JD-C model assumes that work characteristics can be divided into job demands and job control, which is based on the strain hypothesis. The strain hypothesis implies that when job demands are high accompanied with low control over environmental conditions, employees will develop high strain symptoms such as fatigue, anxiety, depression and physical illness (Karasek, 1979; Karasek, et al., 1998). Job demands refer to psychological demands at work and encompass some of the psychological stressors in the work environment, including time pressure and mentally exhausting work. Job control refers to two concepts, namely skill discretion (the scope of skills that the employee uses at work) and decision authority (the extent to which the employee has the authority to make decisions at work) (Karasek & Theorell, 1990). Later on the JD-C was expanded to include social support, which implied that when an employee functions in a demanding environment with low control and low social support, the strain hypothesis would be even stronger (Johnson & Hall, 1988). Some of the main limitations of the JD-C include that the definition of job demands and resources are very limited and restricted, that it might not be applicable to all

work environments or job positions and that only autonomy in or control over tasks could buffer the effect of job demands (Bakker & Demerouti, 2007; Bakker et al., 2003a).

The Work Characteristics model of Hackman and Oldham

In the early 1980s Hackman and Oldham (1980) developed the Work Characteristics model in an attempt to understand the specific conditions that lead to motivation, satisfaction and productivity. This model proposes that these employee and work outcomes will become evident when employees experience three psychological states, including perceiving work to be meaningful, experiencing responsibilities for work results and having knowledge of their work results. According to this model, employees will experience these states if the following five work characteristics are enhanced: skill variety (the degree to which a variety of skills are required to do the work), task identity (the extent to which a job requires a whole identifiable piece of work), task significance (the degree to which the job has an impact on other people's lives or work internal or external to the organisation), autonomy (the extent to which the job allows employees autonomy and independence in carrying out work) and feedback (the extent to which clear and direct information regarding the job and effectiveness of performance is obtained). One of the main criticisms against this model is that strong support exists for the relationship between work characteristics and personal outcomes but that a relationship between these work characteristics and organisational outcomes is not established (Boonzaier, Ficker & Rust, 2001).

The JD-R model of Demerouti et al.

In an attempt to broaden the understanding of work characteristics, Demerouti et al. (2001a) have developed the JD-R model. The focus of this model was on two categories, job demands and job resources that influence the negative psychological well-being state burnout and ultimately ill-health. Schaufeli and Bakker (2004) suggested that the JD-R can also play a role in developing the positive psychological well-being state, namely work engagement. Therefore, the JD-R model assumes two processes – a health impairment process and a motivational process.

The first assumption of this model is that work characteristics can be divided into two categories, namely job demands and job resources. Job demands can be regarded as those physical, psychological and organisational aspects that required some form of physical and psychological effort and demand physiological and psychological costs (i.e. exhaustion). Job

resources are regarded as those physical, psychological, social and organisational aspects in the job that enable employees to cope with the physical and psychological effects of high job demands (Demerouti et al., 2001a; Schaufeli & Bakker, 2004). Although job resources are necessary to curb high job demands, they are also important to motivate employees (Bakker & Demerouti, 2007). Job resources can either be external to the job (e.g. colleague support and supervisory support) or internal to the job (e.g. opportunities to learn and grow) (Demerouti et al., 2001a).

The second assumption of the JD-R model is that there are two psychological processes namely the health impairment process and the motivational process. The health impairment or energetic process is characterised by job demands that exhaust mental and emotional energy, which contribute to total energy depletion and evidently ill-health outcomes (Demerouti et al., 2001a, Demerouti, Bakker, De Jonge, Janssen & Schaufeli, 2001). When employees experience excessive demands at work, the expected performances can still be reached but at the expense of psychological (i.e. exhaustion) and physiological (i.e. increased emission of cortisol) costs (Schaufeli & Bakker, 2004). On the other hand, the motivational process is characterised by the availability of job resources, which leads to higher work engagement and ultimately better work outcomes (i.e. commitment, productivity, etc.). At the core of the JD-R model lies the assumption that high job demands and low job resources contribute to negative individual and organisational outcomes, while manageable job demands and sufficient job resources lead to positive individual and organisational outcomes (Schaufeli & Bakker, 2004). Because of the ability to accommodate a wide range of work characteristics and the evidence supporting this model (e.g., Bakker et al., 2003a; Jackson et al, 2006; Korunka, Kubicek, Schaufeli & Hoonakker, 2009; Lewig et al., 2007; Oldfield & Mostert, 2007; Jackson & Rothmann, 2005) the JD-R model is utilised as theoretical framework for the purpose of developing a work characteristics questionnaire for blue-collar mine workers.

Measurement of work characteristics

Based on the Work characteristics model (Hackman & Oldham, 1980), the Job Diagnostic Survey (JDS) was developed to assess the work characteristics in a multi-method diagnosis and is mostly used to assess jobs for work redesign purposes and to evaluate the effects of job redesign (Hackman & Oldham, 1980). The JDS measures five work characteristics (each with three items), including skill variety, task identity, task significance, autonomy and feedback.

According to Boonzaier and Boonzaier (1994), the JDS is also applicable for job redesign purposes in South Africa.

Based on the JD-C model, Karasek (1985) developed the 49-item Job Content Questionnaire (JCQ) to measure psychological demands (nine items), decision latitude (twenty-two items), social support (eleven items), physical support (five items) and job insecurity (six items). The JCQ has been translated into more than twelve languages and has been standardised for different occupations in several countries (Karasek et al., 1998). Some studies based on the JD-R model utilise items from the JCQ to measure specific demands and resources (Bakker et al., 2003a; Bakker et al., 2003b; Bakker et al., 2004; Hakanen et al., 2008; Lewig et al., 2007; Schaufeli & Bakker, 2004).

Internationally, no standard instrument exists to measure job demands and job resources based on the JD-R model. The reason for this might be the fact that the work characteristics influencing employees might differ from one industry to another and from one occupation to the next (Demerouti et al., 2001a). In most studies, the possible demands and resources that might be experienced by participants were identified before deciding on the scales that would be used to measure work characteristics.

In the first study conducted on job demands and job resources, participants from different industries and occupations were included (Demerouti et al., 2001a). Therefore, evaluation of the working conditions was subjective and heterogeneous with eleven theoretically derived working conditions. The job demands that were measured included physical workload (one item), time pressure (one item), demanding contact with clients (two items), unfavourable shift-work schedule (two items) and a demanding physical environment (two items). Six job resources were included in this questionnaire, namely performance feedback (two items), rewards (two items) job control (three items), participation in decision-making (one item), job security (one item) and supervisory support (two items).

Based on existing questionnaires, Bakker et al. (2004) developed a scale measuring the following job demands and resources in a study on employees in the insurance industry, occupational health and safety services, pension fund company and home-care institution: workload (five items), emotional load (four items), work-home conflict (three items), autonomy (three items), possibilities for professional development (three items) and social

support (three items). In another study among seventeen different organisations (Van den Broeck, Vansteenkiste, De Witte & Lens, 2008), the items for measuring job demands and job resources were taken from well-established Dutch questionnaires. Workload (four items) and emotional load (three items) were taken from a previous study by Bakker et al. (2003b). Physical demands (three items) were measured with an instrument developed by Van der Doef and Maes (1999) and work-home interferences were measured with the ‘‘Survey Work-Home Interference Nijmegen’’ (SWING; Geurts et al., 2005). The job resources included in this scale were task autonomy (nine items) taken from Van Veldhoven and Meijman (1994), opportunities for skill utilisation (four items) measured with the questionnaire of Van der Doef and Maes (1999) and positive feedback (three items) as constructed by Van den Broeck et al. (2008).

In the Netherlands, a shorter version of the experience and evaluation of work questionnaire (QEEW) is often utilised to measure job demands and job resources (Llorens, Bakker, Schaufeli & Salanova, 2006; Peeters, Montgomery, Bakker & Schaufeli, 2005; Schaufeli et al., 2009). The QEEW is widely used for Dutch occupational health services and applied researchers (Van Veldhoven, De Jonge, Broersen, Kompier & Meijman, 2002). In a study amongst managers and executives of a Dutch telecom company items were utilised from the QEEW (Schaufeli et al., 2009). Work overload was measured with five items, emotional load with three items, social support with three items, autonomy with three items, opportunities to learn and to develop with four items and performance feedback with three items. Work-home interference (seven items) was measured with a scale developed by Peeters, De Jonge, Janssen and Van der Linden (2004). From the above discussion it is evident that researchers utilise items from different instruments to measure the relevant job demands and resources in their studies.

In South Africa work characteristics has also been measured with self-constructed items and items from existing questionnaires (Mostert & Rathbone, 2001; Montgomery, et al., 2005; Rothmann, Steyn & Mostert, 2005; Wiese, Rothmann & Storm, 2003). However, Jackson and Rothmann (2005) developed the Job Demands-Resources Scale (JDRS) to evaluate the work characteristics of educators. The JDRS was validated by Rothmann, Mostert and Strydom (2006) for white-collar workers in South Africa. The validation study confirmed that the different work characteristics could be divided into two categories, namely job demands and job resources, and that these work characteristics differ among industries. The work

characteristics included in this scale were overload (eight items), job insecurity (three items), growth opportunities (seventeen items), advancement (six items) and organisational support (eight items).

Relevant work characteristics of blue-collar mine workers in the mining industry

Limited research was found on the work characteristics of blue-collar mine workers. Research on blue-collar mine workers in Israel and India found that the safety environment, work hazards, workload, emotional state and social support from colleagues and supervisors contribute to accidents and injuries (Kirchenbaum et al., 2000; Paul, 2009). It is therefore evident that overload and social support play an important role. Furthermore, because of the important function that social support seems to play, it is also important to investigate the effect of bullying by superiors and/or colleagues. Although none of the international studies focusing on blue-collar employees has confirmed the importance of learning opportunities for blue-collar workers, various South African studies among white-collar employees have indicated opportunities to learn as an important work characteristic. It was decided to include three demands, overload and bullying by supervisors and colleagues, and three resources, social support by supervisors and colleagues and opportunities to learn, in the new questionnaire.

Work overload

Blue-collar mine workers are required to work in difficult circumstances for long hours underground and are under tremendous pressure to perform. The fast pace and amount of work can contribute to negative work-related well-being and ill-health might become evident, effecting their ability to be productive. Moreover, international studies among blue-collar workers in different industrial companies show that high workload contributes significantly to ill-health (Pousette & Hanse, 2002).

Numerous instances of research indicated the negative influence of work overload on work-related psychological well-being of employees, which in turn lead to physical and psychological ill-health (Coetzer & Rothmann, 2006; Demerouti et al, 2001a; Maslach & Leiter, 2008; Maslach, Schaufeli & Leiter, 2001; Rothmann & Essenko, 2007; Rothmann & Jorgensen, 2007; Shirom, Nirel & Vinokur, 2006). In a study conducted amongst white-collar mine workers in a platinum mine in South Africa, it was confirmed that high workload

contributes to higher exhaustion levels and ultimately to burnout (Rothmann & Joubert, 2007).

Bullying by superiors and/or colleagues

Bullying behaviour by both superiors and/or colleagues might be evident among blue-collar mine workers. Bullying in the workplace is experienced by employees as harmful, fearful and unpleasant (Hutchinson, Wilkes, Vickers & Jackson, 2008). Therefore, these actions might affect employees personally and contribute to physical and psychological ill-health symptoms influencing their ability to function optimally. Although bullying has been researched among white-collar workers, the extent to which bullying affects blue-collar workers seems to be unknown (Bilgel, Aytac & Bayram, 2006).

Indeed bullying actions can be regarded as an emotional load because it causes employees to become emotionally upset and affects them personally. Bullying can include actions such as teasing, badgering and insulting the employee, or more subtle actions such as exclusion or isolation (Zapf & Einarsen, 2001). However, these negative actions should occur repeatedly over a period of time to be regarded as bullying actions (Einarsen, 2000). Bullying of employees can be experienced by co-workers, supervisors and subordinates (Vartia & Hyyti, 2002). Various studies among white-collar workers have concluded that bullying has a profound negative effect on the health and well-being of employees in terms of anxiety, depression, mental health and psychosomatic symptoms (Hansen et al., 2006; Mikkelsen & Einarsen, 2002; Vartia, 2001).

Social support

If blue-collar mine workers experience supervisors and colleagues as helpful, supportive, caring and trustworthy it may contribute to positive work-related well-being, better performance, higher commitment and less turnover intentions. Research among blue-collar Turkish textile workers indicates that good relationships with supervisors contribute to organisational citizenship behaviour (Ersoy, Born, Derous & Van der Molen, in press). Furthermore, a study among blue-collar underground mine workers in India found that good social support (colleague and supervisory support) contributes to a decrease in job stress and positively influences job involvement (Paul & Maiti, 2005). A comparative study between white and blue-collar workers in an industrial company found that blue-collar employees

experience less support from colleagues and supervisors (Väänänen, Pahkin, Kalimo & Buunk, 2004) compared to white-collar workers.

Research among white-collar workers indicates that social support, including support from colleagues and supervisors, serves as a buffer for the negative effects of high job demands and possible ill-health (Väänänen et al., 2003). It has also proven to reduce turnover intention (Van der Heijden et al., 2010). Furthermore, employees experiencing their supervisor as supportive and trustworthy showed less turnover intension (DeConinck, in press). Research found that high colleague support contributes to job satisfaction, better performance and work-related psychological well-being (De Jonge & Schaufeli, 1998; Xanthopoulou, Bakker, Heuven, Demerouti & Schaufeli, 2008). Moreover, it was reported that employees experiencing their supervisors as trustworthy show less turnover intentions (DeConinck, in press).

Learning opportunities

Opportunities to learn, grow and develop are regarded as work characteristics influencing the motivation of employees (Schaufeli & Bakker, 2004). Therefore, providing blue-collar mine workers with learning opportunities to grow professionally might contribute to experiencing meaning from work and at work, motivating them to improve their performance. A qualitative study regarding the workplace perceptions of blue-collar workers in South Africa came to the conclusion that these employees feel that they are not allowed learning opportunities at work (Lee & Mohammed, 2006). Therefore it would be important empirically to investigate what influence learning opportunities or the lack thereof may have on these employees.

Poggi (2010) confirms that employees who experience opportunities to learn and grow demonstrate more job satisfaction. In South Africa engineers and academics in higher institutions experience higher growth opportunities whereas correctional officers indicated lower growth opportunities (Rothmann et al., 2006). Furthermore white-collar mine workers in South Africa who experience opportunities to learn also indicated that they experience more work enjoyment (Geldenhuys, 2006).

Potential value-add of the study

This study will provide researchers and practitioners with a questionnaire that could be used to measure the work demands and resources of blue-collar mine workers. Furthermore, it will enable organisations to understand the perceptions of the work environment and how it influences employee and work outcomes in terms of health, productivity, safety and organisational commitment. With this previously unknown insight into the work environment of blue-collar employees, organisations can intervene to ultimately contribute to more positive employee and work outcomes.

What will follow

The following section is presented in two phases. In the first phase the scale development process for the new questionnaire is discussed. In phase two, the Rasch analysis of the newly developed tool is discussed.

RESEARCH DESIGN

Research method: Phase 1 (questionnaire development)

Scale development procedure

The scale development procedure as proposed by DeVellis (2003) is followed in developing the new questionnaire. The following steps are included: conceptualisation of the construct, item generation and evaluation, item development and item refinement.

Conceptualising the construct

Prior to the development of the scale it was important to define the construct to be measured. Drawing from the existing literature on the JD-R model (Demerouti et al., 2001a; Schaufeli & Bakker, 2004), the following definitions of job demands and resources are adopted from Demerouti et al. (2001a): "*Job demands refers to physical, social and organisational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs (e.g. exhaustion). Job resources refer to physical, psychological, social and organisational aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands at the associated physiological and psychological costs; and (c) stimulate personal growth and development.*"

As discussed above, the following dimensions were identified and definitions were developed to describe the different job demands and job resources (Demerouti, et al., 2001a; Einarsen, 2000; Hutchinson et al., 2008; Jackson & Rothmann, 2005; Karasek & Theorell, 1990; Rothmann et al., 2006; Schaufeli & Bakker, 2004; Zapf & Einarsen, 2001):

- **Workload** refers to the pace and amount of work that employees have to deal with frequently – i.e. the quantity of the workload and the time pressures pertaining to the workload.
- **Bullying by superiors and/or colleagues** is defined as those repeated actions and practices (e.g. gossiping, isolation, teasing, insulting, exclusion) over a period of time that are directed to one or more workers, that are all unwanted by the victim, which may be done deliberately or unconsciously, but clearly cause humiliation, offence, and distress, and that may interfere with job performance and/or cause an unpleasant working environment.
- **Colleague support** refers to the availability of and perceived relationship between the employee and co-workers.
- **Supervisor support** refers to the availability of and perceived relationship between the supervisor and the employee which manifests in three dimensions:
    - **Supervisory care** refers to the extent to which the employees experience their supervisor as supportive, caring and appreciative.
    - **Supervisory communication** is the extent to which employees feel the supervisor discusses critical matters concerning the organisation and provides the necessary information to complete their work.
    - **Supervisory integrity** refers to the extent to which employees perceive the supervisor as trustworthy, honest and fair.
- **Learning opportunities** refer to the level of personal and professional development, growth and new skills attainment within their immediate working environment.

Item generation

With the specific target group in mind, 58 preliminary items were developed. Considering the educational and literacy levels of these employees, each item was evaluated based on the following criteria as proposed by DeVellis (2003): 1) items should measure the construct it was intended to measure; 2) each item should demonstrate appropriate grammatical structures; and 3) each item should be concise and problematic wording should be avoided.

Items were rated according to the evaluation criteria in high, moderate and low categories by a panel of four subject experts (i.e. researchers in the area of work-related well-being and Industrial Psychologists). Where moderate to low categories were identified, these experts were asked to provide alternatives to the items. These ratings were discussed and where necessary, adapted. After this process was completed, 32 acceptable items were identified for the next step in questionnaire development.

Item development

During the item development phase, feedback from the subject experts was used to develop and adapt items where necessary. Moreover, it was ensured that each item should fit the proposed definitions and is clearly understandable for lower literacy level employees. Where necessary, items were adapted to fit the specific frequency based format scale: responses vary from never (0), almost never (1), infrequently (2), sometimes (3), quite frequently (4), regularly (5) to always (6). Items were categorised in seven dimensions: workload (three items), bullying (six items), colleague support (five items), supervisory care (eight items), supervisory communication (five items), supervisory integrity (three items) and learning opportunities (three items).

Item evaluation and refinement

Following the item development process, each item was evaluated by a panel of four subject experts. The panel consisted of researchers and Industrial Psychologists. During the evaluation of items, the definitions of each construct were provided to the judges and items had to be categorised into the different dimensions. The items were also evaluated on the basis of clarity and to ensure that uncertainties are dealt with. The judges categorised all the items correctly, but proposed alternative wording for some items to ensure clarity. Based on these recommendations, the items were refined.

Research method: Phase 2 (Item evaluation with Rasch analysis)

Following the item refinement process, 32 items were retained to measure the dimensions of the job demands and resources among mine workers. From the scale development literature it is evident that shorter scales are more sufficient because they place less of a burden on respondents (DeVellis, 2003). The main objective of the study was to evaluate the items with Rasch model analysis (Rasch, 1960) in order to retain the best functioning items for future validation.

Research approach

A cross-sectional survey design was used during this study to evaluate interrelationships between different variables within a specific sample (Struwig & Stead, 2001). This type of survey design allows researchers to detect different patterns and to analyse data collected during more than one incident at a single point in time (Bryman & Bell, 2007).

Research participants

The participants consisted of blue-collar mine workers in a gold mine environment (N=361, response rate = 54%). The characteristics of the participants are provided in Table 1.

Table 1

Demographic Characteristics of the Participants (N = 361)

Item	Category	Frequency	Percentage
Gender	Male	259	71,75
	Female	102	28,25
Marital status	Single	254	70,36
	Married	105	29,09
	Divorced	2	0,55
Race	Black	355	98,34
	White	6	1,66
Age	20-29	204	56,51
	30-39	96	26,59
	40-49	47	13,02
	50-59	9	2,49
	Younger than 20	5	1,39
Educational level	No qualification	2	0,55
	Grade 1-3	5	1,38
	Grade 4-7	19	5,26
	Grade 8	15	4,16
	Grade 9	20	5,54
	Grade 10	36	9,97
	Grade 11	95	26,32
	Grade 12	149	41,27
	Others	20	5,54
Job type	Assistant (Underground)	184	50,97
	Mining team	70	19,39
	Stope driller	24	6,65
	Scraper winch operator	19	5,26
	Loco operator	14	3,88
	Crew supervisor	8	2,22
	Stope team leader	8	2,22
	Store cum first-aid attendant	7	1,94
	Assistant (Surface)	5	1,39
	Development driller	5	1,39
	Miners' assistant	5	1,39
	Other	12	3,33
Years employed at company	More than 20	23	6,37
	11-20	20	5,54
	6-10	11	3,05
	0-5	307	85,04

The sample consisted of mainly Black (98,34%) male participants (71,75%) between the ages 20 to 29 (56,51%), with at least a grade 12 qualification (41,27%). The employees functioned in the following job types: underground assistant (50,97%), mining team (19,39%), stope driller (6,65%), scraper winch operator (5,26%), locomotive operator (3,88%), crew supervisor (2,22%), stope team leader (2,22%), store cum first-aid attendant (1,94%), surface assistant (1,39%), development driller (1,39%) and miners' assistant (1,39%). The majority of the participants (85,04%) were employed by this gold mine for five years or less.

Research procedure

After permission was granted by the general manager of the mine, labour unions were informed of the purpose of the questionnaire. With the specific target population in mind, all the items were translated (following a multistage translation process) into Sesotho, isiXhosa and Setswana by three accredited language experts (Shanahan, Anderson & Mkize, 2001). During this process the English questionnaire was translated into the other three languages and then back-translated to English by three different language experts. To ensure the correct translation the three back-translated questionnaires were compared to the original questionnaire. After problematic translations were identified, it was discussed, adapted to reach the best fit and finalised for the four different languages.

Workplace assessors in the mine were recruited to assist with the data gathering. These field workers were trained in administering the questionnaire to the participants by means of facilitation. During a one-day training session field workers were equipped with the necessary skills and equipment to successfully administer the questionnaire. They were trained in the basic concepts of the questionnaire and how to use the provided flashcard for answering the questionnaire. The flashcards were provided as a helping aid in answering the questionnaire and were available in English, Sesotho, isiXhosa and Setswana. On these flashcards the rating scale categories were indicated as a volume indicator ranging from very small to very big. To ensure that the respondents answered the questions truthfully, the fieldworkers were advised to inform the respondents of the confidentiality of their answers. During the facilitation process, fieldworkers had asked the question and participants indicated on the flashcard which option best described them. Fieldworkers were only allowed to read the questions to the participants and not to interpret the questions for the participants. During the training, emphasis was also placed on ensuring not to lead the participants when answering questions.

Prior to administering the questionnaire, fieldworkers had to explain the purpose of the study and assure participants of the confidentiality of their responses. The informed consent of each participant was obtained prior to completing the questionnaire. All the participants were assisted by the trained field workers by means of facilitation to complete the questionnaire. To speed up the process, field workers only had to obtain the employee number of the participants because a data file with all the relevant biographical information was provided by

the mine. Depending on the literacy level and level of understanding the questionnaire took between 10 and 20 minutes to complete.

Statistical analysis

Rasch analysis was conducted utilising the WINSTEPS program (Linacre, 2005) to evaluate the reliability and validity of the items. The Rasch model is a probabilistic model that determines the relationship between person ability and item difficulty or endorsement for each unidimensional dimension separately (Fox & Jones, 1998). This implies that the whole continuum of the latent trait is evaluated through the items and invariantly for all groups or individuals (Hagquist, 2007). Rasch analysis was performed on all the items to evaluate the performance of the items of each dimension separately.

During the analysis attention was given to the reliability, item fit, measures and the functioning of the rating categories. Traditionally the reliability of an instrument is evaluated by calculating a Cronbach alpha coefficient. However, with the Rasch analysis the reliability of the rating scale is determined by both the item and person reliability. The person and item separations index is measured and refers to the distribution of the items or people over the continuum of the measured latent trait. Separation should be higher than 2,00 for an instrument to be regarded as useful. Higher values on separation indicate greater distribution of items or people along the measured latent variable (Green & Frantom, 2002).

In Rasch analysis two chi-square statistics, infit and outfit, are utilised to evaluate unidimensionality of the scale. These statistics indicate how well the item measures the intended underlying construct. The ideal value is 1,0 (Cervellione et al., 2009). Item fit indicates the level of useful and logical information obtained from the participants and participants in other settings will provide the same answers. Possible reasons for item misfit can be found in the complexity of the item, confusion from participants or that the item does not measure the construct as intended (Green & Frantom, 2002). Person fit indicates that individuals responded to the items in a consistent manner. Misfit might be ascribed to different reasons such as being bored with the task, when confusion occurs or when the item evokes a different answer from the individual than was expected (Green & Frantom, 2002). Item underfit is detected when fit statistics are higher than 1.30 – this implies that the item is not sufficiently predictable from the measured construct. When items overfit it implies that these items do not provide new information regarding the measured latent variable and are

therefore not independent. This is detected when infit statistics are lower than 0,70 (Bond & Fox, 2007).

In evaluating the rating scale categories it is indicated whether the categories function sufficiently or whether some categories should be collapsed. In examining the rating scale categories the following guidelines can be followed: examine the category frequencies to determine how many respondents chose a particular rating category; investigate the average measures as it is expected to increase in size as the measured variable increases; and investigate fit statistics as outfit statistics higher than 2,00 indicate more misinformation than information. If the above is evident in a category it might need to be collapsed with broader categories (Bond & Fox, 2007; Linacre, 1999).

RESULTS

Table 2 demonstrates the internal consistency of the measurement in terms of the item separation and reliability index, person separation and reliability index, the average measure of each dimension (person and item) as well as the fit statistics (person and item) for each dimension.

Table 2

Person and Item Summary Statistics

Dimension	Average Measure (SD)	Infit (SD)	Outfit (SD)	Separation	Reliability
Work load					
Person	0,15 (0,74)	0,99 (-0,20)	1,00 (1,06)	1,17	0,58
Item	0,00 (0,27)	0,01 (0,11)	1,00 (0,11)	6,07	0,97
Bullying					
Person	-0,74 (0,64)	0,96 (0,70)	0,94 (0,72)	1,16	0,57
Item	0,00 (0,17)	1,03 (0,09)	0,93 (0,15)	3,32	0,92
Colleague support					
Person	0,39 (0,99)	1,00 (0,98)	1,01 (1,03)	1,45	0,68
Item	0,00 (0,41)	1,06 (0,24)	1,00 (0,26)	6,38	0,98
Supervisory care					
Person	0,56 (0,85)	1,05 (0,88)	1,03 (0,85)	2,28	0,84
Item	0,00 (0,18)	1,01 (0,16)	1,03 (0,18)	3,85	0,94
Supervisory communication					
Person	0,52 (0,77)	1,01 (0,87)	1,01 (0,89)	1,57	0,71
Item	0,00 (0,21)	1,01 (0,12)	1,01 (0,11)	4,53	0,95
Supervisory integrity					
Person	0,74 (1,15)	0,95 (1,23)	0,95 (1,24)	1,55	0,71
Item	0,00 (0,13)	0,98 (0,15)	0,95 (0,11)	2,06	0,81
Learning opportunities					
Person	0,89 (1,02)	0,94 (1,05)	0,94 (1,04)	1,21	0,59
Item	0,00 (0,10)	1,01 (0,16)	1,94 (0,13)	1,48	0,69

Table 2 demonstrates acceptable item separation for most of the dimensions (>2,00) (Bond & Fox, 2007) except for the learning opportunities dimension. This indicates that items in the learning opportunities dimension do not differentiate well among the measured variable. The person separation index for all the dimensions is somewhat lower compared to the guideline (>2,00) except for the supervisory care dimension. The opportunities to learn dimension shows the highest person average measure (0,89, *SD*=1,02) and the bullying dimension the

lowest average measure (-0,74, *SD*=0,64). The mean item fit and person fit are acceptable for all the dimensions.

Table 3 indicates the fit statistics of all seven dimensions.

Table 3

Item Fit Statistics for the Seven Different Dimensions

Dimension	**Item**	**Measure(*θ*)**	**Infit Mean Square**	**Outfit Mean Square**
Workload	WL1	0,36	1,11	1,11
	WL2	-0,27	1,07	1,03
	WL3	-0,09	0,85	0,84
Bullying	BULLY1	-0,26	1,15	1,16
	BULLY2	-0,17	0,98	0,88
	BULLY3	0,15	1,02	0,81
	BULLY4	-0,06	0,97	0,97
	BULLY5	0,21	0,90	0,71
	BULLY6	0,13	1,14	1,08
Colleague support	COLSUPP1	0,43	1,14	1,18
	COLSUPP2	0,31	0,91	0,86
	COLSUPP3	0,26	0,79	0,76
	COLSUPP4	-0,57	0,98	0,79
	COLDUPP5	-0,42	1,48	1,43
Supervisory care	SUPCARE1	0,11	0,18	1,31
	SUPCARE2	0,03	0,91	0,99
	SUPCARE3	-0,25	0,98	0,96
	SUPCARE4	-0,19	0,92	0,90
	SUPCARE5	0,13	1,02	1,04
	SUPCARE6	-0,17	1,17	1,05
	SUPCARE7	0,04	0,72	0,72
Supervisory communication	SUPCOMM1	0,37	1,11	1,07
	SUPCOMM2	-0,23	1,16	1,17
	SUPCOMM3	0,06	1,02	1,03
	SUPCOMM4	-0,15	0,88	0,83
	SUPCOMM5	-0,05	0,88	0,95
Supervisory integrity	SUPINTE1	0,10	1,15	1,06
	SUPINTE2	0,08	0,79	0,79
	SUPINTE3	-0,18	1,02	1,00
Learning opportunities	LEARNOP1	0,12	1,17	1,03
	LEARNOP2	-0,13	0,79	0,75
	LEARNOP3	0,01	1,06	1,03

The results of the workload items indicate that WL1 has the highest measurement intensity (θ = 0,36) and WL3 has the lowest measurement intensity (θ =-0,09). The infit and outfit statistics for all three items are satisfactory. BULLY5 shows the highest measurement intensity (θ = 0,21) and BULLY1 the lowest intensity (θ = -0,26). The infit and outfit statistics for the bullying items are also acceptable. The colleague support item with the highest intensity is COLLSUPP1 (θ = 0,43), whilst COLLSUPP4 shows the lowest intensity (θ = -0,57). The infit and outfit statistics of COLLSUPP5 (Infit=1,48; Outfit=1,43) seem to underfit the model and should be removed from the instrument.

The supervisory care item with the highest measurement intensity is SUPCARE8 (θ = 0,31) and the item with the lowest measurement intensity is SUPCARE3 (θ = -0,25). Regarding the infit and outfit statistics all the items show good fit except for SUPCARE1 (Infit = 0,18; Outfit = 1,31). Interestingly, the inlier-sensitive infit value suggests that the SUPCARE1 item overfits, while the outlier-sensitive outfit value suggests that the item underfits. This implies that SUPCARE 1 gets unexpected responses in cases where the item measure differs more drastically from the respondent's ability, and predictable responses where the item measure is in line with the respondent's ability. The supervisor communication item with the highest measurement intensity is SUPCOMM1 (θ = 0,37) and the item with the lowest measurement intensity is SUPCOMM2 (θ = -0,23). The infit and outfit of the supervisor communication items are satisfactory. The supervisor integrity item with the highest measurement intensity is SUPINTE1 (θ = 0,10), while SUPINTE3 shows the lowest measurement intensity (θ = -0,18). The infit and outfit of these dimensions seem to be satisfactory. With regard to the learning opportunities items, the results show that LEARNOPP1 has the highest intensity (θ = 0,12) and LEARNOPP2 the lowest intensity (θ = -0,13).

Table 4

Person and Item Summary Statistics with Removed Items

Dimension	Average Measure (SD)	Infit (SD)	Outfit (SD)	Separation	Reliability
Colleague support					
Person	0,36 (1,09)	0,99 (0,88)	1,03 (1,04)	1,18	0,58
Item	0,00 (0,59)	1,01 (0,24)	1,03 (0,29)	7,30	0,98
Supervisory care					
Person	0,66 (0,98)	1,01 (0,95)	1,00 (0,92)	2,06	0,81
Item	0,00 (0,16)	1,01 (0,08)	1,00 (0,09)	3,17	0,91

When the two misfitting items (COLSUPP5 and SUPCARE1) are removed, the item separation stays acceptable. The person separation index, was improved for supervisor care and is somewhat lower for colleague support (>2,00).

Table 5 shows the item fit statistics for colleague support and supervisor care in terms of the measurement intensity for each item, the item mean square infit and item mean square outfit when misfitting items are removed.

Table 5

Item Fit after Problematic Items are Removed

Dimension	Item	Measure (θ)	Infit Mean Square	Outfit Mean Square
Colleague support	COLSUPP1	0,53	1,33	1,44
	COLSUPP2	0,23	0,75	0,76
	COLSUPP3	0,23	0,81	0,76
	COLSUPP4	-0,99	1,15	1,14
Supervisory care	SUPCARE1	0,11	1,06	1,15
	SUPCARE2	-0,21	0,98	0,95
	SUPCARE3	-0,14	0,98	0,94
	SUPCARE4	0,23	1,07	1,06
	SUPCARE5	-0,12	1,13	1,02
	SUPCARE6	0,12	0,87	0,90

The above table illustrates that when COLLSUPP5 is removed, the infit and outfit statistics of the remaining items improve except for COLSUPP1 that underfits. However, when SUPCARE7 is removed the infit and outfit statistics of all the remaining items improve.

Table 6 indicates the functionality of the rating scale categories of all seven dimensions.

Table 6

Rating Scale Categories for all Seven Dimensions

Dimension	Rating Category	Category Frequency	Average measure	Infit	Outfit
Work load	0	118	-0,77	1,15	1,16
	1	30	-0,58	0,99	1,03
	2	78	-0,30	0,87	0,81
	3	446	0,01	0,92	0,87
	4	66	0,36	0,97	0,80
	5	125	0,76	0,84	0,90
	6	163	0,99	1,06	1,07
Bullying	0	620	-1,10	1,06	1,04
	1	214	-0,89	0,80	0,99
	2	94	-0,48	0,85	0,63
	3	271	-0,33	0,96	0,75
	4	34	-0,14	0,80	0,72
	5	64	0,07	0,85	0,84
	6	58	0,09	1,36	1,40
Colleague support	0	25	-0,65	1,63	1,69
	1	18	-0,79	0,72	0,70
	2	49	-0,01	0,99	1,06
	3	226	0,53	1,06	1,13
	4	166	0,81	0,78	0,67
	5	444	1,56	0,79	0,82
	6	516	2,14	1,15	1,07
Supervisory care	0	196	-0,69	1,19	1,35
	1	85	-0,40	1,31	1,62
	2	177	-0,19	0,78	0,75
	3	686	0,16	0,89	0,92
	4	275	0,48	0,73	0,65
	5	633	0,98	0,72	0,76
	6	705	1,27	1,23	1,17
Supervisory communication	0	121	-0,65	1,19	1,25
	1	36	-0,43	0,92	1,18
	2	127	-0,22	0,78	0,77
	3	371	0,22	1,00	1,06
	4	164	0,38	0,85	0,66
	5	412	1,92	0,67	0,75
	6	414	1,12	1,20	1,12
Supervisory integrity	0	44	-0,99	1,40	1,49
	1	30	-0,89	0,93	0,93
	2	65	-0,67	0,54	0,50
	3	230	0,10	0,75	0,72
	4	131	0,78	0,80	0,77
	5	232	1,52	0,63	0,74
	6	172	1,75	1,53	1,33
Learning opportunities	0	33	-0,80	1,34	1,45
	1	31	-0,67	0,95	0,98
	2	48	-0,38	0,61	0,53
	3	155	0,24	0,90	0,82
	4	90	0,67	0,69	0,64
	5	283	1,40	0,46	0,70
	6	209	1,59	1,65	1,31

The above table shows that for most of the dimensions the seven point frequency-based scale functions satisfactory except for the colleague support dimension. The average measure of this dimension does not increase indicating that the rating scale might be problematic and the lower categories should be collapsed. Concern arises about the fact that some of the rating

scale categories for most of the dimensions are under-utilised. In all the dimensions except supervisory communication and supervisory care, only four of the seven categories are sufficiently used.

Table 7

Rating Scale Categories Collapsed for Colleague Support

Dimension	Rating Category	Category Frequency	Average measure	Infit	Outfit
Colleague support	1	216	-0,88	1,14	1,23
	2	146	-0,48	0,71	0,75
	3	374	0,53	0,86	0,93
	4	334	1,35	1,05	1,05

Table 7 indicates that when the seven point frequency-based scale for the colleague support dimension is collapsed to a four point frequency-based scale the categories function more satisfactory and the average measure and fit statistics improve. Categories zero, one, two and three were collapsed to form part of the first category. The original categories four, five and six became categories two, three and four in the collapsed scale.

DISCUSSION

Understanding the work characteristics of employees has become important for both researchers and practitioners and evidence exists that it can influence the employee in terms of both individual and organisational outcomes (Bakker et al., 2004; Gilboa, Shirom, Fried & Cooper, 2008; Korunka et al., 2009; Pisarski, Lawrence, Bohle & Brook, 2008; Snyder, Krauss, Chen, Finlinson & Huang, 2008). Furthermore, different studies in South Africa focus on identifying work characteristics of white-collar employees, but unfortunately no studies could be found measuring the work characteristics of blue-collar employees in South Africa. Therefore, building on the JD-R Model, a measurement instrument has been developed to evaluate the work characteristics of blue-collar mine workers.

The work characteristics that could possibly influence blue-collar mine workers were identified from existing literature. Three job demands were identified and consisted of workload (pace and amount of work) and bullying by superiors and/or colleagues

(experiencing bullying actions i.e. harassment, gossiping etc. over a period of time). Three job resources were identified and included colleague support (the perceived availability of and relationship with colleagues), supervisory support (the perceived availability of and relationship with colleagues) and learning opportunities (perceived personal and professional development, growth and skill development in the immediate work environment). The supervisory support dimension manifested in three sub-dimensions, including supervisory care (experiencing support, care and appreciation from the supervisor), supervisory communication (experience that the supervisor discusses critical matters and provide information) and supervisory integrity (experience the actions of the supervisor as honest and truthful).

In the next phase items were developed strictly following the scale development process suggested by DeVellis (2003). The following steps were followed: conceptualising the different constructs for the measurement, generating and evaluating items, further developing items, refining items and following the correct translation process to include the three languages mostly spoken in this specific mine (i.e. Sesotho, isiXhosa and Setswana). In order to identify and eliminate poorly functioning items the Rasch model was used. The Rasch rating scale has been used in different research settings and has become very popular in psychometric evaluation (Tennant & Conaghan, 2007). Furthermore, the Rasch measurement model was used to examine the items across a continuum of a specific latent trait (Hagquist, 2007; Rasch, 1960).

During the Rasch analysis the rating scale categories were evaluated for each dimension. Although most of the rating scales seemed to function sufficiently considering their average measures and fit statistics, some of the rating scales for most of the dimensions were under-utilised. Considering the workload dimension, most of the responses provided were in the middle category (‘sometimes’). This implies that the participants might have misunderstood the questions or were reluctant to answer with the relevant intensity. Another reason might be that the seven point frequency-based rating scale is too complex for the literacy level of the blue-collar mine workers and a four point scale (never, almost never, sometimes, always) might function more sufficiently. Furthermore, responses on the bullying dimension were mostly zero or never and the other categories were under-utilised. This might indicate that employees were rather reluctant to answer the questions truthfully. The problematic infit of the colleague support dimensions confirms the difficulties that might have been experienced

with the seven point frequency-based categories. After the categories for the colleague support dimension were collapsed to a four point scale the results improved.

In order to evaluate the reliability of the constructs both the reliability information of item separation and the reliability information of person separation were utilised. The item reliability for all the dimensions seemed sufficient except for learning opportunities. This implies that the learning opportunities items did not discriminate well and that these items will not be stable if conducted in another research setting. Furthermore, the person reliability for all the dimensions, except the supervisor care dimension was somewhat less sufficient. This indicates that these dimensions did not separate or discriminate well among respondents with different abilities. Furthermore, it might imply that different items targeted the same ability excessively. Possible reasons for the insufficient person reliability might be that the respondents misunderstood the items or that they were reluctant to answer the questions with the relevant intensity. Therefore, to ensure better person reliability the wording and intensity of the items might be explored and adapted.

Another important function of the Rasch analysis is to identify items that do not fit within the unidimensional variable (Fox & Jones, 1998). Based on the infit and outfit statistics two problematic items were identified and eliminated from the instrument – item one of supervisory care and item five of colleague support. Both these items showed problematic fit to the model and were not sufficient in predicting the specific dimensions. Item one of the supervisor care dimension seemed to overfit the model implying that it provides no new information regarding the dimension. Item five of colleague support seemed to underfit the model and does not provide consistent information with the other colleague support items. Further investigation regarding the phrasing of the other colleague support items indicated that all the other items referred to the caring and support from colleagues whereas COLLSUP5 was more related to engaging in teamwork. Another reason might be that the low literacy employees did not understand the exact meaning of this item. After these items were removed from the scale the infit and outfit as well as the person separation and item reliability indexes of the remaining items have improved.

To conclude, this study attempted to develop a job demands-resources scale to investigate the work characteristics that might influence employee and organisational outcomes. Items were developed following the scale development procedure (DeVellis, 2003) taking into

consideration the literacy levels of blue-collar mine workers. Rasch analysis was conducted to evaluate the function of the scale and to identify problematic items. From this study it is evident that measuring the work characteristics of blue-collar employees is somewhat more difficult than measuring the work characteristics of white-collar employees. Nevertheless, this study provides researchers with a preliminary insight into the perceptions of blue-collar mine workers regarding their work environment.

Although this study is a valuable contribution in terms of measuring the work characteristics of blue-collar mine workers, some limitations do exist. The main focus of the study was to develop an instrument to investigate the work characteristics of blue-collar mine workers, and therefore extensive psychometric properties (factorial validity, reliability, etc.) were not examined. Also, although the instrument had been translated into Sesotho, isiXhosa and Setswana, the language in which the participants had completed the questionnaire was unfortunately not captured. Therefore the cultural sensitivity of the newly developed instrument could not be investigated. It would be important to investigate the bias and factorial invariance of these different language groups.

Another limitation was that the items did not differentiate well among the participants and that some of the rating scale categories seemed to be problematic. The reason for this might be that the item wording was too complex and too long and that the participants did not understand the seven point frequency-base scale. It is possible when including more but shorter items and reducing the rating scale categories that the results will improve.

The sample was not representative, although it was homogeneous, seeing that only blue-collar mine workers from a gold mine participated in the study. The organisational culture of this mine might have influenced the employees' responses and cannot be generalised to all blue-collar mine workers in South Africa. Therefore, future research on the demands-resources scale for blue-collar mine workers should make use of representative samples of all blue-collar mine workers in South Africa. Furthermore, the need still exists to replicate this study in blue-collar workers from different industries.

Despite the limitations, recommendations for future studies regarding the use of the newly developed job demands-resources scale for blue-collar mine workers can be made. The focus of this study was to develop items and eliminate items that functioned undesirably. Therefore extensive psychometric property analyses of this newly developed instrument were not

conducted. It is, however, recommended that future studies should examine the psychometric properties of this scale in terms of internal validity, reliability and external validity. A primary focus of future studies should be to examine the factorial invariance across different language groups to ensure that the same construct is measured across the different groups. Furthermore, external validity analysis can add value in terms of the relationship between these work characteristics and theoretically relevant variables.

Based on the information regarding the rating scale categories and item fit, additional items for each dimension should be explored. Considering the low literacy levels of these employees, careful attention should be given to the grammatical structure of these items. Although five to seven point scales are regarded as the optimum number of response categories, the circumstances of the respondents need to be taken into consideration (Preston & Colman, 2000). Furthermore, DeVellis (2003) indicated that it is better to have a shorter scale where all the categories are utilised than a long scale where some categories are under-utilised. It might be necessary to consider shorter questions to ensure that participants do not misunderstand the questions. Furthermore, future researchers should consider replacing the seven point frequency scale with a shorter scale where no middle option is available. When respondents have difficulty to discriminate meaningfully between too many options, it is recommended that the number of categories be reduced (DeVellis, 2003).

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CHAPTER 5

RESEARCH ARTICLE 4

A PRELIMINARY EVALUATION OF THE PSYCHOMETRIC PROPERTIES OF A NEWLY DEVELOPED JOB DEMANDS-RESOURCES SCALE FOR BLUE-COLLAR MINE WORKERS

ABSTRACT

Orientation: Based on the Job demands-Resources (JD-R) model a new instrument, the Job Demands-Resources Scale for Mine workers (JDRSM) has been developed to measure the work characteristics of blue-collar mine workers. However, no information regarding the psychometric properties of this instrument was provided.

Research purpose: The objectives of this study were to investigate the factorial validity, reliability and external validity (relationships with relevant external variables) of the JDRSM.

Motivation for the study: Evidence exists that work characteristics influence the individual and organisational outcomes of white-collar workers. In order to evaluate the work characteristics of blue-collar mine workers, evidence of a psychometrically sound instrument is of great importance.

Research design, approach and method: A cross-sectional survey design was used for the populations of blue-collar workers in the gold mine industry in South Africa (N = 361).

Main findings: The results provide evidence of factorial validity of the JDRSM. Furthermore, the reliability of the scale was confirmed and evidence was found for the relationship between job demands and job resources and external variables (physical and psychological ill-health; behavioural and affective commitment).

Practical/Managerial implications: This newly developed instrument shows promise to be used by researchers and managers to investigate the work characteristics prevalent among blue-collar mine workers. If work characteristics can be measured validly and reliably, it will provide managers with usable insight into the workplace experiences of blue-collar mine workers and evidently focused interventions can be put into place.

Contribution/Value-add: This study provides evidence on the psychometric properties of a new instrument that measures the work characteristics of blue-collar mine workers.

Key words: factorial validity, reliability, blue-collar workers, work characteristics, job demands, job resources, Job Demands-Resources model.

INTRODUCTION

Key focus of the study

The importance of measuring work characteristics has been emphasised in various studies around the world. Research indicates that work characteristics in terms of job demands and job resources are related to work-related psychological well-being, safety behaviour, performance, job satisfaction, commitment, turnover intention and ill-health (Bakker, Demerouti & Verbeke, 2004; Gilboa, Shirom, Fried & Cooper, 2008; Jackson, Rothmann & Van de Vijver, 2006; Korunka, Kubicek, Schaufeli & Hoonakker, 2009; Lambert, 2004; Loretto et al., 2005; Oldfield & Mostert, 2007; Pisarski, Lawrence, Bohle & Brook, 2008; Schaufeli & Bakker, 2004; Snyder, Krauss, Chen, Finlinson & Huang, 2008). Several studies in South Africa were found that investigate work characteristics of white-collar workers in different industries (e.g. Jackson & Rothmann, 2005; Fourie, Rothmann & Van de Vijver, 2008; Koekemoer & Mostert, 2006; Marais, Mostert, Geurts & Taris, 2009; Mostert & Rathbone, 2001; Mostert & Rothmann, 2006; Rothmann & Essenko, 2007; Rothmann & Jorgensen, 2007; Rothmann & Joubert, 2007). However, no studies could be found that included the experience of work characteristics of blue-collar mine workers in South Africa. This is mainly due to the difficulty *measuring* work-related experiences of employees with lower (or no) literacy (see Brand-Labuschagne, Mostert, Rothmann & Rothmann, in press). In an attempt to address this research limitation, Brand-Labuschagne and her colleagues developed an instrument to measure the demands and resources of blue-collar mine workers. However, the psychometric properties of this measurement were not investigated. The current study attempts to demonstrate the factorial validity, reliability and external validity (i.e. relationships with relevant outcome variables) of the job demands-resources scale for blue-collar mine workers.

Background to the study

Over the last thirty years researchers have recognised the importance of measuring work characteristics and the influence thereof on employees (Cheng, Kawachi, Coakley, Schwartz & Colditz, 2000; Demerouti, Bakker, Nachreiner & Schaufeli, 2001; De Jonge & Schaufeli, 1998; Hackman & Oldham, 1980; Jackson & Rothmann, 2005; Karasek, 1979; Schaufeli & Bakker, 2004; Sims, Szilagyi & Keller, 1976). In an attempt to understand the impact of work characteristics on work-related well-being, the Job Demands-Resources (JD-R) model was

developed (Demerouti et al., 2001; Schaufeli & Bakker, 2004). In essence, this model states that work characteristics can be classified into two categories – job demands and job resources, which can have an effect on employee well-being (burnout and work engagement) and health or organisational outcomes (ill-health and organisational commitment). Although the theory behind the JD-R model was adopted in various South African studies, only one specific instrument was developed to measure the job demands and job resources of educators (Jackson & Rothmann, 2005) and later validated for employees in different industries (Rothmann, Mostert & Strydom, 2006). However, this measurement mainly focused on white-collar employees.

The blue-collar workforce in South Africa comprises one-third of the total workforce (Stats SA, 2004), where most of the workers are considered to be semi-literate or illiterate (Lee & Mohamed, 2006). The working environment of the blue-collar mine worker is regarded as extremely hazardous because they are constantly faced with unfavourable working conditions (e.g., heat, dust, high noise levels, Paul & Maiti, 2005). Consequently, the physical conditions in the work environment contributing to employee outcomes are recognised. Insight and research on the experience and effect of psychosocial work characteristics of blue-collar workers is limited.

In an attempt to address this limitation, Brand-Labuschagne et al. (in press) developed an instrument to measure specific job demands and job resources experienced by blue-collar mine workers. With the JD-R model as theoretical framework, new items were developed with the focus on blue-collar mine workers. Rasch's rating scale analysis was utilised to evaluate the functioning of the items and to identify poorly functioning items. During these analyses, items were carefully evaluated and 30 items were retained. Although this study showed promising results, no information exists on the psychometric properties of this instrument.

Research objectives

The objective of this study was to determine the psychometric properties of the newly developed job demands-resources scale for blue-collar mine workers. More specifically the factorial validity, reliability and external validity of the newly developed instrument were investigated.

Trends from the research literature

The Job Demands-Resources model

At the core of the JD-R model lie the assumption that each organisation has its own set of work characteristics that influence employee and organisational outcomes (Demerouti et al., 2001, Schaufeli & Bakker, 2004). This implies that the work characteristics of different organisations can be identified irrespective of the specific job demands and job resources. Therefore, both the negative and positive indicators of work-related well-being can be incorporated into this model (Bakker & Demerouti, 2007). As mentioned above, work characteristics can be divided in job demands and job resources. Job demands refer to physical, psychological and social aspects in the work environment that require some physical and psychological effort from the employee. Consequently these efforts result in physiological and psychological costs (Demerouti et al., 2001; Schaufeli & Bakker, 2004). Job resources refer to the individual and organisational aspects of the work that enables the employee to buffer the effect of high job demands. Job resources also play a motivational role (Demerouti et al., 2001; Schaufeli & Bakker, 2004).

Demerouti et al. (2001) and Bakker and Schaufeli (2004) proposed that work characteristics can initiate two psychological processes. The first process is a health impairment process in which high job demands influence the employee's health through burnout. The motivational process implies that high job resources influence organisational commitment through work engagement. It was also proposed that job resources can buffer the negative effect of job demands on the employee (Bakker, Demerouti & Euwema, 2005).

The psychometric properties of job demands-resources measures

Work characteristics influencing employee and organisational outcomes differ between organisations. Therefore, no specific instrument for measuring work characteristics exists. Researchers rather identify the job demands and resources applicable to the specific organisation and develop self-constructed questionnaires or utilise different existing well-established scales (Bakker & Demerouti, 2007). Bakker et al. (2004) have developed a questionnaire for employees in the insurance industry and included the following dimensions: workload, emotional load, work-home conflict, possibilities for professional development and social support. Some of the well-defined questionnaires oftentimes used in job demands-resources studies include the Experience and Evaluation of Work Questionnaire (QEEW)

(Van Veldhoven, De Jonge, Broersen, Kompier & Meijman, 2002), the Leiden quality of work questionnaire (Van der Doef & Maes, 1999), the Questionnaire Experience and Judgement of Work (VBBA) (Van Veldhoven & Meijman, 1994) and the Job Content Questionnaire (JQC) (Karasek, 1985).

In an attempt to understand job demands and resources in the South African context, Jackson and Rothmann (2005) have developed the Job Demands-Resources Scale (JDRS) for educators. The JDRS was later validated for employees from different industries in South Africa, including the insurance industry, engineering industry, correctional services, staff members at a university of technology and academics in higher educational institutions (Rothmann et al., 2006). This validation study confirmed the originally proposed two-factor structure of work characteristics namely job demands and job resources, providing support for the results of previous studies (i.e. the studies of Demerouti et al., 2001; Bakker & Schaufeli, 2004). Job demands consisted of overload (pace and amount of work as well as affective and cognitive loads) and insecurity (feeling insecure in the future of your specific job). Job resources consisted of growth opportunities (the level of growth and development to experience at work), advancement (feeling that you can progress in your work in terms of remuneration, promotion opportunities) and organisation support (the level of feedback, social support, supervisory support etc. within the organisation).

The internal consistencies of the JDRS were sufficient for all five the dimensions: overload ($\alpha = 0,76$), job insecurity ($\alpha = 0,89$), growth opportunities ($\alpha = 0,86$), advancement ($\alpha = 0,83$) and organisational support ($\alpha = 0,92$). Furthermore, the study found evidence that the general framework of the JD-R model was stable across different organisations. This study also confirmed that job demands and job resources differ in each organisation. For example, engineers experience higher levels of work overload than employees in the insurance industry (Rothmann et al., 2006).

The Job Demands-Resources scale for blue-collar mine workers

Based on a thorough literature review, Brand-Labuschagne et al. (in press) have developed a Job Demands-Resources scale for blue-collar mine workers. The scale was developed by strictly adhering to the scale development procedure proposed by DeVellis (2003). The process included generating an initial item pool and developing, evaluating and refining the items. Furthermore, following the multi-translation process (Shanahan, Anderson & Mkize,

2001), the scale was translated to isiZulu, isiXhosa and Sesotho. Utilising Rasch analysis, items were identified to be retained or eliminated from the scale. The scale consisted of 30 items. All the items were rated on a seven-point frequency scale, ranging from zero (never) to six (always).

The newly developed scale included three demands (workload and bullying by supervisors and/or colleagues) and five resources (opportunities to learn, supervisory support (consisting of supervisory care, supervisory communication and supervisory integrity) and colleague support).

- *Workload* refers to the quantitative load in terms of the amount of work and time pressure pertaining to the workload that has to be dealt with frequently (three items).
- *Bullying by superiors and/or colleagues* refers to repeated unwanted actions and practises (i.e. gossiping, harassment, isolation, etc.) directed at one or more workers and may be done deliberately or unconsciously. These actions can cause humiliation, offence, and distress, and may interfere with job performance and/or cause an unpleasant working environment (six items).
- *Opportunities to learn* are defined as personal and professional development, opportunities for growth and new skills attainment within their immediate working environment (three items).
- *Supervisory support* refers to the perceived availability of and relationship with the supervisor and manifests in supervisory care, supervisory communication and supervisory integrity. Supervisory care refers to perceiving the supervisor as caring, supportive and appreciative (seven items). Supervisory communication is the level of communication and information perceived from the supervisor (five items). Supervisory integrity refers to the extent to which the supervisor's actions are perceived as honest, trustworthy and fair (three items).
- *Colleague support* refers to the perceived availability of and relationship with co-workers (five items).

During the Rasch analysis the functioning of all the items was investigated. It was proposed that two items (one colleague support item and one supervisory care item) be eliminated from the scale to improve the overall functioning of the scale. The scale reliability obtained from the Rasch analyses was not optimal but Rasch reliability is regarded as stricter than that of the

original Cronbach alpha. From the study it also became evident that a four-point frequency scale would be more effective than the seven-point scale.

The relationship between work characteristics and outcome variables

Various studies concluded that high job demands and low resources impact on work-related well-being and result in poor employee and organisational outcomes (e.g. physical and psychological ill-health, lower organisation commitment). In a study among employees from two different countries (Spain and the Netherlands), the basic structure of the JD-R model was confirmed as similar across these two countries. Job demands and job resources were identified as the antecedents of organisational commitment (Llorens, Bakker, Schaufeli & Salanova, 2006). It was also confirmed that job resources influence organisational commitment directly and through the positive work-related well-being state, work engagement. In addition, it was evident that job resources also reduce the negative effect of job demands on employee and organisational outcomes (Llorens et al., 2006).

In a study conducted among employees from four organisations in the Netherlands, high job demands (work overload and emotional load) contribute to health problems, while job resources (feedback, social support, supervisory coaching) influence turnover intention (Schaufeli & Bakker, 2004). Bakker, Demerouti and Schaufeli (2003) report that employees in a call centre experience high job demands (workload, emotional demands, changes in tasks and computer problems) and in turn have more health complaints. However, job resources (social support, supervisory coaching, performance feedback and time control) had a positive influence on organisational commitment. As a result these employees show low turnover intention. In a study among Finnish teachers, Hakanen, Bakker and Schaufeli (2006) found that job demands (i.e. workload and physical work environment) had a negative influence on employee health through burnout, while job resources (i.e. job control, supervisory support, social climate) had a positive influence on organisation commitment, and that work engagement acted as a mediator.

Among a group of Australian volunteer ambulance officers, the well-being of these employees was influenced by high job demands (time pressure and work-home interference). Furthermore, this study also indicated that high job demands impacted on employee turnover intention (Lewig, Xanthopoulou, Bakker, Dollard & Metzer, 2007). In a recent comparative study among white- and blue-collar workers in the services and manufacturing industry in

Austria, it was confirmed that job demands (i.e. qualitative and quantitative workload) have an impact on ill-heath through burnout. However, this relationship was not as strong as the influence of job resources (i.e. supervisory support, decision latitude and co-worker support) on work engagement and in turn on organisational commitment (Korunka et al., 2009).

In South Africa these two processes were also confirmed among white-collar workers. Among a group of teachers, the link between high job demands and ill-health and high resources and commitment was confirmed (Jackson et al., 2006). Montgomery, Mostert and Jackson (2005) have found evidence that high job demands of primary school educators (i.e. pace and amount of work) influence both physical and psychological ill-health (i.e. headaches, muscular tension, constant irritability, mood swings) as a result of high burnout levels, even more so when the necessary job resources to cope with high job demands are not optimised. In the mining industry, Oldfield and Mostert (2007) found that high job demands (pressure and poor work conditions) contribute to high exhaustion levels, somatic complaints, anxiety and insomnia. They also indicated that sufficient job resources (autonomy, task characteristics, social support, instrumental support and pay and benefit) might have a positive effect on employee health in terms of higher energy levels which might prevent ill-health symptoms.

Potential value-add of the study

This study investigated the psychometric properties of the newly developed job demands-resources instrument, more specifically to prove the factorial validity, reliability and external validity of the instrument for blue-collar workers in a gold mine. This study therefore aims to provide preliminary evidence for a valid and reliable instrument that can be used to identify the work characteristics of blue-collar mine workers. Since no instrument could be found that measures the work characteristics of blue-collar workers in South Africa, this instrument will enable researchers to measure the work characteristics influencing blue-collar mine workers and evidently their employee and organisational outcomes. Practically, this instrument could provide organisations with a clear picture of the workplace experiences of blue-collar employees. The insight gained could enable managers to plan focused interventions to enhance the well-being of employees as well as organisational outcomes.

What will follow

The following hypotheses will be evaluated to reach the objectives of the study.

Objective 1: Factorial validity

Hypothesis 1a: The job demands component is a three-dimensional construct, consisting of workload, bullying by superiors and also bullying by colleagues.

Hypothesis 1b: The job resources component is a five-dimensional construct, consisting of learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support.

Objective 2: Reliability

Hypothesis 2: All the dimensions of the newly developed instrument (workload, bullying by superiors, bullying by colleagues, learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleagues' support) are reliable (Cronbach alpha coefficients $\geq 0{,}70$).

Objective 3: External validity

Hypothesis 3a: Job demands are significantly and positively related to physical ill-health and psychological ill-health.

Hypothesis 3b: Job resources are significantly and positively related to behavioural commitment and affective commitment.

RESEARCH DESIGN

Research approach

For the purpose of this study a cross-sectional survey design was used (Struwig & Stead, 2001). This allows researchers to collect data on more than one incidence on a single point in time to analyse the data and detect different patterns (Bryman & Bell, 2003).

Research method

Research participants

The participants consisted of blue-collar mine workers in a gold mine environment (N = 361, response rate = 54%). The characteristics of the populations are provided in Table 1.

Table 1

Demographic Characteristics of the Participants (N = 361)

Item	Category	Frequency	Percentage
Gender	Male	259	71,75
	Female	102	28,25
Marital status	Single	254	70,36
	Married	105	29,09
	Divorced	2	0,55
Race	Black	355	98,34
	White	6	1,66
Age	20-29	204	56,51
	30-39	96	26,59
	40-49	47	13,02
	50-59	9	2,49
	Younger than 20	5	1,39
Educational level	No qualification	2	0,55
	Grade 1-3	5	1,38
	Grade 4-7	19	5,26
	Grade 8	15	4,16
	Grade 9	20	5,54
	Grade 10	36	9,97
	Grade 11	95	26,32
	Grade 12	149	41,27
	Others	20	5,54
Job type	Assistant (Underground)	184	50,97
	Mining team	70	19,39
	Stope driller	24	6,65
	Scraper winch operator	19	5,26
	Loco operator	14	3,88
	Crew supervisor	8	2,22
	Stope team leader	8	2,22
	Store cum first-aid attendant	7	1,94
	Assistant (Surface)	5	1,39
	Development driller	5	1,39
	Miners' assistant	5	1,39
	Other	12	3,33
Years employed at company	More than 20	23	6,37
	11-20	20	5,54
	6-10	11	3,05
	0-5	307	85,04

The majority of the participants were black employees (98,34%) and between the age groups 20-29 (56,51%). In total, 71,75% of the participants were male, while 28,25% were female employees. Most of the employees indicated educational levels below grade 12 (53,18%), although 41,27% had at least a grade 12 qualification. The following job types were represented in the sample: The employees functioned in the following job types: underground assistant (50,97%), mining team (19,39%), stope driller (6,65%), scraper winch operator (5,26%), locomotive operator (3,88%), crew supervisor (2,22%), stope team leader (2,22%), store cum first-aid attendant (1,94%), surface assistant (1,39%), development driller (1,39%) and miners' assistant (1,39%). The majority of the participants (85,04%) have been employed by this gold mine for five years or less.

Measuring instrument

Job demands and job resources. The newly developed job demands-resources instrument for mine workers has been utilised in this study. The Job Demands-Resources Scale for Mine workers (JDRSM) measures two dimensions. Job demands were measured with the following subscales: workload (three items, e.g. "I have to work very hard"), bullying by supervisors (three items, e.g. "I experience insults from my shiftboss") and bullying by colleagues (three items, e.g. "My colleagues humiliate me in front of others"). Job resources were measured with five sub-scales, including learning opportunities (three items, e.g. "I have the opportunity to develop myself at work"), supervisory care (six items, e.g. "I feel that my shiftboss respects me"), supervisory communication (five items, e.g. "My shiftboss explains to me what to do"), supervisory integrity (three items, e.g. "I trust my shiftboss") and colleague support (four items, e.g. "My colleagues help me to get the work done"). All items were measured on a seven-point frequency rating scale ranging from zero ("never") to six ("always"). Higher scores on workload and bullying by colleagues/supervisors are indicators of high job demands, while higher scores on learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support, are indicators of high job resources.

Ill-health. Physical and psychological ill-health (16 items) was measured with an adaptive version of the Health Questionnaire developed by Jackson and Rothmann (2005). The six physical ill-health items measured physical symptoms of stress (i.e. "How often do you experience headaches"), while the ten psychological ill-health items measured psychological ill-health symptoms of mental health (e.g. "How often does it happen that you experience panic or anxiety attacks"; "How often do you experience constant irritability"). All items were scored on a four-point scale ranging from one ("never") to four ("frequently"). In South Africa acceptable internal consistencies were found for both scales: 0,78 and 0,88 respectively (Jackson & Rothmann, 2005). Following the multi-translation process these items were also translated into the eleven official languages of South Africa.

Commitment. Behavioural and affective commitment was measured with an adapted nine-item version of the Organisational Commitment Scale (Jackson et al., 2006). Behavioural commitment refers to the extent to which the employee perceives the organisation to be committed to him/her (five items, e.g. "I feel valued and trusted by the organisation"), while affective commitment refers to the extent to which the employee feels committed towards the

organisation (four items, e.g. “I feel proud of this organisation”). All the items were scored on a six-point scale ranging from one (“strongly disagree”) to six (“strongly agree”). Acceptable internal consistencies ($\alpha = 0,88$) for organisational commitment were found in South Africa (Jackson et al., 2006; Visser & Rothmann, 2008).

Research procedure

The management of the mine was briefed on the purpose of the research and their permission was obtained to conduct the research and use data anonymously. The labour unions were also informed of the research and assured about the confidentiality of the responses. With the specific target population in mind, all the items were translated (following a multistage translation process) into Sesotho, isiXhosa and Setswana by three accredited language experts (Shanahan, Anderson & Mkize, 2001). During this process the English questionnaire was translated into the other three languages and then back translated into English by three different language experts. To ensure the correct translation the three back-translated questionnaires were compared to the original questionnaire. After problematic translations were identified, they were discussed, adapted to reach the best fit and finalised for the four different languages.

Workplace assessors working for the mine were recruited to assist with the gathering of the data. These fieldworkers were trained in a one-day training session on the basic concepts of the questionnaire, how to administer the questionnaire and use the provided assessment tool (including flashcards as helping aid to answer questions). The fieldworkers were also informed to assure participants about the confidentiality of their answers and to encourage them to answer the questions truthfully. The fieldworkers were trained how to ask questions and wait for participants to respond. Fieldworkers would then fill in the responses obtained from the participants on the provided answer sheet. During this process careful attention was given to ensure that the fieldworkers understood their role in the facilitation and would not lead the participants in answering the questions. Fieldworkers were also informed of the importance that all questions should be answered and how to use the provided flashcards. The flashcards included all the rating scale categories in the four different languages and were provided in the form of a volume indicator, going from very small to very large. Example questions were also provided to the fieldworkers and could be used to explain to participants what was expected from them. When asking the questions, fieldworkers utilised the flashcards and participants indicated on the flashcard which option they chose.

Prior to administering the questionnaire, the workforce was informed of the purpose of the research and provided their informed consent. The fieldworkers went to the workplaces of the participants and facilitated the questionnaire completion with the participants. Furthermore, the fieldworkers only had to write down the employee number of the participants because a data file with all the relevant biographical information was provided by the mine. The participants had between 10 and 20 minutes to complete the questionnaire.

Statistical analysis

In order to examine the factorial validity of the new instrument, confirmatory factory analysis (CFA) was conducted using the Amos programme (Arbuckle, 2007). Exploratory factor analysis (EFA) is generally regarded as the method of choice when investigating the validity of newly developed instrument confirmatory factor analysis. However, EFA is usually preferred when little theoretical or empirical evidence is available to make assumptions in terms of the number of common factors or the specific variables these factors are likely to influence (Fabrigar, Wegener, MacCallum & Strahan, 1999). CFA was preferred to EFA because a strong theoretical basis exists (i.e. JD-R model) and because specific hypotheses could be tested implying that certain models or small subsets of models could be identified (Fabrigar et al., 1999). Furthermore, CFAs have the advantage of statistically testing a hypothesised structure based on the postulated relationship between the observed measure and the underlying factors. In addition, CFA enables researchers to comparatively evaluate alternative models which vary in complexity (Byrne, 2010).

To test the factorial validity of job demands, the hypothesised three-factor model was compared with two competing models to evaluate the relationship between the nine items. The hypothesised model (Model 1) suggested that job demands can be explained by three separate dimensions, including workload, bullying by superiors and bullying by colleagues. Model 2 anticipated that all nine items would load on one latent variable. Model 3 proposed a two-factor model consisting of workload as a one-factor and a combined dimension for bullying by superiors and bullying by colleagues as the second factor. To test the factorial validity of job resources, the hypothesised model (Model 1) suggested that five job resources (i.e. learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support) can be distinguished from one another. Model 2 proposed that all 21 items load on one latent variable. Model 3 suggested that job resources consists of

two dimensions, learning opportunities, supervisory support (supervisory care, supervisory communication and supervisory integrity were combined) and colleague support. Model 4 proposed a three-factor model consisting of learning opportunities as a factor, supervisory support as a factor and colleague support as a factor. Model 5 suggested a four-factor model in which learning opportunities and supervisory care form one factor and supervisory communication, supervisory integrity and colleagues form the other three factors. Model 6 proposed another four-factor model where learning opportunities and supervisory communication form one factor and supervisory care, supervisory integrity and colleague support the other three factors. Model 7 suggested another four-factor model in which learning opportunities and supervisory integrity form one factor and supervisory care, supervisory communication and colleague support the other factors. Model 8 also proposed an alternative four-factor model where learning opportunities and colleague support form one factor, and supervisory care, supervisory communication and supervisory integrity the other three factors. Model 9 suggested that supervisory care and supervisory communication form one factor and learning opportunities, supervisory integrity and colleague support the other three factors. Finally model 10 proposed that supervisory care and supervisory integrity form one factor and learning opportunities, supervisory communication and colleague support the other three factors.

To determine the differences in statistical fit between the hypothesised and competing models the χ^2 statistics were used. Statistical support for the hypothesised model is indicated when significant differences between models are evident. However, the χ^2statistic are regarded as somewhat problematic because of sensitivity to sample size and therefore, additional to the χ^2 statistics, the following goodness-of-fit indices are utilised to evaluate the model fit: the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), the Parsimony Goodness-of-Fit Index (PGFI), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Root Mean Square of Approximation (RMSEA) and the Closeness of Fit index (PCLOSE). The rule of thumb for the two absolute indices of fit, GFI and AGFI is that values close to 1,00 are indicative of a good fit. PGFI are characterised with lower threshold values than for other indices of fit. Mulaik et al. (1989) suggested that nonsignificant χ^2 values and goodness-of-fit indices in the 0,90s, accompanied by a PGFI in the 0,50s are not uncommon. TLI ranges from zero to 1,00 and values close to 0,95 for large samples are regarded as indicative of a good fit to the data. CFI is considered the index of choice and although values

greater than 0,90 indicate a relatively good fit, values close to 0,95 are regarded as a better fit (Byrne, 2010). RMSEA values smaller than 0,08 indicate an acceptable fit, while model rejection can be assumed with values greater than 0,10 (MacCallum, Browne & Sugawara, 1996). The cut-off point for PCLOSE should be bigger than 0,50 to indicate that the RMSEA fits well in the specific population (Jöreskog & Sörbom, 1996). In addition, the Hoelter index was investigated to determine the adequacy of the sample size. This index suggests that the value should exceed 200 for the model to be regarded as adequately representative of the sample data (Byrne, 2010).

The reliability of the JDRSM scale was evaluated with Cronbach alpha coefficients. In addition, descriptive statistics (means and standard deviations) were used to describe the data. Product-momentum correlation coefficients were used to determine the relationships between the subscales of the JDRSM and selected external variables (i.e. ill-health and commitment). The level of statistical significance was set at $p < 0,05$. Because statistical significance may show results that are practically of little relevance, effect sizes were used to determine the practical significance of the relationships (Cohen, 1988; Steyn, 2002). Effect sizes identify the results which are practically important (Steyn, 2002). The cut-off point for practical significance of the correlation coefficients was set at 0,30 (medium effect) and 0,50 (large effect) (Cohen, 1988).

RESULTS

Factorial validity of the job demands and job resources scales (Hypothesis 1)

The factorial validity of the job demands and job resources scales were tested by comparing the hypothesised models with alternative models. First the hypothesised three-factor model of job demands was tested against a one-factor and two-factor model. Thereafter, the hypothesised five-factor job resources model was tested and compared with several competing models. The results are reported in Table 2.

Table 2

Comparison of Factorial Models for Job Demands and Job Resources

	Model	χ^2	*df*		GFI	AGFI	PGFI	TLI	CFI	RMSEA	PCLOSE	HOELTER 0,05	HOELTER 0,01
Job demands													
M1	Hypothesised three-factor model	53,35	26	0,00	0,96	0,94	0,56	0,94	0,96	0,06	0,25	224	263
M2	One-factor model	178,12	27	0,00	0,88	0,80	0,53	0,69	0,77	0,14	0,00	70	81
M3	Two-factor model	103,42	27	0,00	0,93	0,88	0,56	0,84	0,88	0,10	0,00	120	140
Job resources													
M1	Hypothesised five-factor model	396,77	179	0,00	0,89	0,86	0,69	0,91	0,92	0,06	0,01	164	175
M2	One-factor model	1151,52	189	0,00	0,70	0,64	0,58	0,61	0,65	0,13	0,00	60	64
M3	Two-factor model	945,19	188	0,00	0,74	0,68	0,60	0,69	0,72	0,12	0,00	72	77
M4	Alternative three-factor model	593,03	186	0,00	0,83	0,79	0,67	0,83	0,85	0,08	0,00	114	122
M5	Alternative four-factor model	612,95	183	0,00	0,84	0,79	0,66	0,82	0,84	0,09	0,00	108	116
M6	Alternative four-factor model	623,10	183	0,00	0,83	0,79	0,66	0,81	0,84	0,09	0,00	107	114
M7	Alternative four-factor model	612,29	183	0,00	0,84	0,79	0,66	0,82	0,84	0,09	0.00	109	116
M8	Alternative four-factor model	649,40	183	0,00	0,83	0,78	0,65	0,80	0,83	0,09	0,00	102	109
M9	Alternative four-factor model	458,80	183	0,00	0,87	0,84	0,69	0,88	0,90	0,07	0,00	145	155
M10	Alternative four-factor model	528,44	183	0,00	0,85	0,81	0,67	0,85	0,87	0,08	0,00	126	134

As can be seen in Table 2, it is evident that M1 (the hypothesised three-factor model) fit the data significantly better compared with M2 ($\Delta\chi^2 = 124{,}77$; $\Delta df = 1$; $p < 0{,}05$) and M3 ($\Delta\chi^2 = 50{,}07$; $\Delta df = 1$; $p = <0{,}05$). Also, the factorial validity of the job resources scale was tested. It is evident that M1 (the hypothesised five-factor model) fit the data significantly better compared to M2 ($\Delta\chi^2 = 754{,}75$; $\Delta df = 10$; $p < 0{,}05$), M3 ($\Delta\chi^2 = 348{,}42$; $\Delta df = 9$; $p < 0{,}05$), M4 (($\Delta\chi^2 = 296{,}26$; $\Delta df = 7$; $p < 0{,}05$), M5 ($\Delta\chi^2 = 216{,}18$; $\Delta df = 4$; $p < 0{,}05$), M6 ($\Delta\chi^2 = 226{,}33$; $\Delta df = 3$; $p < 0{,}05$), M7 ($\Delta\chi^2 = 215{,}52$; $\Delta df = 4$; $p < 0{,}05$), M8 ($\Delta\chi^2 = 252{,}63$; $\Delta df = 4$; $p < 0{,}05$), M9 ($\Delta\chi^2 = 62{,}03$; $\Delta df = 4$; $p < 0{,}05$) and M10 ($\Delta\chi^2 = 131{,}67$; $\Delta df = 4$; $p < 0{,}05$). These results provide support for Hypotheses 1a and 1b.

Reliability and relationships with external variables (Hypotheses 2 and 3)

Next, the reliability and correlations with ill-health and commitment were determined. The results are reported in Table 3.

Table 3

Descriptive Statistics and Product Moment Correlations of the Job Demands and Job Resources dimensions, Physical Ill-Health, Psychological Ill-Health and Organisational Commitment

Item	***M***	***SD***	***α***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1. Workload	3,33	1,28	0,53	-	-	-	-	-	-	-	-	-	-	-
2. Bullying by superiors	1,00	1,35	0,75	0,09	-	-	-	-	-	-	-	-	-	-
3. Bullying by colleagues	0,80	1,18	0,74	-0,02	$0,56^{+**}$	-	-	-	-	-	-	-	-	-
4. Learning opportunities	4,62	1,36	0,77	$0,12^{+}$	$-0,18^{+}$	$-0,19^{+}$	-	-	-	-	-	-	-	-
5. Supervisory care	4,17	1,33	0,85	0,01	$-0,38^{+*}$	$-0,17^{+}$	$0,34^{+*}$	-	-	-	-	-	-	-
6. Supervisory communication	4,15	1,37	0,81	-0,10	$-0,27^{+}$	$-0,17^{+}$	$0,26^{+}$	$0,69^{+**}$	-	-	-	-	-	-
7. Supervisory integrity	4,26	1,43	0,79	$-0,15^{+}$	$-0,38^{+*}$	$-0,25^{+}$	$0,26^{+}$	$0,62^{+**}$	$0,55^{+**}$	-	-	-	-	-
8. Colleague support	4,88	1,06	0,80	0,01	$-0,22^{+}$	$-0,40^{+*}$	$0,25^{+}$	$0,23^{+}$	$0,24^{+}$	$0,45^{+*}$	-	-	-	-
9. Physical ill health	2,20	0,64	0,76	0,07	$0,33^{+*}$	$0,36^{+*}$	$-0,25^{+}$	$-0,23^{+}$	$-0,19^{+}$	$-0,19^{+}$	$-0,30^{+*}$	-	-	-
10. Psychological ill health	1,80	0,59	0,84	0,03	$0,47^{+**}$	$0,45^{+*}$	$-0,25^{+}$	$-0,27^{+}$	$-0,20^{+}$	$-0,29^{+}$	$-0,35^{+*}$	$0,65^{+**}$	-	-
11.Behavioural commitment	4,77	0,87	0,74	$0,13^{+}$	$-0,14^{+}$	$-0,17^{+}$	$0,27^{+}$	$0,22^{+}$	$0,12^{+}$	$0,23^{+}$	$0,24^{+}$	$-0,20^{+}$	$-0,16^{+}$	-
12. Affective commitment	4,42	0,95	0,63	0,09	$-0,19^{+}$	$-0,19^{+}$	$0,20^{+}$	$0,20^{+}$	0,11	$0,14^{+}$	0,05	$-0,19^{+}$	$-0,19^{+}$	$0,58^{+**}$

+ Statistically significant ($p < 0,05$); * Correlation is practically significant $r > 0,30$ (medium effect); ** Correlation is practically significant $r > 0,50$ (large effect)

Table 3 showed acceptable reliability for bullying by superiors, bullying by colleagues, learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support ($\alpha > 0,70$, Nunnally & Bernstein, 1994). However, the Cronbach alpha of workload ($\alpha = 0,53$) was below the cut-off point of 0,70, and was therefore not reliable. Therefore caution should be taken in interpreting further results on this dimension. These results provide partial support for Hypothesis 3.

Bullying by superiors and bullying by colleagues were statistically and practically significantly related to physical ill-health (0,33; 0,36), psychological ill-health (0,47; 0,45) and significantly and practically negatively associated with behavioural (-0,14; -0,17) and affective commitment (-0,19; -0,19).

All the job resources showed only statistically significant relationships with behavioural and affective commitment and no practically significant associations were evident. Learning opportunities, supervisory care and supervisory integrity were positively related to behavioural (0,27; 0,22; 0,23) and affective (0,20; 0,20; 0,14) commitment. However, supervisory communication and colleague support were only statistically significantly related to behavioural commitment (0,12; 0,24) and not to affective commitment. The results provide support for Hypothesis 3a and partial support for Hypothesis 3b.

DISCUSSION

The importance of understanding the work characteristics in terms of job demands and job resources and the impact thereof on employee and organisational outcomes has been raised in various national and international research (Bakker et al., 2004; Gilboa et al., 2008; Jackson et al., 2006; Korunka et al., 2009; Lambert, 2004; Loretto et al., 2005; Oldfield & Mostert, 2007; Pisarski et al., 2008; Schaufeli & Bakker, 2004; Snyder et al., 2008). Numerous studies have been conducted to investigate the job demands and resources of white-collar employees in various industries in South Africa (e.g. Jackson & Rothmann, 2005; Fourie et al., 2008; Koekemoer & Mostert, 2006; Marais et al., 2009; Mostert & Rathbone, 2001; Mostert & Rothmann, 2006; Rothmann & Essenko, 2007; Rothmann & Jorgensen, 2007; Rothmann & Joubert, 2007). Unfortunately no instrument exists to explore the work characteristics of blue-collar employees. In an attempt to address this limitation, Brand-Labuschagne et al. (in press)

has recently developed a job demands resources instrument to measure the work characteristics of blue-collar mine workers. However, the psychometric properties of this new instrument have not been established. Therefore, the general objective of this study was to provide preliminary evidence on the internal and external validity of this new instrument.

The first objective was to evaluate the factorial validity of the JDRSM. It was hypothesised that job demands is a three-factor construct (consisting of work load, bullying by superiors and bullying by colleagues, Hypothesis 1a) and that job resources is a five-factor construct (consisting of learning opportunities, supervisory care, supervisor communication, supervisor integrity and colleague support, Hypothesis 1b). These hypotheses were tested utilising CFA. Moreover, comparisons were done between the competing models and the hypothesised three-factor model for job demands and the hypothesised five-factor model for job resources. Hypotheses were based on the foundation of the JD-R model (Demerouti et al., 2001). With regard to job demands, the results indicated that the relationships between items were significantly better for the three-factor hypothesised model compared to the competing models (i.e. one-factor model and two-factor model). This provided support for Hypothesis 1a. Furthermore, results regarding the comparison of the five-factor job resources model and competing models also suggested that the hypothesised model explained relationships between all the items significantly better compared to the alternative models, providing support for Hypothesis 1b. These findings support previous research on the psychometric properties of job demands and resources in South Africa (Jackson & Rothmann, 2005; Rothmann et al., 2006).

The second objective was to determine if all the job demands and resources dimensions were reliable, thus showing acceptable Cronbach alpha coefficients higher than 0,70 (Hypothesis 2). Acceptable Cronbach alpha coefficients were evident for bullying by superiors ($\alpha = 0,75$), bullying by colleagues ($\alpha = 0,74$), learning opportunities ($\alpha = 0,77$), supervisory care ($\alpha = 0,85$), supervisory communication ($\alpha = 0,81$), supervisory integrity ($\alpha = 0,79$) and colleague support ($\alpha = 0,80$). However, the workload construct showed low reliability ($\alpha = 0,53$), which might indicate that the respondents did not understand the questions or that they were reluctant to truthfully answer these questions. Furthermore, the low number of items for workload might have influenced the reliability of this construct. It would therefore be important to further investigate the reasons for the low reliability of the workload dimension, adapt the items where necessary and maybe explore the possibility of including more items to

measure workload. The reliability of the job demands and resources are in line with previous research on job demands resources in South Africa (Jackson & Rothmann, 2005; Mostert, Rothmann, Mostert & Nell, 2008; Rothmann et al., 2006)

The final objective of this study was to provide evidence of external validity (Hypothesis 3a). It was hypothesised that job demands (workload, bullying by superiors and bullying by colleagues) are significantly related to physical and psychological ill-health. Workload, bullying by superiors and bullying by colleagues were significantly related to physical and psychological ill-health, which confirms the assumption that job demands may lead to high levels of physical and psychological ill-health. Although all three dimensions of job demands were related to physical and psychological ill-health they differed in strength, which indicated the unique relationship of various job demands dimensions with ill-health. The two bullying dimensions showed the strongest association with physical and psychological ill-health. This implies that when blue-collar mine workers are bullied by superiors and colleagues it contributes more to symptoms of physical and psychological ill-health. Furthermore, significantly negative relationships were evident between the two bullying dimensions and both behavioural and organisation commitment, indicating that employees who experience bullying feel less committed to the organisation and perceive the organisation as less committed towards them. Support was therefore found for Hypothesis 3a.

With regard to job resources dimensions it was hypothesised that significant relationships exist with behavioural and affective commitment (Hypothesises 3b). Support was found that learning opportunities, supervisory care and supervisory integrity are significantly related to behavioural and affective commitment. This implies that employees who experience opportunities to learn and grow in their work environment and experience their supervisor as caring, truthful, honest and trustworthy are more likely to be committed to the organisation and experience the organisation as committed to them. However, supervisory communication and colleague support were only significantly related to behavioural commitment and not to affective commitment. This implies that good supervisory communication and colleague support only contribute to perceptions of the organisation's commitment towards the employee. Thus, the commitment of employees toward the organisation is not strongly influenced by supervisory communication and colleague support. These findings confirm previous research concerning the relationship between job demands/resources, ill-health and organisational commitment (Bakker et al., 2003; Hakanen et al., 2006; Llorens et al., 2006;

Montgomery et al., 2005; Mostert et al., 2008; Montgomery et al., 2005; Oldfield & Mostert, 2007).

In conclusion, this study contributes to the field of Industrial Psychology by validating a new instrument that measures the job demands and job resources of blue-collar mine workers. Evidence of internal validity (i.e. factorial validity and reliability) and external validity (i.e. the relationship between job demands/resources and theoretically relevant external variables) of the job demands resources scale for blue-collar mine workers was reported.

Although the findings of this study area are a valuable contribution to the measurement of work characteristics of blue-collar employees, there were limitations to the study.
Firstly, the invariance of the newly developed job demands-resources scale for blue-collar mine workers could not be investigated. The reason for this was to keep the questionnaire as short as possible and that a dataset with all the demographical information of the participants would be provided by the participating mine. The specifications of the information required were provided to the mine, and although their English proficiency was indicated the different home languages were not available on the dataset. However, it is regarded as important to validate the assessments of multicultural groups, although still in its infancy stage more research is urgently required on this topic in South Africa (Van de Vijver & Rothmann, 2004).

Secondly, this study has only focused on a homogeneous, relatively small sample of gold mine workers. Therefore the results of this study cannot be generalised to the broader blue-collar workforce. As a result of this limitation, this instrument will have to be validated further among blue-collar mine workers. In addition, a job demands-resources scale for blue-collar workers in other industries also needs to be investigated and validated.

Despite the limitations, recommendations for future studies regarding the use of the newly developed job demands resources scale for blue-collar mine workers can be made. Unsatisfactory reliability coefficient of the workload dimension was reported, therefor the need exists to further investigate items for this dimension as proposed by Brand-Labuschagne et al. (in press) in order to improve the reliability.

Future research should focus on studying the invariance of the job demands resources scale for blue-collar mine workers to ensure that the instrument is culturally sensitive for all the different language and cultural groups in South Africa. Furthermore, it is recommended that future research focus on the development and validation of a job demands-resources instrument for blue-collar employees in different industries in South Africa. This implies that a representative sample from each industry should be included in these studies in order to ensure that the results can be generalised to the bigger workforce under study.

Longitudinal research regarding causal relationships between work characteristics, work-related psychological well-being, health and commitment of blue-collar employees should be pursued in South Africa. Previous research concerning the causality of work-related psychological well-being of white collar employees found that an increase in job demands and a decrease in job resource negatively influence the work-related psychological well-being of employees, influencing the absenteeism rates of employees (Schaufeli, Bakker & Van Rhenen, 2009).

Although the results of this instrument should be used with caution as a test under development, organisations can utilise the job demands-resources scale for blue-collar mine workers to gain insight into the experiences of blue-collar gold mine workers in terms of their work environment. If organisations can understand the impact of job demands and resources on their blue-collar employees, intervention plans can be developed accordingly, thereby assisting employees with difficulties that arise in the workplace. Consequently, better organisational and employee outcomes can be accomplished.

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CHAPTER 6

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

The purpose of this chapter is to draw conclusions from the four articles that form part of this study. Conclusions are drawn in accordance with the research objectives. Furthermore, limitations of this study are discussed followed by recommendations to organisations with regard to the specific research problem. Lastly, suggestions and recommendations are made for future research.

6.1 CONCLUSIONS

Over the last decade the importance of understanding the work-related psychological well-being of white-collar employees in South Africa has been emphasised and is evident from the number of research studies that has been conducted on this topic (Jackson & Rothmann, 2005; Naudé & Rothmann, 2004a; Naudé and Rothmann, 2004b, Rothmann & Joubert, 2007; Rothmann & Malan, 2003; Storm & Rothmann, 2003a; Storm & Rothmann, 2003b; Van der Colff & Rothmann, 2009). Close attention was paid by researchers to validate and ensure equivalence of instruments measuring work-related well-being. Although the importance of measuring work-related psychological well-being has been emphasised and measured among the white-collar workforce, blue-collar employees have been excluded from this focus. The South Africa Occupational Health and Safety Act (Act No. 85 of 1993), specifically the Construction Regulations of 2003, has only recently recognised the importance of understanding psychological well-being among blue-collar employees functioning in extremely hazardous industries and this is referred to as "psychological fitness". Unfortunately a definition and theoretical framework for understanding psychological fitness were not provided.

The first objective of this study was to propose a definition of psychological fitness. Following an extended literature review regarding work-related psychological well-being of employees (i.e. Demerouti, Bakker, Nachreiner & Schaufeli, 2001; Maslach & Jackson, 1986; Maslach, Jackson & Leiter, 1996; Maslach, Schaufeli & Leiter, 2001; Sandström, Rhodin, Lundberg, Olsson & Nyberg, 2005; Schaufeli & Bakker, 2004a; Van Horn, Taris,

Schaufeli & Schreurs, 2004), the definition of psychological fitness was proposed as a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely. Therefore, with the guidance of the existing literature on work-related psychological well-being (focusing mainly on burnout and work engagement literature) the negative work-related well-being state distress and the positive work-related well-being state eustress were identified as possible indicators of psychological fitness. The following dimensions of distress were included: exhaustion (total energy depletion), mental distance (withholding effort and the development of negative feelings towards work) and cognitive weariness (experiencing difficulty to focus and concentrate). The following dimensions of eustress were included: vitality (the availability of positive energy and the willingness to invest effort in one's work) and work devotion (strong involvement in work accompanied by inspiration, pride, dedication and enthusiasm).

The second objective of this study was to propose a theoretical framework to serve as guidance to understand psychological fitness. It was argued that psychological fitness can be regarded as an analogue to work-related psychological well-being and that the theoretical models relevant to work-related psychological well-being are also applicable to psychological fitness. The proposed theoretical frameworks for psychological fitness included the Job Demands-Resources (JD-R) model (Demerouti et al., 2001), Effort Recovery (E-R) theory (Meijman & Mulder, 1998) and the Conservation of Resources (COR) theory (Hobfoll, 1998). The JD-R model assumes that high job demands and limited job resources will negatively influence the psychological fitness and consequently the health and commitment of employees. However, if job demands and job resources are balanced they will contribute to psychological fitness so that employee health and organisational commitment will be optimised. The E-R model suggests that in order for employees to cope with high job demands, sufficient effort-recovery needs to be ensured. If sufficient effort-recovery is ensured, the psychological fitness of employees will increase. The COR theory implies that employees will strive to protect and retain their resources. Therefore, if resources are threatened it will negatively influence the psychological fitness of employees and if resources are protected it will enhance the psychological fitness of employees.

The third objective of the study was to develop a measuring instrument and test the newly developed items in order to determine the psychological fitness of blue-collar workers. Following the scale development procedure prescribed in the literature (i.e. conceptualisation

of the different constructs, item generation and evaluation, item development, item refinement and the correct translation process) (DeVellis, 2003), a new psychological fitness instrument, the South African Psychological Fitness Index (SAPFI) has been developed. Furthermore, the development of the items was firmly grounded in the work-related psychological well-being literature and with the proposed theoretical frameworks in mind. The Rasch model was utilised to evaluate all the items and to eliminate poorly functioning items. Both item and person separation indexes have been calculated to investigate the reliability of the scale.

Although the item separation for all the dimensions showed sufficient reliability the person separation indexes for all the dimensions were somewhat less reliable. This implied that the items discriminate well across the different variables but that the dimensions could have discriminated better amongst respondents with different abilities. Furthermore, it might be that different items targeted the same ability excessively. Reasons for the lower person separation might also include the misunderstanding of some items or respondents might have been reluctant to answer with the required intensity. Therefore, it was recommended that the wording and intensity of the items are explored and adapted to ensure better person separation. Furthermore, during the evaluation of the scale both the rating scale categories and the functioning of the items have been assessed. It was evident that the rating scales for the exhaustion, vitality and work devotion dimensions were under-utilised implying that the seven-point rating scale might be too complex for low literacy employees. Furthermore, it was proposed that a four-point rating scale (never, almost never, sometimes and infrequently) might be more efficient. During the evaluation of item functioning it became evident that two items, one from the cognitive weariness scale and one from the vitality scale, might be problematic and should be eliminated from the scale.

The fourth objective of the study was to determine the psychometric properties of the SAPFI for blue-collar employees. Following a cross-validation approach as proposed by MacCallum, Roznowski and Necowitz (1992), the total sample was randomly split into two sub-samples. The first subsample, namely the exploratory sample was used to compare different models in order to find the best fitting model and the second subsample, the confirmatory sample was used to confirm these results. Firstly, the internal validity was investigated by testing five specific hypotheses relating to factorial validity, factorial invariance and the reliability of the instrument. By utilising confirmatory factor analyses (CFA), the factorial validity of the two

subscales of the SAPFI was tested with the exploratory sample. Competing models were tested and compared with the hypothesised three-factor model of distress and the hypothesised two-factor model of eustress. The results regarding distress confirmed that the three-factor model fitted the data significantly better compared to the alternative competing models that were tested (i.e. one-factor model and two-factor models). However, standardised residual covariance indicated that one item (MD5) cross-loaded on a different factor from the one it was intended to (i.e. this item showed high standardised covariances with other items). Therefore it was decided to delete this item from the model. Results of the adjusted three-factor model indicated that this model explained the relationship between the 14 items better. Nevertheless, upon further investigation, the modification indices of the adjusted model demonstrated that two of the cognitive weariness items (CW2 and CW4) overlapped in content and it was decided to allow the errors of these items to correlate. The adjusted model showed improvement but the standardised residual covariances suggested that two mental distance items (M3 and MD4) correlated. After further investigation into the content of these items it became evident that they did not overlap in content and as a result MD4 was deleted from the scale. The final 13-item model was cross-validated with the confirmatory sample. Consequently, the hypothesis stating that distress can be regarded as a three-dimensional construct, consisting of exhaustion, mental distance and cognitive weariness was accepted.

The results regarding eustress confirmed that the two-factor model fitted the data significantly better compared to the alternative competing one-factor model. However, in further investigating the modification indices covariances between two vitality items (VI1 and VI2) and between two work devotion items (WD3 and WD4) were evident. Upon further investigation of the content of these problematic items, it was evident that VI1 and VI2 overlapped in content and were therefore constrained. WD3 and WD4 did not show signs of overlap in content but rather a systematic measurement error. It was therefore decided to delete WD4 from the scale. The final model showed improvement in the fit to the data compared to the original hypothesised model. Moreover, the final seven-item model was cross-validated with the confirmatory sample. Therefore, the hypothesis stating that eustress is a two-dimensional construct, consisting of vitality and work devotion, was accepted.

In addition to the factorial validity, factorial invariance of both the subscales was also evaluated. In both instances baseline models were tested for six language groups (Afrikaans, English, Sepedi, Sesotho, Setswana, isiZulu and isiXhosa) resulting in a configural model

that allowed the evaluation of all the groups simultaneously. In the configural model factor loadings, item error covariance and factor covariance were allowed to vary across the different groups. The configural model was compared to a constrained model where all the parameters were fixed. With regard to the distress subscale, the comparison between the unconstrained and constrained model revealed that the data fitted the unconstrained model better. Furthermore, it was evident that the items measuring the distress dimensions and the item correlations were invariant across the six language groups but the covariance between the construct was not invariant. This implied that the theoretical construct underlying the distress construct cannot be regarded as the same across the different language groups. This is consistent with previous research in South Africa regarding the invariance of factor covariances of the burnout construct among three different white-collar language groups (Marais, Mostert & Rothmann, 2009). Two of the possible reasons for this non-invariance might be that cultural differences influenced the results and that the multi-stage translation of the items had jeopardised the meaning of the items.

The hypothesis regarding the invariance of the eustress scale was rejected because when all the parameters were constrained equally the model did not fit the data. During post hoc analyses where two groups at a time were compared, it became evident that three-factor loadings (VI3, WD2 and WD3) did not accurately measure the intended content between the compared groups. These problematic factor loadings were mostly evident for the African language groups which might indicate that during the translation the meaning of these items might have been jeopardised. Although the multi-stage translation process is very popular in psychological research, some risks are associated with it. One of the main risks associated implies that this process does not guarantee valid results because evaluating the quality of translations is extremely difficult (Cheung & Thumboo, 2000). Furthermore, this study identified that covariances and item error variances differed between most of the two-group comparison which implied that the theoretical construct and the meaning of items differ across these groups. Amongst white-collar employees in South Africa it has been confirmed that eustress consists of vitality and work devotion, but this seems to be different for blue-collar employees (Coetzer & Rothmann, 2007; Jackson, Rothmann & Van de Vijver, 2006; Rothmann & Jorgensen, 2007; Rothmann & Pieterse, 2007). Further research should confirm this finding regarding structural invariance of eustress for blue-collar employees.

In addition to evaluating the invariance of the SAPFI subscales, reliability of the different constructs was also evaluated. Cronbach alpha coefficients higher than 0,70 were evident for exhaustion, mental distance, cognitive weariness and work devotion. Somewhat lower reliability was evident for vitality ($\alpha = 66$). Although this construct should be treated with caution, the SAPFI can still be regarded as a reliable instrument (see Kline, 1999).

In order to evaluate the external validity of the SAPFI, the relationships between distress and ill-health and between eustress and commitment were evaluated. The results confirmed that the distress construct (exhaustion, mental distance and cognitive weariness) was statistically and practically positively related to physical and psychological ill-health and that the eustress constructs (vitality and work devotion) were positively related to behavioural and affective commitment. This implies that employees who experience high levels of distress will have lower levels of physical and psychological ill-health, while employees who experience eustress will feel more committed towards the organisation and will perceive the organisation as more committed towards them.

The fifth objective of the study was to develop a questionnaire that measures the experience of work characteristics of blue-collar workers in the gold mining industry, namely the Job Demands-Resources scale for mine workers (JDRSM). The J-DR model was utilised as the theoretical framework to develop this instrument. Therefore, job demands and job resources that may possibly influence blue-collar workers were identified from existing literature. Three job demands were identified including workload and bullying by superiors and/or colleagues. Furthermore, five job resources were identified, that included learning opportunities, supervisory care, supervisory communication and supervisory integrity as well as colleague support. Items for each dimension were developed strictly adhering to the scale development procedure as described in the literature (conceptualising the different constructs for the measurement, generating and evaluating items, further developing and refining items) (DeVellis, 2003). Furthermore, careful attention was given to ensure the correct translation process in translating the questionnaire into the languages mostly spoken in the mine (i.e. Sesotho, isiXhosa and Setswana).

Rasch analysis was used to examine all the items across a continuum of the specific latent variables and to determine the item and person reliability of all the items (Hagquist, 2007; Rasch, 1960). Item reliability seemed sufficient except for the learning opportunities

dimension, which means that these items did not discriminate well and will not be stable in another research setting. Furthermore, person reliability was only sufficient for the supervisory care dimensions implying that for all the other dimensions different items targeted the same ability excessively. Moreover, respondents might have misunderstood the items or been reluctant to answer the questions truthfully and with the relevant intensity. Therefore, in order to ensure person reliability it was recommended that the wording and intensity of these items should be explored and adapted accordingly. Furthermore, during the Rasch analysis the functioning of the rating scale categories, the reliability of both item and person and the functioning of the items were evaluated. Although a seven-point rating scale was utilised it was found that some of the rating scales for most of the dimensions were under-utilised. This implied that the participants might have misunderstood the questions or were reluctant to answer with the relevant intensity. The seven-point scale might have been too difficult for the literacy levels of blue-collar mine workers and a four-point scale (never, almost never, sometimes, always) was proposed to increase the functionality of the scale. Furthermore, two problematic items, item one of supervisory care and item five of colleague support were identified and eliminated from the instrument. These items were not sufficient in predicting the specific dimensions.

The sixth objective of this study was to determine the psychometric properties of the newly developed JDRSM. In order to evaluate the factorial validity of this scale, it was hypothesised that job demands can be regarded as a three-factor model (workload, bullying by superiors and bullying by colleagues) and that job resources can be regarded as a five-factor model (learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support). This hypothesis was based on the foundation of the widely known JD-R model (Demerouti et al., 2001). In addition to the hypothesised models different competing models were evaluated for each subscale. The results showed that the hypothesised three-factor job demands scale explained the relationships between the items significantly better compared to one-factor and two-factor competing models. Likewise, the results of the hypothesised five-factor job resources scale also indicated a significantly better relationship between items than the competing alternative models.

In order to further investigate the internal consistency of the subscales, the Cronbach alpha coefficients were evaluated. The results revealed that bullying by superiors, bullying by colleagues, learning opportunities, supervisory care, supervisory communication, supervisory

integrity and colleague support all showed acceptable reliability coefficients (Cronbach alpha coefficients higher than 0,70). Low reliability were evident for workload ($\alpha = 53$) which might indicate that the respondent did not understand the questions or was reluctant to answer these questions truthfully. Furthermore, workload was only measured with three items and the low number of items might have influenced the reliability of the construct.

Finally the external validity of the job demands and job resources sub-scales were evaluated to identify relationships with external variables. Job demands (workload, bullying by superiors and bullying by colleagues) were significantly and positively related to symptoms of physical and psychological ill-health. This implied that when these job demands are high employees show signs and symptoms of physical and psychological ill-health. Moreover, significantly negative relationships were evident between the job demands and behavioural and affective commitment, implying that high job demands negatively influence the commitment of employees. Furthermore, job resources (learning opportunities, supervisory care, supervisory communication, supervisory integrity and colleague support) were significantly positively related with high levels of commitment. Learning opportunities and the supervisory support dimensions were all positively related to behaviour and affective commitment. This implies that employees who experience growth and development opportunities in their direct work environment and who are experiencing their supervisor as caring and trustworthy are more likely to feel committed towards the organisation and experience the organisation as committed to them. However, colleague support and supervisory communication were significantly positively related to behavioural but not affective commitment. This implies that employees who experience good colleague relationships and supervisory communication felt that the organisation is committed to them but will not necessarily feel committed towards the organisation.

6.2 LIMITATIONS

The first limitation of this study has been that of method bias or common method variance because the results from this study were obtained using only self-reporting questionnaires. This implies that when two or more variables are measured using the same method some of the observed correlations might be higher due to shared biases (Spector, 2006). Because single data sources with cross-sectional designs were used during this study, method variance

problems were not determined and investigated (Spector, 1987). Nevertheless, some studies have indicated that common method variance is not as big a threat as might be anticipated and is even regarded as a myth by some (Dollard & Winefield, 1998; Semmer, Zapf & Grief, 1996; Spector, 2006; Wall, Jackson, Mullarkey & Parker, 1996). Unfortunately, little alternative methodologies are proposed as alternative to self-reporting measures because the employee is regarded as the most important source of work-related experiences (Frese & Zapf, 1999). In addition, subjective methods (i.e. observers' ratings) are not without problems, including observer's bias and stereotyping effects. However, research is still needed on the objective measures of work-related psychological well-being, job characteristics and outcomes.

The second limitation refers to a relatively small convenient sample size (N = 361) participating in phases three and four of the empirical studies (i.e. developing a job demands-resources scale for blue-collar mine workers and the validation study concerning the job demands-resources scale). Consequently, the data is likely to be biased and not representative of the entire population of blue-collar gold mine workers (Du Plooy, 1995). Furthermore, the organisational culture might have influenced the responses of the participants and can therefore not be generalised to include all mine workers in South Africa. Research on the demands-resources scale representative of all blue-collar mine workers should be explored in future.

The third limitation refers to the relatively low response rate of 54% that has been obtained in phases three and four of the empirical studies (i.e. developing a job demands-resources scale for blue-collar mine workers and the validation study concerning the job demands-resources scale). Although Babbie (1990) indicated that sufficient response rates should be at least 60%, response rates this high are rarely reported. Sivo, Saunders, Chang and Jiang (2005) found in four of six journals they have surveyed a response rate of below 40 per cent. Furthermore, Pinsonneault and Kraemer (1993) reviewed 122 different studies and found that ninety of these studies did not report response rates or indicate response rates below 51 per cent. However, response rates below 50 per cent are regarded as poor and over 90 per cent as excellent. It is suggested that response rates below 75 per cent would not provide information that can be generalised to a bigger population (Neuman, 2000). Even though the response rate is in line with the average response rates of other studies, the results of this study cannot be adequately generalised to other blue-collar mine workers.

The final limitation was that during phases three and four of the empirical study (i.e. developing a job demands-resources scale for blue-collar mine workers and the validation study concerning the job demands-resources scale) the questionnaire has been translated into Sesotho, isiXhosa and Setswana but the language in which participants completed the questionnaires was not captured. This implied that the cultural sensitivity of the questionnaire could not be evaluated. Van de Vijver and Tanzer (2004) indicated that by ensuring the cultural sensitivity in a multi-cultural setting the researcher can be certain that all the items are understood in the same way and that the items measure the same construct across different language and cultural groups. Therefore, it is recommended that the invariance of the JDRSM should be evaluated.

6.3 RECOMMENDATIONS

6.3.1 Recommendations to the organisation

The importance of understanding work-related psychological well-being and the effect thereof on white-collar employees in South Africa must be emphasised. Keeping the results of the current study in mind, it is important that South African organisations should become more aware of the consequences for the employee and the organisation if the work-related psychological well-being of blue-collar employees is not ensured. If organisations become more aware of the state of mind of blue-collar employees as well as of the psychosocial factors in the organisational climate influencing the work-related psychological well-being of employees, organisations can ensure that they provide the necessary assistance by optimising the organisational climate. Furthermore, if the organisational climate is optimised in terms of a balance between job demands and resources it will contribute to better outcomes in terms of higher productivity, better safety, less turnover intention and absenteeism rates.

When employers are informed of the psychosocial factors influencing the work-related psychological well-being of their blue-collar employees they can provide more resources to buffer the negative effect of job demands on the work-related psychological well-being of employees. This is suggested according to the Job Demand-Resources (JD-R) model of work-related well-being (Demerouti et al., 2001; Schaufeli & Bakker, 2004). These resources may

differ from one organisation to the next and it is important for organisations to investigate which resources should be optimised to ensure better outcomes.

From the results in this study, the SAPFI could be used by South African organisations to gain insight into the work-related psychological well-being of their blue-collar employees. Once work-related psychological well-being risks have been identified, specific interventions can be planned and implemented in the organisation accordingly to ensure enhanced productivity and safety of these employees. One intervention might include focus group discussions to understand the job demands and resources contributing to work-related psychological (un)well-being. Furthermore, individual-based interventions can be implemented to make individuals aware of health symptoms and to ensure that they understand the importance of effort-recovery.

In the gold mining industry the newly developed JDRSM can be used (but with caution to compare the results between different language groups) to identify the antecedents of work-related psychological well-being. Administering the JDRSM will provide organisations with a clear understanding of the job demands and lack of job resources that negatively impact on the work-related psychological well-being of blue-collar mine workers. Once organisations understand what in the organisational climate is causing these work-related psychological well-being problems, interventions can be planned and implemented to ensure better outcomes. These interventions might include better supervisory support, ensuring contact possibilities between colleagues and providing opportunities for skills development and professional growth in their immediate work environment.

6.3.2 Recommendations for future research

The findings of this study have important implications for future research. Firstly, several recommendations can be made for future research, viewing the results obtained from the development and validation studies of the SAPFI and the JDRSM. The findings regarding the item and rating scale categories suggested that additional items should be explored for the different dimensions. Because of the lower literacy of most of the blue-collar employees, careful attention should be given to structuring these items and to include shorter questions. Indeed, it seems that shorter questions function more desirably than items consisting of long

sentences. Furthermore, the possibility of reducing the scale categories to include four-point frequency scales should be investigated. The seven-point rating scale used in the empirical studies has not worked sufficiently and some categories were under-utilised. Furthermore, following a study on the optimum number of rating scale categories, Preston and Colman (2000) found support for the widely used seven-point scale in psychological research. Although the use of seven-point rating scales is preferred because of better validity and a greater range, DeVellis (2003) suggests that it is better to have a shorter scale where all the categories are utilised rather than a long scale where some categories are under-utilised. Furthermore, it should be taken into consideration that the length of the scale categories depends on the circumstances of the participants (i.e. low literacy levels that might be the cause of respondents struggling to understand long complex rating scales) (Preston & Colman, 2000). DeVellis (2003) suggested that it is more useful to have a shorter scale where all the categories are utilised than to have scales with many categories and some categories are under-utilised.

The results from the factorial invariance analysis of the SAPFI indicated that the eustress sub-scale has not shown factorial invariance for the six language groups. Further investigation identified three items that did not adequately measure eustress among the different language groups. Furthermore, it was also evident that the underlying relationships between the two eustress dimensions differed across the language groups. Although the multi-stage translation process was followed, the quality of the translations could not be established and the meaning of these items might have been jeopardised during the translation process (Cheung & Thumboo, 2006). Van de Vijver and Tanzer (2006) argued that from a psychological point of view the quality of items might still be poor although grammatically correctly translated. Therefore, it is recommended that the factorial invariance of the eustress subscale should be further investigated in future research.

Secondly it is recommended that the JDRSM be administered to a group that is more representative of the South African mining population. Although adequate measures of validity and reliability were obtained it was only validated in one mining sample (i.e. blue-collar employees from a specific gold mine). Furthermore, future research should focus on the development and validation of a job demands-resources instrument for blue-collar employees across numerous organisations and occupations in South Africa. This will ensure

an instrument that can be used with confidence and the results obtained will be generalisable (Carlson, Kacmar & Williams, 2000).

Thirdly although the JDRSM study included translated versions in four official languages, the language in which participants completed the survey was not captured and therefore the cultural sensitivity of the instrument could not be established. It has been reported that invariant multi-cultural assessment in South Africa is becoming a requirement (Van de Vijver & Rothmann, 2004). Therefore, it is proposed that future research should translate the JDRSM into all eleven official languages of South Africa and determine the cultural sensitivity of the instrument. This will provide in-depth information regarding the job characteristics among blue-collar employees from all the different South African cultures.

Although a variety of antecedents and consequences were included in this study, future research should investigate and test structural models regarding work-related psychological well-being, job demands and resources, employee and organisational outcomes. Future research can also focus on including more objective organisational outcomes in terms of safety performance and productivity. Moreover, the development of a structural model would result in better understanding work-related psychological well-being and job characteristics in organisations and provide valuable information for the development of focused intervention plans. According to Jackson et al. (2006) structural models regarding work-related psychological well-being can be applied to plan workplace interventions with the aim of reducing job demands, increasing job resources whereby the overall work-related psychological well-being, employee health and organisational outcomes (i.e. commitment) can be ensured.

Longitudinal research regarding causal relationships between work-related psychological well-being, job characteristics, health and commitment of blue-collar employees should be pursued in South Africa. Previous research concerning the causality of work-related psychological well-being of white-collar employees found that an increase in job demands and a decrease in job resources negatively influence the work-related psychological well-being of employees, influencing absenteeism of employees (Schaufeli, Bakker & Van Rhenen, 2009).

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