

**BURNOUT, JOB STRESS AND SENSE OF COHERENCE  
IN THE COAL MINING INDUSTRY**

**Hanelie Roets**

Hons B.A. (Industrial Psychology)

12654760

Mini dissertation submitted as partial fulfilment of the requirements for the degree  
Magister Artium in Industrial Psychology at the Northwest-University

**Supervisor: Dr. J. Pienaar**

**May 2004**

**Potchefstroom**

## COMMENTS

The reader is reminded of the following:

- The references as well as the editorial style as prescribed by the *Publication Manual (5<sup>th</sup> edition)* of the American Psychological Association (APA) were followed in this dissertation. This practice is in line with the policy of the Programme in Industrial Psychology of the Northwest-University in all scientific documents as from January 1999.
- The mini dissertation is submitted in the form of a research article. The editorial style specified by the *South African Journal of Industrial Psychology* (which agrees largely with the APA style) is used, but the APA guidelines were followed in constructing tables.

## ACKNOWLEDGEMENTS

I herewith would like to thank the following key individuals and organisations, which assisted and contributed to the completion of this mini-dissertation:

- My Lord and Saviour; without Him nothing would be possible.
- Dr. Jaco Pienaar, my Study Leader, for his inspiration, guidance, patience, and his contribution to this study and the statistical analysis.
- To the management of Xstrata Coal for permitting me to conduct the research in this organisation.
- Mr. Piet Henderson, Group Human Resources Manager of Xstrata Coal SA for his support and help.
- The various Human Resource Managers of Xstrata Coal SA who assisted in the collection of the data.
- To the participants in this research project.
- To my husband, Johan for his continuous support during my studies.

## TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION		Page
1.	Problem Statement	1
2.	Aim of Research	6
2.1	General Aim	6
2.2	Specific Aim	6
3.	Research Method	6
3.1	Literature Review	6
3.2	Empirical Study	6
3.2.1	Research Design	7
3.2.2	Study Population	7
3.2.3	Measuring Instruments	7
3.2.4	Statistical Analysis	8
4.	Research Procedure	11
5.	Division of chapters	11
6.	Chapter Summary	12

## REFERENCES

## CHAPTER 2: RESEARCH ARTICLE

Abstract/Opsomming

Introduction

Method

    Research Design

    Study Population

    Measuring Instruments

    Statistical Analysis

Results

    Post hoc analysis

    Factor analysis of the intensity of job stress items

Discussion

Recommendations

## REFERENCES

## CHAPTER 3: CONCLUSIONS, LIMITATIONS & RECOMMENDATIONS

3.1	Conclusions	53
3.2	Limitations	54
3.3	Recommendations	54
3.3.1	Recommendations for the organisation	55
3.3.2	Recommendations for future research	56

## REFERENCES

## LIST OF TABLES

<b>Table</b>	<b>Description</b>	<b>Page</b>
Table 1	Characteristics of Participants	25
Table 2	Goodness-of-Fit Statistics for the Hypothesised MBI-GS Model	31
Table 3	Factor loadings, Communalities, Percentage Variance and Covariance for Oblique Rotation on Job Stress Items	34
Table 4	Descriptive Statistics, Alpha Coefficients and Inter-Items Correlation Coefficients of the Measuring Instruments	35
Table 5	Severity of Stressors in the Mining Industry	37
Table 6	Product-Moment Correlation Coefficients between the Measuring Instruments	39
Table 7	Results of the Canonical Analysis: Sense of Coherence, Job Stress and Burnout	41
Figure 1	Maximum likelihood estimates of the Burnout Model	43

## ABSTRACT

**Title:** Burnout, Job Stress and Sense of Coherence of employees in the coal mining industry.

**Key terms:** Burnout, mine employees, stress, sense of coherence, validity, reliability.

Since the buyout of Duiker coal-mines by Xstrata PLC, considerable organisational change took place: people were made redundant, restructuring took place, much flatter structure (which also meant a much leaner workforce) and a new culture was introduced. The coal-mining environment is also one of the harshest environments in which to work. Various factors in this industry may lead to stress and eventually burnout, which is detrimental to the wellbeing of employees.

Burnout is a syndrome consisting of three dimensions. They are: Cynicism, which reflects a negative, a cynical and callous attitude towards recipients, and/or extreme, detached responses to aspects pertaining to the job and Lack of Professional Efficacy, which is the tendency to evaluate aspects negatively with regard to personal accomplishments and competence at work. Exhaustion refers to the depletion and draining of emotional resources, feelings of being overextended as well as cynicism. Burnout in various industries is a particular and growing phenomenon and the mining industry is no different.

The objective of this research was to establish the relationship between psychological burnout and job stress and to determine whether Sense of Coherence moderates the effects of job stress on burnout of employees. The sample consisted of 163 employees of the Xstrata Coal SA Mine group. A cross-sectional survey design was used. The Job Stress Indicator, Maslach Burnout Inventory, and Orientation to Life Questionnaire were administered.

Canonical correlation analysis showed that a weak sense of coherence combined with stress because of job demands and a lack of resources were associated with all three components of burnout. Structural equation modelling showed that Sense of Coherence moderates the effect of job stress on exhaustion.

Recommendations for future research were made.

## OPSOMMING

**Titel:** Uitbranding, Werkstres en Lokus van Kontrole van werknemers in die steenkool-industrie.

**Sleutelterme:** Uitbranding, myn werknemers, stres, lokus van kontrole, geldigheid, betroubaarheid.

Groot organisatoriese veranderinge het plaasgevind sedert Xstrata PLC die Duiker myngroep gekoop het. Afleggings het plaasgevind, asook herstrukturering wat 'n baie platter struktuur en minder mense beteken het. Werknemers is ook aan 'n nuwe kultuur blootgestel. Die steenkool-industrie is ook een van die moeilikste industrieë om in te werk. Daar is verskeie faktore wat stres en uitbranding kan veroorsaak en nadelig kan wees vir die welstand van werknemers.

Uitbranding is 'n sindroom wat uit drie dimensies bestaan, naamlik Sinisme wat 'n negatiewe, siniese en verharde verhouding teenoor die ontvanger daarvan reflekteer en Uitputting, wat na die lediging en dreinerings van emosionele bronne verwys, asook gevoelens van ooreising, en sinisme. Uitbranding kom al hoe meer in verskeie industrieë voor en die myn-industrie is geen uitsondering nie.

Die doelstelling van hierdie navorsing was om die verwantskap tussen psigiese uitbranding en werkstres te bepaal en om te bepaal of koherensiesin die effek van werkstres op uitbranding by werknemers modereer. Die steekproef het bestaan uit 163 werknemers van die Xstrata Steenkool SA Myngroep. 'n Dwarssnee opname-ontwerp is gebruik. Die Werkstres-Aanduier, Maslach Uitbrandingsvraelys, en die Lewensoriëntasievraelys is afgeneem.

Kanoniese korrelasie analise het getoon dat 'n swak koherensiesin, asook stres as gevolg van hoë werkseise en 'n gebrek aan hulpbronne geassosieer was met al drie komponente van uitbranding. Strukturele vergelykings-modellering het aangetoon dat koherensiesin die effek van werkstres op uitputting modereer.

Aanbevelings vir toekomstige navorsing is aan die hand gedoen.

## **CHAPTER ONE: INTRODUCTION**

This mini dissertation deals with burnout, job stress and sense of coherence as it manifests in employees in the coal-mining industry.

This chapter focuses on the problem statement, objectives and basic hypothesis as well as the research method.

### **1. PROBLEM STATEMENT**

Duiker Mines were bought by Xstrata PLC, which is now listed on the London and Swiss Stock Exchanges. Xstrata Coal SA is mainly situated in the Mpumalanga area and consists of three divisions (Tweefontein, Impunzi and Mpumalanga). There are 10 mines in total in these three divisions (9 underground operations and one open cast mine). Xstrata Coal SA mainly focuses on the production of export coal. It is the largest exporter of thermal coal in the world. There are currently 4123 full-time employees working at Xstrata Coal SA.

The buyout of Duiker coal-mines by Xstrata PLC implied considerable organisational change: employees were made redundant, restructuring took place (the workforce was reduced by 43.98%) and a new culture was introduced. The coal-mining environment is also one of the harshest industries to work in. Some of the employees are exposed to working conditions that include mining underground (up to 80m deep), long working hours, shift work, a sometimes unsafe and highly unionised environment and enormous pressure to perform. Production of coal and the support of this function are the way employees are measured, thus, workers are in a constant mode of “producing” and assisting production and this could lead to burnout if it takes place over a long period of time. This presents a volatile situation for employee wellbeing, with constant pressure to perform, in a challenging environment.

Schaufeli and Enzman (1998, p. 36) define burnout as “a persistent, negative, work-related state of mind in ‘normal’ individuals that is primarily characterised by exhaustion, which is accompanied by distress, a sense of reduced effectiveness, decreased motivation, and the development of dysfunctional attitudes and behaviours at work”. Burnout as a phenomenon was originally observed primarily among people providing human services.

Research was expanded about the subject and Maslach, Jackson and Leiter (1996) developed the Maslach Burnout Inventory – General Survey (MBI-GS) to measure burnout in occupational groups other than human services.

Research has shown that burnout is not only related to negative outcomes for the individual, including depression, a sense of failure, fatigue, loss of motivation, low morale and job dissatisfaction (Maslach & Jackson, 1986), but also to negative outcomes for the organisation, including absenteeism, turnover rates and lowered productivity (Maslach & Jackson, 1986). According to Levert Lucas & Ortlepp (2000), burned-out workers show a lack of commitment and are less capable of providing adequate services, especially along dimensions of decision-making and initiating involvement with clients (Fryer, Poland, Bross & Krugman, 1988; Maslach, 1982). Burned-out workers are also too depleted to give of themselves in a creative, co-operative fashion (Sammut, 1997). The consequences of burnout are potentially serious for employees and the institutions in which they interact. It is the end result of consistently unmoderated or unsuccessful attempts at mediating stressors in the environment on the part of the individual (Levert et al., 2000).

Burnout correlates with various self-reported indices of personal dysfunction, increased use of drugs and alcohol (Maslach et al., 1996), and marital and family problems (Maslach & Jackson, 1986). Managers suffering from burnout could negatively affect the organisation, spreading burnout to subordinates (DuBrin, 1990). Burnout can be caused by biographical as well as organisational factors. Biographical factors that could explain burnout include age, work experience and sex. Burnout is observed more often among younger employees, compared with those older than 30 years. Burnout is negatively related to work experience (Cherniss, 1980; Künzel & Schulte, 1986; Maslach, Jackson & Leiter, 1996). Women tend to score higher on emotional exhaustion, whereas men score higher on depersonalisation. According to Schaufeli and Enzmann (1998), this can partly be explained by sex role-dependent stereotypes. Cash (1988) found that individuals with a higher level of education were more prone to burnout, possibly due to the higher expectations of more educated individuals.

Organisational factors which contribute to burnout are work overload (Bacharach, Bamberger & Conley, 1991; Landsbergis, 1988), poor collegial support (Golembiewski & Munzenrider, 1988), role conflict and role ambiguity (Miller, Ellis, Zook & Lyles, 1990),

low levels of perceived control (Shirom, 1989) and lack of feedback (participation in decision making and autonomy). These factors represent “demands” on employees (also referred to as job stressors) that are included in most models of burnout (Schaufeli & Enzmann, 1998).

Stress should not be confused with burnout. Schaufeli and Enzmann (1998) said that burnout could be considered as a particular kind of prolonged job stress. An individual experiences job stress when the demands of the workplace exceed his or her adaptive responses. Burnout is a particular, multidimensional and chronic stress reaction that goes beyond the experience of mere exhaustion.

As mentioned before, the mining environment is harsh and factors like enormous pressure to produce and perform, a leaner workforce (less people), strenuous physical working conditions, long hours, shift work and the highly unionised environment add to the stress factor in the mining industry. According to Spielberger and Vagg (1999) stressors can include organisational factors, inherent factors, shortage of resources and stressful working conditions. The majority of the group that was targeted in this study was middle management and up. The stressors involved for this group will also include the pressure to perform and produce, managing the rest of the workforce, union activities and pressure to constantly improve safety conditions.

In the Pearson-Environment Fit theory (Frenz, Caplan & Harrison, 1992), stress in work settings is attributed to the interaction of an individual with his or her work environment. According to Spielberger and Vagg (1999), a comprehensive assessment of work stress requires an evaluation of the specific aspects of one's job that produce job strain.

Dispositional characteristics of individuals involve beliefs about the world and possibilities of dealing with it, and include constructs such as sense of coherence, personality hardiness and locus of control. For the purpose of this research, the focus is on employees' sense of coherence and its possible relationship with burnout and job stress.

The reason for deciding on sense of coherence is that it is a broad-band resource (Hobfoll, 2001), which is positively associated with coping with change (Fouche & Rothmann, 2001) and job satisfaction (Rothmann, 2001), and negatively associated with suicide ideation (Rothmann & Van Rensburg 2001) and burnout (Basson & Rothmann, 2002).

Antonovsky (1991) defined the concept of *Sense of Coherence* as "A global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement."

Antonovsky (1987) further defines a sense of coherence as something that includes three dimensions that represent the concept, namely manageability, comprehensibility and meaningfulness.

- *Manageability* refers to the extent to which individuals experience events in life as situations that are endurable or manageable, or even as new challenges.
- *Comprehensibility* refers to the extent to which one perceives stimuli from the internal and external environment as information that is ordered, structured and consistent. The stimuli are perceived as comprehensible and make sense on a cognitive level.
- *Meaningfulness* refers to the extent to which one feels that life is making sense on an emotional and not just a cognitive level.

Sense of coherence is a coping resource that is presumed to mitigate life stress by affecting the overall quality of one's cognitive and emotional appraisal of the stimuli that impact on one, which is, in turn, presumed to engender, sustain and enhance health as well as strength at other extremities. Antonovsky (1987) states that the primary development of the dynamics of sense of coherence takes place in the first decade of one's adult life. He also mentions that one's sense of coherence is tried continually, but individuals who developed a strong sense of coherence early in adulthood have the ability to use general resistance resources to restore equilibrium.

Sense of coherence can thus be viewed as a stable dispositional orientation. A strong sense of coherence is negatively related to measures of negative affectivity, such as anxiety and neuroticism (Flannery & Flannery, 1990; Frenz, Carey & Jorgenson, 1993) and work stress (Feldt, 1997).

A strong sense of coherence is also related to competence and life satisfaction (Kalimo & Vuori, 1990), general wellbeing (Feldt, 1997), emotional stability (Mlonzi & Strümpfer, 1998) and successful coping with life stress (McSherry & Holm, 1994).

Levert et al. (2000) reported significant correlations between two components of burnout (emotional exhaustion and depersonalisation) and sense of coherence in a group of psychiatric nurses in South Africa. Gilbar (1998) found significant correlations between social workers' sense of coherence and emotional exhaustion ( $r = 0,30$ ) as well as sense of coherence and personal accomplishment ( $r = -0,34$ ). Rothmann, Malan and Rothmann (2001) found significant correlations between sense of coherence and emotional exhaustion ( $-0,56$ ), depersonalisation ( $-0,41$ ) and personal accomplishment ( $0,48$ ).

A need exists to determine the relationship between burnout and job stress on the one hand, and the influence of sense of coherence on the other. No studies about these factors in the coal-mining industry were found in the literature and it could present valuable information regarding burnout, and specifically to the mining industry. The objective is thus to investigate the relationship between burnout, job stress and sense of coherence among employees in the Xstrata coal-mining group in South Africa.

From the problem statement the following research questions emerge:

- How are burnout, job stress and sense of coherence conceptualised in the literature?
- How is the relationship between burnout, job stress and sense of coherence conceptualised in the literature?
- What is the empirical relationship between burnout, job stress and sense of coherence among employees in the coal-mining industry?
- What recommendations for improving employee wellbeing can be made based on the results of the empirical investigation?

## **2. AIM OF RESEARCH**

The aim of this research can be divided into general and specific aims.

### **2.1 General Aim**

The general aim of this research is to investigate relationships between burnout, job stress and Sense of Coherence among employees in the Xstrata coal-mining group in South Africa in order to contribute to an understanding of the interaction between these variables and the implication thereof for the management of burnout and job stress in the specific setting.

### **2.2 Specific Aims**

1. To conceptualise burnout, job stress and sense of coherence from the literature.  
To conceptualise the relationship between burnout, job stress and sense of coherence from the literature.
2. To investigate the empirical relationship between burnout, job stress and sense of coherence among employees in the coal-mining industry.
3. To make recommendations for improving employee wellbeing based on the results of the empirical investigation.

## **3. RESEARCH METHOD**

### **3.1 Phase 1: Literature Review**

In phase 1 a complete literature review regarding the following is undertaken: burnout, sense of coherence and job stress and any relationships that have been investigated and/or proven between these constructs.

### **3.2 Phase 2: Empirical Study**

Phase 2 consists of the empirical study and includes the research design, the study population, measuring instruments and statistical analysis and interpretation of the data.

### **3.2.1 Research Design**

A survey design will be used to achieve the research objective. The specific design will be a cross-sectional design, by means of which a sample is randomly drawn from a population at a particular point in time (Shaughnessy & Zechmeister, 1997). This design can be used to assess interrelationships among variables within a population. Random selection is important if we wish to draw accurate conclusions about the entire group of interest (Spector, 2000).

### **3.2.2 Study Population**

The participants will be employees of Xstrata Coal SA. They will be randomly selected from the Tweefontein, Impunzi and Mpumalanga divisions. Employees from level 14 (mainly miner and artisan category) up to level 23 (Colliery manager's level) will be included in the study.

They will be randomly selected (stratified method) from the middle to high management level groups.

### **3.2.3 Measuring Instruments**

The following measuring instruments will be used in this study:

- The *Maslach Burnout Inventory – General Survey* (MBI-GS) (Maslach et al., 1996) will be used to measure the burnout of participants. The MBI-GS consists of 16 items in three sub-scales, namely Exhaustion, Cynicism and Professional Efficacy. Together the sub-scales of the MBI-GS provide a three-dimensional perspective on burnout. Internal consistencies (Cronbach coefficient alphas) reported by Maslach et al. (1996) varied from 0,87 to 0,89 for Exhaustion, 0,73 to 0,84 for Cynicism and 0,76 to 0,84 for Professional Efficacy. Test-retest reliabilities after one year were 0,65 (Exhaustion), 0,60 (Cynicism) and 0,67 (Professional Efficacy) (Maslach et al., 1996). External validation of the MBI has been obtained from its convergence with peer ratings, job dimensions associated with burnout, and stress outcomes (Maslach & Jackson, 1984).

- The *Job Stress Inventory* (JSI) will be used to assess the sources of job stress and lack of organisational support. In line with previous research (Spielberger & Vagg, 1999), this study will address both the severity and frequency of stressors. Firstly, participants rate each of the 30 items regarding the intensity of stress on a nine-point scale. Secondly, the frequency part of the questionnaire asks "how many times in the last six months" the source of stress had been experienced. The JSI focuses on aspects of work situations that often result in psychological strain. The items represent two categories, namely job demands and lack of organisational support.
- The *Orientation to Life Questionnaire* (OLQ) (Antonovsky, 1987) is used to measure participants' sense of coherence. The OLQ consists of 29 items. Antonovsky (1993) reported alpha coefficients of the OLQ in 29 research studies varying between 0,85 and 0,91. Test-retest reliability studies found coefficients between 0,41 and 0,97 (Antonovsky, 1993). Rothmann (2001) reported an alpha coefficient of 0,89 for the OLQ, which may be regarded as acceptable (Nunnally & Bernstein, 1994). Regarding the construct validity of the OLQ, it was found that there is a negative relationship between the OLQ and experienced stress and that the OLQ correlates negatively with the "State-Trait Anxiety Inventory-Trait" and the "Beck Depression Inventory" (Frenz et al., 1993).

### 3.2.4 Statistical Analysis

The statistical analysis is carried out with the help of the SAS program (SAS Institute, 2000). Principal factors extraction with oblique rotation will be performed through SAS FACTOR on the Job Stress Inventory. Principal components extraction is used prior to principal factors extraction to estimate the number of factors, presence of outliers and factorability of the correlation matrices.

Cronbach alpha coefficients and inter-item correlations are used to assess the internal consistency of the measuring instruments (Clark & Watson, 1995). Coefficient alpha conveys important information regarding the proportion of error variance contained in a scale. According to Clark and Watson (1995), the average inter-item correlation coefficient (which is a straightforward measure of internal consistency) is a useful index to supplement information supplied by coefficient alpha.

However, simply focusing on the mean inter-item correlation cannot ensure unidimensionality of a scale – it is necessary to examine the range and distribution of these correlations as well.

Descriptive statistics (e.g. means, standard deviations, skewness and kurtosis) are used to analyse the data. Canonical correlation will be used to determine the relationships between the dimensions of burnout, sense of coherence and stress. The goal of canonical correlation is to analyse the relationship between two sets of variables (Tabachnick & Fidell, 2001). Canonical correlation is considered a descriptive technique rather than a hypothesis-testing procedure.

Structural equation modelling (SEM) methods as implemented by AMOS (Arbuckle, 1999) will be used to test the causal model containing burnout, job stress and sense of coherence, using the maximum likelihood method. SEM is a statistical methodology that takes a confirmatory (i.e. hypothesis-testing) approach to the analysis of a structural theory bearing on some phenomenon (Byrne, 2001). Several aspects of SEM set it apart from the older generation of multivariate procedures (Byrne, 2001). Firstly, it takes a confirmatory rather than an exploratory approach to data analysis. Furthermore, by demanding that the pattern of inter-variable relations be specified a priori, SEM lends itself well to the analysis of data for inferential purposes. Secondly, although traditional multivariate procedures are incapable of either assessing or correcting for measurement error, SEM provides precise estimates of these error variance parameters. Thirdly, SEM procedures can incorporate both unobserved (latent) and observed variables.

Hypothesised relationships are tested empirically for goodness of fit with the sample data. The  $\chi^2$  statistic and several other goodness-of-fit indices summarise the degree of correspondence between the implied and observed co-variance matrices. Jöreskog and Sörborn (1993) suggest that the  $\chi^2$  value may be considered more appropriately as a badness-of-fit rather than as a goodness-of-fit measure in the sense that a small  $\chi^2$  value is indicative of a good fit. However, because the  $\chi^2$  statistic equals  $(N - 1)F_{\min}$ , this value tends to be substantial when the model does not hold and the sample size is large (Byrne, 2001). A large  $\chi^2$  relative to the degrees of freedom indicates a need to modify the model to better fit the data.

Researchers have addressed the  $\chi^2$  limitations by developing goodness-of-fit indices that take a more pragmatic approach to the evaluation process. One of the first fit statistics to address this problem was the  $\chi^2$ /degrees of freedom ratio. These criteria, commonly referred to as "subjective" or "practical" indices of fit, are typically used as adjuncts to the  $\chi^2$  statistic.

The Goodness of Fit Index (GFI) indicates the relative amount of the variances/co-variances in the sample predicted by the estimates of the population. It usually varies between 0 and 1 and a result of 0,90 or above indicates a good model fit. In addition, the Adjusted Goodness-of-Fit Index (AGFI) is given.

The AGFI is a measure of the relative amount of variance accounted for by the model, corrected for the degrees of freedom in the model relative to the number of variables. The GFI and AGFI can be classified as absolute indices of fit because they basically compare the hypothesised model with no model at all (Hu & Bentler, 1995). Although both indices range from zero to 1,00, the distribution of the AGFI is unknown, therefore no statistical test or critical value is available (Jöreskog & Sörbom, 1986). The parsimony goodness-of-fit index (PGFI) addresses the issue of parsimony in SEM (Mulaik et al., 1989). The PGFI takes into account the complexity (i.e., number of estimated parameters) of the hypothesised model in the assessment of overall model fit and provides a more realistic evaluation of the hypothesised model. Mulaik et al. (1989) suggested that indices in the 0,90's accompanied by PGFIs in the 0,50's are not unexpected, however, values  $> 0,60$  are considered to be more appropriate (Byrne, 2001).

The Normed Fit Index (NFI) is used to assess global model fit. The NFI represents the point at which the model being evaluated falls on a scale running from a null model to perfect fit. This index is normed to fall on a 0 to 1 continuum. Marsh, Balla and Hau (1996) suggest that this index is relatively insensitive to sample sizes.

The Comparative Fit Index (CFI) represents the class of incremental fit indices in that it is derived from the comparison of a restricted model (i.e., one in which structure is imposed on the data) with that of an independence (or null) model (i.e., one in which all correlations among variables are zero) in the determination of goodness-of-fit.

The Tucker-Lewis Index (TLI; Tucker & Lewis, 1973) is a relative measure of co-variation explained by the model that is specifically developed to assess factor models.

For these fit indices (NFI, CFI and TLI), it is more or less generally accepted that a value of less than 0,90 indicates that the fit of the model can be improved (Hoyle, 1995), although a revised cut-off value close to 0,95 has recently been advised (Hu & Benler, 1999).

To overcome the problem of sample size, Browne and Cudeck (1993) suggested using the Root Mean Square Error of Approximation (RMSEA) and the 90 percent confidence interval of the RMSEA. The RMSEA estimates the overall amount of error; it is a function of the fitting function value relative to the degrees of freedom. The RMSEA point estimate should be 0,05 or less and the upper limit of the confidence interval should not exceed 0,08. Hu and Bentler (1999) suggested a value of 0,06 to be indicative of good fit between the hypothesised model and the observed data. MacCallum, Browne and Sugawara (1996), recently elaborated on these cut-off points and noted that RMSEA values ranging from 0,08 to 0,1 indicate mediocre fit, and those greater than 0,1 indicate poor fit.

#### **4. RESEARCH PROCEDURE**

The measuring battery will be compiled. A letter will be drawn up, requesting participation and giving the motivation for the research. With regard to the research, ethical aspects will be discussed with the participants. The test battery will be administered in small groups at the work premises on suitable dates.

#### **5. DIVISION OF CHAPTERS**

- Chapter 1: Introduction
- Chapter 2: Research article
- Chapter 3: Conclusions, limitations and recommendations

## **6. CHAPTER SUMMARY**

In this chapter the problem statement, the aims of the study and the research method were discussed. A prospective chapter division was also indicated.

Chapter 2 contains the research article.

## REFERENCES

- Antonovsky, A. (1987). *Unravelling the mystery of health: How people manage stress and stay well*. San Francisco, CA: Jossey-Bass.
- Antonovsky, A. (1991). The structural sources of salutogenic strengths. In C.L. Cooper & R. Payne (Eds.), *Personality and stress: Individual differences in the stress process*. New York: Wiley.
- Antonovsky, A. (1993). The structure and properties of the sense of coherenceSense of Coherence scale. *Social Science and Medicine*, 36, 725-733.
- Arbuckle J.L. (1997). *Amos users' guide version 4.0*. Chicago: Smallwaters Corporation
- Bacharach, S. B., Bamberger, P. & Conley, S. (1991). Work-home conflict among nurses and engineers: Mediating the impact of role stress on burnout and satisfaction at work. *Journal of Organizational Behaviour*, 12, 39-53.
- Basson, M.J. & Rothmann, S. (2002). Sense of coherenceSense of Coherence, coping and burnout of pharmacists. *South African Journal of Economic and Management Sciences*, 5(1), 35-62.
- Browne, M.W. & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp. 136-162). London: Sage.
- Byrne, B. M. (2001). *Structural equation modelling with Amos: Basic concepts, applications and programming*. Mahwah, NJ: Lawrence Erlbaum.
- Cash, D. (1988). A study of the relationship of demographics, personality, and role stress to burnout in intensive care unit nurses. *Dissertation Abstracts International*, 49, 2585A.
- Cherniss, C. (1980). *Staff burnout*. Beverly Hills, CA: Sage.
- Clark, L.A. & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7, 309-319.
- Dubrin, A.J. (1990) *Effective business psychology* (3rd ed.) Englewood Cliffs, NJ: Prentice-Hall
- Feldt, T. (1997). The role of sense of coherenceSense of Coherence in wellbeing at work: Analysis of main and moderator effects. *Work and Stress*, 11, 134-147.
- Flannery, R.B. & Flannery, G.J. (1990). Sense of coherenceSense of Coherence, life stress, and psychological distress: A prospective methodological enquiry. *Journal of Clinical Psychology*, 46, 415-420.

- Fouche, E. & Rothmann, S. (2001). Bestuurders se coping met verandering: 'n Fortigene benadering. *Tydskrif vir Bedryfsielkunde*, 27(1), 32-38.
- Frenz, A.W., Carey, M.P. & Jorgensen, R.S. (1993). Psychometric evaluation of Antonovsky's sense of coherenceSense of Coherence scale. *Psychological Assessment*, 5, 145-153.
- Frenz, J.R.P., Caplan, R.D. & Harrison, R.V. (1982). *The mechanisms of job stress and strain*. Chichester: Wiley.
- Fryer, G., Poland, J., Bross, D. & Krugman, R. (1988). The child protective service worker: A profile of needs, attitudes and utilisation of professional resources. *Child Abuse & Neglect*, 12, 481-490.
- Gilbar, O. (1998). Relationship between burnout and sense of coherenceSense of Coherence in health social workers. *Social Work in Health Care*, 26(3), 39-49
- Golembiewski, R.T. & Munzenrider, R.F. (1988). *Phases of burnout: Development in concepts and applications*. New York: Praeger.
- Hobfoll, S.E. (2001). The influence of culture, community and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review*, 50, 337-369.
- Hoyle, R.H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues. In R.H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 1-15). Thousand Oaks, CA: Sage.
- Hu, L. T. & Bentler, P.M. (1995) Evaluating model fit. In R.H. Hoyle (Ed), *Structural equation modelling: Concepts, issues, and applications* (pp. 76-99). Thousand Oaks, CA:Sage
- Jöreskog, K.G. & Sörbom, D. (1988). *LISREL 7: A guide to the program and applications*. Chicago: SPSS, Inc.
- Kalimo, R., & Vuori, J. (1990). Work and sense of coherenceSense of Coherence: Resources for competence and life satisfaction. *Behavioural Medicine*, 16, 76-89.
- Künzel, R., & Schulte, D. (1986). Burnout and reality shock among clinical psychologists. *Zeitschrift für Klinische Psychologie, Forschung und Praxis*, 15, 303-320.
- Landsbergis, P.A. (1988). Occupational stress among health care workers: A test of the job demands-control model. *Journal of Organizational Behaviour*, 9, 217-239.
- Levert, T., Lucas, M. & Ortlepp, K. (2000). Burnout in psychiatric nurses: Contributions of the work environment and a Sense of CoherenceSense of Coherence. *South African Journal of Psychology*, 30, 36-43.

- MacCallum, R.C., Browne, M.W. & Sugawara, H.M. (1996). Power analysis and determination of sample size for co-variance structure modelling. *Psychological Methods*, 1, 130-149
- Marsh, H.W., Balla, J.R. & Hau, K.T. (1996). An evaluation of Incremental Fit Indices: A clarification of mathematical and empirical properties. In G.A. Marcoulides & R.E. Scumaker (Eds.), *Advanced structural equation modelling: Issues and techniques* (pp. 315-353). Mahwah, NJ: Erlbaum.
- Maslach, C. & Jackson, S.E. (1986). *The Maslach Burnout Inventory* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.
- Maslach, C. (1982). *Burnout: The cost of caring*. NJ: Prentice Hall.
- Maslach, C., Jackson, S.E. & Leiter, M. (1996). *Maslach Burnout Inventory: Manual* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.
- McSherry, W.C. & Holm, J.E. (1994). Sense of coherence: Its effects on psychological and physiological processes prior to, during, and after a stressful situation. *Journal of Clinical Psychology*, 50, 476-487.
- Miller, K.I., Ellis, B.H., Zook, E.G. & Lyles, J.S. (1990). An integrated model of communication, stress, and burnout in the work place. *Communication Research*, 17, 200-326.
- Mlonzi, E.N., & Strümpfer, D.J.W. (1998). Antonovsky's sense of coherence: Sense of Coherence scale and 16PF second-order factors. *Social Behaviour and Personality*, 26, 39-50.
- Mulaik, S.A., James, L.R., Van Alstine, J., Bennett, N., Lind, S. & Stilwell, C.D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, 105, 430-445.
- Nunnally, J. & Bernstein, I.H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill
- Rothmann, S. & Van Rensburg, P. (2001, May). Suicide ideation in the South African Police Services. Paper presented at the 10th European Congress on Work and Organizational Psychology, Prague, Czech Republic.
- Rothmann, S. (2001). Sense of Coherence, locus of control, self-efficacy and job satisfaction. *Journal of Economic and Management Sciences*, 5(1), 41-65.
- Rothmann, S., Malan, M.M. & Rothmann, J.C. (2001, August). Sense of coherence, coping and burnout in a corporate pharmacy group'. Paper presented at the 7th Annual PsySSA Conference, Johannesburg.

- Sammut, R. G. (1997). Psychiatric nurses' satisfaction: The effect closure of a hospital. *Journal of Advanced Nursing*, 26, 20-24.
- SAS Institute. (2000). *The SAS System for Windows: Release 8.01* Cary, NC: SAS Institute Inc.
- Schaufeli, W.B. & Enzmann, D. (1998). *The burnout companion to study and practice: A critical analysis*. London: Taylor & Francis.
- Shaughnessy, J.J. & Zechmeister, E.B. (1997). *Research methods in psychology* (4th ed.). New York: McGraw-Hill.
- Shirom, A. (1989). Burnout in work organizations. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology*. Chichester: John Wiley.
- Spector, P. E. (2000). *Industrial and organizational psychology: Research and practice* (2nd ed.). New York: John Wiley.
- Spielberger, C.D. & Vagg, P.R. (1999). *Job Stress Survey: Professional manual*. Odessa, FL: Psychological Assessment Resources, Inc.
- Strümpfer, D.J.W. (1990). Salutogenesis: A new paradigm. *South African Journal of Psychology*, 20, 265-276.
- Tabachnick, B.G. & Fidell, L.S. (2002). *Using multivariate statistics* (4th ed.). Boston, Ma: Allyn & Bacon.
- Tucker, L.R. & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, 38, 1-10.

**CHAPTER TWO**

**RESEARCH ARTICLE**

# BURNOUT, JOB STRESS AND SENSE OF COHERENCE IN THE COAL MINING INDUSTRY

**H. Roets**

*Xstrata Coal- Mine, Witbank*

**J. Pienaar**

*WorkWell: Research Unit for People, Policy and Performance, Faculty of Economic and Management Sciences, Northwest-University, Private Bag X6001, Potchefstroom*

## ABSTRACT

The objective of this research is to establish the relationship between psychological burnout and job stress, and to determine whether sense of coherence moderates the effects of job stress on burnout of employees. The sample consisted of 163 employees of the Xstrata Coal SA Mine group. A cross-sectional survey design was used. The Job Stress Indicator, Maslach Burnout Inventory and Orientation to Life Questionnaire were administered. Canonical correlation analysis showed that a weak sense of coherence combined with stress because of job demands and a Lack of Resources were associated with all three components of burnout. Structural equation modelling showed that sense of coherence moderates the effect of job stress on exhaustion.

## OPSOMMING

Die doelstelling van hierdie navorsing is om die verwantskap tussen psigiese uitbranding en werkstres te bepaal en om te bepaal of koherensiesin die effek van werkstres op uitbranding by werknemers modereer. Die steekproef het bestaan uit 163 werknemers van die Xstrata Steenkool SA Myngroep. 'n Dwarssnee opname-ontwerp is gebruik. Die Werkstres-Aanduier, Maslach Uitbrandingsvraelys, en die Lewensoriëntasievraelys is afgeneem. Kanoniese korrelasie analise het getoon dat 'n swak koherensiesin, asook stres as gevolg van hoë werkseise en 'n gebrek aan hulpbronne geassosieer was met al drie komponente van uitbranding. Strukturele vergelykings-modellering het aangetoon dat koherensiesin die effek van werkstres op uitputting modereer.

## INTRODUCTION

Duiker Mines were bought by Xstrata PLC, which is now listed on the London and Swiss Stock Exchanges. Xstrata Coal SA is mainly situated in the Mpumalanga area and consists of three divisions (Tweefontein, Impunzi and Mpumalanga). There are 10 mines in total in these three divisions (9 underground operations and one opencast mine). Xstrata Coal SA mainly focus on the production of export coal. It is the largest exporter of thermal coal in the world. There are currently 4137 full-time employees working at Xstrata Coal SA.

The buyout of Duiker coal-mines by Xstrata PLC implied considerable organisational change: people were made redundant (voluntary separations or forced retrenchment, the workforce was reduced by 43.87 percent over a period of 6 years), restructuring took place (a much flatter structure was introduced that meant a leaner workforce) and employees had to get used to a different culture. The coal-mining environment is also a difficult industry to work in. Some of the employees are exposed to harsh working conditions, which include mining underground (up to 80m deep), long working hours, shift work, sometimes an unsafe working environment, a highly unionised context and enormous pressure to perform. The amount and quality of coal produced and the support of this function is the way employees are measured and workers are thus in a constant mode of producing. The stress of constant production and assistance of production over extended periods of time in a difficult working environment could easily lead to burnout.

Burnout consists of the following factors: (Schaufeli and Enzmann, 1998).

- *Exhaustion* refers to feelings of being overextended and depleted of one's emotional and physical resources.
- *Cynicism* refers to the interpersonal dimension of burnout and is a negative, callous or detached response to various aspects of the job.
- *Personal efficacy* refers to the self-evaluation dimension of burnout and is a feeling of competence, productivity and achievement at work.

Research has shown that burnout is not only related to negative outcomes for the individual, including depression, a sense of failure, fatigue, loss of motivation, low morale and job dissatisfaction, but also to negative outcomes for the organisation, including absenteeism, turnover rates and lowered productivity (Maslach & Jackson, 1986).

According to Levert, Lucas and Ortlepp (2000), burned-out workers show a lack of commitment and are less capable of providing adequate services, especially along dimensions of decision-making and initiating involvement with clients (Fryer, Poland, Bross & Krugman, 1988; Maslach, 1982). Burned-out workers are also too depleted to give of themselves in a creative, co-operative fashion (Sammut, 1997). The consequences of burnout are potentially serious for employees, and the institutions in which they interact. It is the end result of consistently unmediated or unsuccessful attempts at mediating stressors in the environment on the part of the individual (Levert et al., 2000).

Burnout can be caused by biographical as well as organisational factors. Biographical factors that could explain burnout include age, work experience and sex.

Burnout is observed more often among younger employees compared to those older than 30 years. Burnout is negatively related to work experience (Cherniss, 1980; Künzel & Schulte, 1986; Maslach, Jackson & Leiter, 1996).

Women tend to score higher on emotional exhaustion, whereas men score higher on depersonalisation. According to Schaufeli and Enzmann (1998), this can partly be explained by sex role-dependent stereotypes.

Cash (1988) found that individuals with a higher level of education were more prone to burnout, possibly due to the higher expectations of more educated individuals.

Burnout also correlates with various self-reported indices of personal dysfunction, including increased use of drugs and alcohol (Maslach et al., 1996) and marital and family problems (Maslach & Jackson, 1986).

Burnout has also been shown to be “contagious” - managers suffering from burnout could negatively affect the organisation, spreading burnout to subordinates (Dubrin, 1990).

In the Pearson-Environment Fit Theory (Frenz, Caplan & Harrison, 1992) stress in work settings is attributed to the interaction of an individual with his or her work environment. According to Spielberger and Vagg (1999), a comprehensive assessment of work stress requires an evaluation of the specific aspects of one's job that produce job strain. According to Spielberger and Vagg (1999) stressors can include organisational factors, inherent factors, shortage of resources and stressful working conditions.

Organisational factors which have been shown to contribute to burnout are work overload (Bacharach, Bamberger & Conley, 1991; Landsbergis, 1988), poor collegial support (Golembiewski & Munzenrider, 1988), role conflict and role ambiguity (Miller, Ellis, Zook & Lyles, 1990), low levels of perceived control (Shirom, 1989) and lack of feedback (participation in decision making and autonomy). These factors represent “demands” on employees (also referred to as job stressors) that are included in most models of burnout.

Job Resources also have an influence on burnout and job stress. Job Resources include equipment required to perform work, i.e. the number of people available to assist in the work, and the physical equipment and supporting structures available to perform the work (Schaufeli & Enzmann, 1998).

Stress should not be confused with burnout. Schaufeli and Enzmann (1998) said burnout could be considered as a particular kind of prolonged job stress. An individual experiences job stress when the demands of the workplace exceed his or her adaptive responses. Burnout is a particular, multidimensional and chronic stress reaction that goes beyond the experience of mere exhaustion (Schaufeli & Enzmann, 1998).

Dispositional characteristics of individuals involve beliefs about the world and possibilities of dealing with it, and include constructs such as sense of coherence, personality hardiness and locus of control. For the purpose of this research, the focus is on employees' sense of coherence and its possible relationship to burnout and job stress.

The reason for deciding on sense of coherence is that it is a broad-band resource (Hobfoll, 2001), which is positively associated with coping with change (Fouche & Rothmann, 2001) and job satisfaction (Rothmann, 2001), and negatively associated with suicide ideation (Rothmann & Van Rensburg 2001) and burnout (Basson & Rothmann, 2002).

Antonovsky (1991) defined the concept of *Sense of Coherence* as "A global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement."

Antonovsky (1987) defines a sense of coherence as something that includes three dimensions that represent the concept, namely manageability, comprehensibility, and meaningfulness.

- *Manageability* refers to the extent to which individuals experience events in life as situations that are endurable or manageable, or even as new challenges.
- *Comprehensibility* refers to the extent to which one perceives stimuli from the internal and external environment as information that is ordered, structured and consistent. The stimuli are perceived as comprehensible and make sense on a cognitive level.
- *Meaningfulness* refers to the extent to which one feels that life is making sense on an emotional and not just a cognitive level.

Sense of coherence is a coping resource that is presumed to mitigate life stress by affecting the overall quality of one's cognitive and emotional appraisal of the stimuli that impact on one, which is, in turn, presumed to engender, sustain and enhance health as well as strength at other extremities. Antonovsky (1987) states that the primary development of the dynamics of sense of coherence takes place in the first decade of one's adult life. He also mentions that one's sense of coherence is tried continually, but individuals who developed a strong sense of coherence early in adulthood have the ability to use general resistance resources to restore equilibrium.

For the purpose of this research, sense of coherence can thus be viewed as a stable dispositional orientation. A strong sense of coherence is negatively related to measures of negative affectivity, such as anxiety and neuroticism (Flannery & Flannery, 1990; Frenz, Carey & Jorgenson, 1993) and work stress (Feldt, 1997). A strong sense of coherence is also positively related to competence and life satisfaction (Kalimo & Vuori, 1990), general wellbeing (Feldt, 1997), emotional stability (Mlonzi & Strümpfer, 1998) and successful coping with life stress (Mcsherry & Holm, 1994).

Lever et al. (2000) reported significant negative correlations between two components of burnout (emotional exhaustion and depersonalisation) and sense of coherence in a group of psychiatric nurses in South Africa. Gilbar (1998) found a significant positive correlation between social workers' Sense of Coherence and emotional exhaustion as well as a negative correlation between Sense of Coherence and personal accomplishment.

Rothmann, Malan and Rothmann (2001) found significant negative correlations between Sense of Coherence and emotional exhaustion (-0,56) and depersonalisation (-0,41) and a positive correlation with personal accomplishment.

A need exists to determine the relationship between burnout, job stress and sense of coherence of employees in the mining environment. No studies about these factors in the coal-mining industry were found in the literature and it could be valuable to engage in research regarding burnout, and specifically to the mining industry. The mining industry is a stressful industry to work in because of the nature of the environment, as mentioned earlier. Research in this industry regarding these variables would be beneficial in making recommendations for the handling of job stress and burnout and the fostering of a strong Sense of Coherence amongst employees. The objective of this study is thus to investigate the relationship between burnout, job stress and sense of coherence among employees in the Xstrata coal-mining group in South Africa.

## **METHOD**

### **Research Design**

A survey design was used to achieve the research objectives. To ensure representative across the middle to high management level, the cross-sectional design sampling technique is recommended, by means of which a sample is randomly drawn from a population at a particular point in time (Shaughnessy & Zechmeister, 1997). This design can be used to assess interrelationships among variables within a population. Random selection is important if we wish to draw accurate conclusions about the entire group of interest (Spector, 2000).

### **Study Population**

The participants are employees ( $N=163$ ) of Xstrata Coal South Africa. They were randomly selected from mainly the middle to high management level groups in the Tweefontein, Impunzi and Mpumlanga divisions. Employees from level 14 (mainly miner and artisan category) up to level 23 (Colliery manager's level) were to be included in the study.

*Table 1 presents some of the characteristics of participants.*

**Table 1***Characteristics of the Participants (N = 163)*

Item	Category	Percentage
Division worked for	Tweefontein	53.59
	Impunzi	34.64
	Mpumalanga	11.76
Mine worked for	South Witbank Colliery	14.81
	Spitzkop	9.88
	Tavistock	7.41
	Phoenix	5.56
	Waterpan	14.81
	Witcons	1.85
	Boschmans	8.02
	Other	22.22
	Sex	Male
Female		9.32
Employment category	Union Men	25.00
	Officials	75.00
Job Level	Cat 14-15	29.44
	Cat 16	36.20
	Cat 17 - 23	34.36
Area of work	Human Resources	9.86
	Mining	22.54
	Engineering	33.80
	Plant	5.63
	Surface	2.11
	Opencast	1.41
	Services	7.75
	Finances	2.11
	Administration	9.86
Years of Service	0-5 years	32.90
	6-10 years	41.29
	11-20 years	18.07
	21-25 years	5.16
Length of service at specific mine	0-5 years	69.68
	6-10 years	19.35
	11-20 years	6.45
	21-25 years	4.52
Previous experience in another mining house than Xstrata	Yes	69.03
	No	30.97

From Table 1 it can be seen that the majority of the participants came from the Tweefontein Division. The Waterpan and South Witbank Collieries had the highest number of participants. The majority of the participants were male (90,86%).

Officials constituted 75 percent of the participants, while the other 25 percent consisted of Union men. The Union Men category mainly consists of miners (who must have a blasting certificate) and artisans (who must have a registered trade test).

Almost 30 percent of the participants were from the Cat 14-15 (mainly artisans and miners) category, 36 percent represented category 16 (mainly shiftbosses and foremen) and 34 percent were from the 17-23 category (head of department level). The majority of participants were from the mining and engineering departments. These are also the largest departments with the most employees on the mines. The mining department is responsible for extracting coal, and the engineering department's responsibility is to maintain the equipment that is necessary to take out the coal. The plant is responsible to process the coal.

The majority of participants have been employed less than 10 years (74,19 percent). Almost 70 percent of participants indicated that they have had previous experience in the mining environment. The rest had not work for any mining company before they started at Xstrata Coal SA.

### **Measuring Instruments**

The following measuring instruments were used in this study:

- The *Maslach Burnout Inventory – General Survey* (MBI-GS) (Maslach et al., 1996) was used to measure the burnout of participants. The MBI-GS consists of 16 items in three sub-scales, namely Exhaustion, Cynicism and Professional Efficacy. Together the sub-scales of the MBI-GS provide a three-dimensional perspective on burnout.

Internal consistencies (Cronbach coefficient alphas) reported by Maslach et al (1996) varied from 0,87 to 0,89 for Exhaustion, 0,73 to 0,84 for Cynicism and 0,76 to 0,84 for Professional Efficacy. Test-retest reliabilities after one year were 0,65 (Exhaustion), 0,60 (Cynicism) and 0,67 (Professional Efficacy) (Maslach et al., 1996).

External validation of the MBI has been obtained from its convergence with peer ratings, job dimensions associated with burnout, and stress outcomes (Maslach & Jackson, 1986).

- The *Job Stress Inventory* (JSI) was used to assess the sources of job stress and lack of organisational support. In line with previous research (Spielberger & Vagg, 1999) this study addressed both the severity and frequency of stressors. Spielberger & Vagg (1999) compiled a list of 30 items regarded as common stressors in occupational context, and as such the JSI focuses on aspects of work situations that often result in psychological strain. Firstly, participants rated each of the items regarding their intensity of stress on a nine-point scale. Secondly, the frequency part of the questionnaire asked "how many times in the last six months" the source of stress had been experienced.
- The *Orientation to Life Questionnaire* (OLQ) (Antonovsky, 1987) was used to measure participants' Sense of Coherence. The OLQ consists of 29 items.

Antonovsky (1993) reported alpha coefficients of the OLQ in 29 research studies varying between 0,85 and 0,91. Test-retest reliability studies found coefficients between 0,41 and 0,97 (Antonovsky, 1993). Rothmann (2001) reported an alpha coefficient of 0,89 for the OLQ, which may be regarded as acceptable (Nunnally & Bernstein, 1994).

Regarding the construct validity (the degree to which a test questionnaire measures the theoretical construct or abstract variable it was intended to measure) of the OLQ, it was found that there is a negative relationship between the OLQ and experienced stress, and that the OLQ correlates negatively with the "State-Trait Anxiety Inventory-Trait" and the "Beck Depression Inventory" (Frenz et al., 1993).

## **Statistical Analysis**

The statistical analysis was carried out with the help of the SAS program (SAS Institute, 2000). Principal factors extraction with oblique rotation was performed through SAS FACTOR on the Job Stress Inventory, resulting in two factors namely lack of organisational support and job demands. Principal components extraction was used prior to principal factors extraction to estimate the number of factors, presence of outliers and factorability of the correlation matrices.

Cronbach alpha coefficients and inter-item correlations were used to assess the internal consistency of the measuring instruments (Clark & Watson, 1995). Coefficient alpha conveys important information regarding the proportion of error variance contained in a scale. According to Clark and Watson (1995), the average inter-item correlation coefficient (which is a straightforward measure of internal consistency) is a useful index to supplement information supplied by coefficient alpha. However, simply focusing on the mean inter-item correlation cannot ensure unidimensionality of a scale – it is necessary to examine the range and distribution of these correlations as well.

Descriptive statistics (e.g. means, standard deviations, skewness and kurtosis) were used to analyse the data.

Canonical correlation was used to determine the relationships between the dimensions of burnout, Sense of Coherence and stress. The goal of canonical correlation is to analyse the relationship between two sets of variables. Canonical correlation is considered a descriptive technique rather than a hypothesis-testing procedure (Tabachnick & Fidell, 2001).

Structural equation modelling (SEM) methods as implemented by AMOS (Arbuckle, 1999) were used to test the factorial validity of the MBI-GS and the hypothesised causal model of burnout, job stress and Sense of Coherence, using the maximum likelihood method. SEM is a statistical methodology that takes a confirmatory (i.e. hypothesis-testing) approach to the analysis of a structural theory bearing on some phenomenon (Byrne, 2001). Several aspects of SEM set it apart from the older generation of multivariate procedures (Byrne, 2001).

Firstly, it takes a confirmatory rather than an exploratory approach to data analysis. Furthermore, by demanding that the pattern of inter-variable relations be specified a priori, SEM lends itself well to the analysis of data for inferential purposes. Secondly, although traditional multivariate procedures are incapable of either assessing or correcting for measurement error, SEM provides precise estimates of these error variance parameters. Thirdly, SEM procedures can incorporate both unobserved (latent) and observed variables.

Hypothesised relationships are tested empirically for goodness of fit with the sample data. The  $\chi^2$  statistic and several other goodness-of-fit indices summarise the degree of correspondence between the implied and observed co-variance matrices. Jöreskog and Sörborn (1993) suggest that the  $\chi^2$  value may be considered more appropriately as a badness-of-fit rather than as a goodness-of-fit measure in the sense that a small  $\chi^2$  value is indicative of good fit. However, because the  $\chi^2$  statistic equals  $(N - 1)F_{\min}$ , this value tends to be substantial when the model does not hold and the sample size is large (Byrne, 2001). A large  $\chi^2$  relative to the degrees of freedom indicates a need to modify the model to better fit the data. Researchers have addressed the  $\chi^2$  limitations by developing goodness-of-fit indices that take a more pragmatic approach to the evaluation process.

One of the first fit statistics to address this problem was the  $\chi^2$ /degrees of freedom ratio (CMIN/DF). These criteria, commonly referred to as "subjective" or "practical" indices of fit, are typically used as adjuncts to the  $\chi^2$  statistic.

The Goodness of Fit Index (GFI) indicates the relative amount of the variances/co-variances in the sample predicted by the estimates of the population. It usually varies between 0 and 1 and a result of 0,90 or above indicates a good model fit. In addition, the Adjusted Goodness-of-Fit Index (AGFI) is given. The AGFI is a measure of the relative amount of variance accounted for by the model, corrected for the degrees of freedom in the model relative to the number of variables. The GFI and AGFI can be classified as absolute indices of fit because they basically compare the hypothesised model with no model at all (Hu & Bentler, 1995). Although both indices range from zero to 1,00, the distribution of the AGFI is unknown, therefore no statistical test or critical value is available (Jöreskog & Sörborn, 1986).

The parsimony goodness-of-fit index (PGFI) addresses the issue of parsimony in SEM (Mulaik et al., 1989). The PGFI takes into account the complexity (i.e., number of estimated parameters) of the hypothesised model in the assessment of overall model fit and provides a more realistic evaluation of the hypothesised model. Mulaik et al. (1989) suggested that indices in the 0,90's accompanied by PGFIs in the 0,50's are not unexpected, however, values > 0,80 are considered to be more appropriate (Byrne, 2001).

The Normed Fit Index (NFI) is used to assess global model fit. The NFI represents the point at which the model being evaluated falls on a scale running from a null model to a perfect fit. This index is normed to fall on a 0 to 1 continuum. Marsh, Balla and Hau (1996) suggest that this index is relatively insensitive to sample sizes. The Comparative Fit Index (CFI) represents the class of incremental fit indices in that it is derived from the comparison of a restricted model (i.e., one in which structure is imposed on the data) with that of an independence (or null) model (i.e., one in which all correlations among variables are zero) in the determination of goodness-of-fit. The Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), is a relative measure of co-variation explained by the model that is specifically developed to assess factor models.

For these fit indices (NFI, CFI and TLI), it is more or less generally accepted that a value of less than 0,90 indicates that the fit of the model can be improved (Hoyle, 1995), although a revised cut-off value close to 0,95 has recently been advised (Hu & Bentler, 1999).

To overcome the problem of sample size, Browne and Cudeck (1993) suggested using the Root Mean Square Error of Approximation (RMSEA) and the 90 percent confidence interval of the RMSEA. The RMSEA estimates the overall amount of error; it is a function of the fitting function value relative to the degrees of freedom. The RMSEA point estimate should be 0,05 or less and the upper limit of the confidence interval should not exceed 0,08. Hu & Bentler (1999) suggested a value of 0,06 to be indicative of a good fit between the hypothesised model and the observed data. MacCallum, Browne and Sugawara (1996) recently elaborated on these cut-off points and noted that RMSEA values ranging from 0,08 to 0,1 indicate mediocre fit, and those greater than 0,1 indicate poor fit.

## RESULTS

Data analyses for the test of the factorial validity of the MBI-GS proceeded as follows: First, a quick overview of model fit was done by looking at the overall  $\chi^2$  value, together with degrees of freedom and probability value. Global assessments of model fit were based on several goodness-of-fit statistics (GFI, AGFI, PGFI, NFI, TLI, CFI and RMSEA); secondly, given findings of an ill-fitting initially hypothesised model, analyses proceeded in an exploratory mode. Possible misspecifications as suggested by the so-called modification indices were looked for, and eventually a revised, re-specified model was fitted to the data. The full hypothesised 3-factor model consisting of all 16 items was tested.

*Table 2 presents fit statistics for the test of the original model.*

**Table 2**

*Goodness-of-Fit Statistics for the Hypothesised MBI-GS Model*

Model	$\chi^2$	$\chi^2/df$	GFI	AGFI	PGFI	NFI	TLI	CFI	RMSEA
Model 1	222.08	2.20	0.85	0.80	0.63	0.78	0.84	0.86	0.09
Model 2	196.75	2.26	0.86	0.80	0.62	0.80	0.85	0.87	0.09
Model 3	130.52	1.76	0.91	0.87	0.64	0.84	0.91	0.92	0.07

The statistically significant  $\chi^2 (101) = 222,08$  ( $p < 0,00$ ) revealed a relatively poor overall fit of the originally hypothesised MBI model. However, both the sensitivity of the likelihood ratio test to sample size and its basis on the central  $\chi^2$  distribution, which assumes that the model fits perfectly in the population, have been reported to lead to problems of fit (Jöreskog & Sörbom, 1993). Furthermore, the hypothesised model (Model 1) was also not that good from a practical perspective. The PGFI value lower than 0,80, NFI, TLI and CFI values lower than 0,95 and RMSEA value higher than 0,05 are indicative of failure to confirm the hypothesised model.

To pinpoint possible areas of misfit, standardised residual values were examined. Standardised residuals are fitted residuals divided by their asymptotically (large sample) standard errors (Jöreskog & Sörbom, 1988). In essence, they represent estimates of the number of standard deviations the observed residuals are from the zero residuals that would exist if model fit was perfect (Byrne, 2001). Values  $> 2,58$  are considered to be large (Jöreskog & Sörbom, 1988).

### **Post hoc analyses**

Given rejection of the initially postulated 3-factor model, the focus shifted from model testing to model development (exploratory factor analysis). Considering the high standardised residuals of one item, it was decided to re-specify the model with Item 13 deleted. All subsequent analyses are now based on the 15-item revision, which is labelled here as Model 2. The fit statistics are presented in Table 2.

Although the various fit indices for this model are substantially improved compared to those for the initial model, there is still some evidence of misfit in the model. For example, the  $\chi^2(86) = 196,75$  ( $p < 0,00$ ) was still statistically significant, while the PGFI values were only marginally adequate. Considering the high standardised residuals of one item, it was decided to re-specify the model with Item 10 deleted. All subsequent analyses are now based on the 14-item revision (includes the three factors), which is labelled here as Model 3. Table 2 summarises the goodness-of-fit statistics of Model 3.

The fit statistics in Table 2 indicate a relatively good fit for the re-specified model. Although the  $\chi^2(74) = 130,52$  ( $p < 0,00$ ) is still high, it is considerably lower than in Model 1. All the other fit statistics indicate good fit of the measurement model to the data. Since this model fit was satisfactory and the results agreed with the theoretical assumptions underlying the structure of the MBI-GS, no further modifications of the model were deemed necessary. The correlations between the three burnout dimensions are as follows: Exhaustion and Cynicism show the highest correlation of 0,51, followed by Cynicism and Professional Efficacy with a correlation of -0,15 and exhaustion and Professional Efficacy with a correlation of -0,07 respectively.

**Factor analysis of the intensity of job stress items:**

The results of the factor analysis of the intensity of the job stress items are given in Table 5.

*Loadings of variables on factors, communalities and percentage of variance and co-variance are shown in Table 3.*

**Table 3**

*Factor loadings, Communalities ( $h^2$ ), Percentage Variance and Co-variance for Oblique Rotation on Job Stress Items (JSI)*

Number		$F_1^a$	$F_2$	$h^2$
1	Conflicts with other departments	0.00	0.75	0.56
2	Lack of supervisor support	0.00	0.71	0.53
3	Interruptions	0.00	0.68	0.46
4	Assignment of unfamiliar duties	0.00	0.67	0.53
5	Competition for advancement	0.00	0.66	0.45
6	Excessive paperwork	0.00	0.65	0.44
7	Periods of inactivity	0.00	0.65	0.43
8	Lack of recognition	0.00	0.61	0.40
9	Dealing with crisis situations	0.00	0.58	0.34
10	Meeting deadlines	0.00	0.48	0.24
11	Making critical decisions	0.00	0.00	0.19
12	Personal insult from customer/colleague	0.49	0.00	0.25
13	Inadequate supervision	0.51	0.00	0.33
14	Covering work for others	0.52	0.00	0.32
15	Insufficient personnel to handle assignment	0.56	0.00	0.31
16	Difficulty to get along with supervisor	0.60	0.00	0.46
17	Assignment of disagreeable duties	0.63	0.00	0.43
18	Inadequate salary	0.63	0.00	0.48
19	Lack of participation in policy-making decisions	0.63	0.00	0.44
20	Performing tasks not in job description	0.64	0.00	0.42
21	Fellow-workers not doing their job	0.64	0.00	0.42
22	Negative attitudes towards Xstrata Coal SA	0.64	0.00	0.41
23	Poor/inadequate equipment	0.64	0.00	0.42
24	Poorly motivated workers	0.66	0.00	0.46
25	Assignment of increased responsibility	0.67	0.00	0.48
26	Insufficient personal time	0.72	0.00	0.51
27	Making critical on-the-spot decisions	0.72	0.00	0.16
28	Changes from boring to demanding activities	0.73	0.00	0.54
	Percentage co-variance	54.20	45.80	
	Percentage variance	31.24	26.40	
	Squared Multiple Correlation (SMC)	0.91	0.88	

a Factor labels:

F1 Job Demands

F2 Lack of Organisational Support

Principal components extraction through SAS FACTOR was used in an initial run to estimate the number of factors of the JSI using the scree-plot and eigen values. It was indicated that two factors should be extracted. When oblique rotation was requested, factors showed an inter-correlation of 0,48. It was therefore decided not to continue with a varimax rotation.

Variables are ordered and grouped by size of loading to facilitate interpretation. Loadings under 0,45 (20% of variance) are replaced by zeros. Labels are suggested for each factor in a footnote. As indicated by the SMCs, both factors were internally consistent and well-defined by the variables. Communality values, as seen in Table 3, tended to be low to moderate. With a cut-off of 0,45 for inclusion of a variable in the interpretation of a factor, one item did not load on the two factors. This item dealt with making critical decisions.

*The descriptive statistics, alpha coefficients and inter-item correlation coefficients of the MBI-GS, OLQ and JSI are given in Table 4.*

**Table 4**

*Descriptive Statistics, Alpha Coefficients and Inter-Item Correlation Coefficients of the Measuring Instruments*

Item	Mean	SD	Skewness	Kurtosis	r (Mean)	$\alpha$
<b>Burnout</b>						
Exhaustion	9.07	0.06	0.45	0.66	0.57	0.87
Cynicism	4.61	0.15	0.23	0.62	0.35	0.67
Professional Efficacy	29.44	0.15	0.14	0.62	0.39	0.77
<b>Sense of Coherence</b>						
OLQ Total	146.47	0.11	-0.12	0.58	0.23	0.89
<b>Job Stress</b>						
Job Demands	64.85	0.09	0.09	0.15	0.41	0.91
Lack of Organisational Support	49.04	0.09	0.22	0.62	0.40	0.88

It can be seen in Table 4 that the scores of all the scales are normally distributed, considering the skewness and kurtosis. The Cronbach alpha coefficients of all the scales, except for Cynicism, are considered to be acceptable compared to the guideline of  $\alpha > 0,70$ , although this is an arbitrary value. Values of  $\alpha > 0,60$  may still be deemed acceptable (Nunnally & Bernstein, 1994). Furthermore, the inter-item correlations are considered acceptable compared to the guideline of  $0,15 < r < 0,50$  (Clark & Watson, 1995). Exhaustion does however show a somewhat high inter-item correlation.

*The intensity, frequency and severity of job stressors in the mining industry are reported in Table 5. (For the purposes of this study the severity of a stressor was regarded as the product of intensity multiplied by the frequency of occurrence.)*

**Table 5***Intensity, Frequency and Severity of Stressors in the Mining Industry*

	Intensity	Frequency	Severity
<b>Job Demands</b>			
Interruptions	5.00	4.90	24.50
Meeting deadlines	4.70	5.17	24.30
Working overtime	3.88	5.95	23.09
Dealing with crisis situations	4.92	4.55	22.39
Assignment of increased responsibility	4.75	4.60	21.85
Excessive paperwork	5.37	3.45	18.53
Performing tasks not in job description	4.30	4.08	17.54
Assignment of unfamiliar duties	4.34	3.78	16.41
Changes from boring to demanding activities	4.06	4.00	16.24
Covering work for others	4.04	3.76	15.19
Assignment of disagreeable duties	4.75	2.35	11.16
Making critical decisions	4.08	4.43	8.51
Insufficient personnel to handle assignment	3.28	2.35	7.71
Insufficient personal time	3.93	1.94	7.62
<b>Lack of Organisational Support</b>			
Fellow-workers not doing their job	5.85	5.10	29.84
Poor or inadequate equipment	5.30	3.77	19.98
Inadequate salary	5.18	3.82	19.79
Poorly motivated co-workers	4.92	4.02	19.78
Lack of opportunity for advancement	5.37	3.45	18.53
Lack of recognition	5.04	3.39	17.09
Conflict with other departments	4.53	3.30	14.95
Inadequate support by supervisor	5.01	2.92	14.63
Lack of participation in policy-making decisions	4.64	2.98	13.83
Competition for advancement	4.48	2.98	13.35
Periods of inactivity	4.29	2.16	9.27
Negative attitudes towards Xstrata Coal SA	3.96	2.28	9.03
Personal insult from customer/colleague	4.24	2.11	8.95
Poor or inadequate supervision	4.12	2.02	8.32
Difficulty to get along with supervisor	3.93	1.94	7.62

Table 5 shows that fellow-workers not doing their job, interruptions, meeting deadlines, working overtime, dealing with crisis situations, assignment of increased responsibility, poor or inadequate equipment and inadequate salary are regarded as stressors with the highest severity.

Items with the highest intensity were fellow-workers not doing their job (also highest on severity), excessive paperwork, lack of opportunity for advancement, poor or inadequate equipment, and inadequate salary.

Items which loaded highest on frequency were working overtime, meeting deadlines, fellow-workers not doing their job, interruptions, assignment of increased responsibility, dealing with crisis situations, working overtime and making critical decisions.

Table 5 shows that insufficient personnel to handle assignments, insufficient personal time, poor or inadequate supervision and difficulty to get along with the supervisor are regarded as the stressors lowest on severity.

Items which loaded the lowest on intensity were insufficient personnel to handle assignment, insufficient personal time, negative attitude towards Xstrata Coal SA (this indicates that there are a positive attitude towards the organisation), and difficulty to get along with a supervisor (supervision is not a problem).

Items which loaded the lowest on frequency were insufficient personal time, periods of inactivity, personal insult from a colleague/customer poor or inadequate supervision, and difficulty of getting along with the supervisor (supervision is not an issue).

*The Pearson product-moment correlation coefficients between burnout, stress and sense of coherence are given in Table 6.*

**Table 6***Product-Moment Correlation Coefficients between the Measuring Instruments*

	OLQ	JD	LOS	EX	CY
Exhaustion	-0.52 <sup>++</sup>	0.31 <sup>+</sup>	0.45 <sup>+</sup>		
Cynicism	-0.56 <sup>++</sup>	0.18	0.17	0.40 <sup>+</sup>	
Professional Efficacy	0.33 <sup>+</sup>	-0.00 <sup>*</sup>	-0.06	0.03 <sup>*</sup>	0.14
Job Demands	-0.25		0.64 <sup>++</sup>	0.31 <sup>+</sup>	0.18
Lack of Organisational Support	-0.40 <sup>+</sup>	0.64 <sup>++</sup>		0.45 <sup>+</sup>	0.17

OLQ = Orientation to Life total score; JD = Job Demands; LOS = Lack of Organisational Support; EX = Exhaustion; CY = Cynicism; PE = Professional Efficacy

\* Statistically significant correlation:  $p \leq 0,05$

+ Practically significant correlation (medium effect):  $r \geq 0,30$

++ Practically significant correlation (large effect):  $r \geq 0,50$

Table 6 shows a statistically significant negative correlation between Exhaustion and Cynicism on the one hand (practically significant, medium effect) and a Lack of Organisational support (practically significant, medium effect) and Sense of Coherence (large effect) on the other. Sense of Coherence (large effect) also shows a practically significant positive correlation (medium effect) with Professional Efficacy.

Exhaustion shows a practically significant correlation (medium effect) with Job Demands, Lack of Organisational Support and Cynicism. It shows a statistically significant correlation with Professional Efficacy.

Cynicism shows a practically significant correlation (large effect) with Sense of Coherence and a practically significant correlation (medium effect) with Exhaustion.

Professional Efficacy shows a practically significant correlation (medium effect) with Sense of Coherence and statistically significant correlations with Job Demands and Exhaustion. Job Demands show a practically significant correlation (large effect) with lack of organisational support and a practically significant correlation (medium effect) with Exhaustion.

It also shows a statistically significant correlation with Professional Efficacy. Lack of Organisational Support shows a practically significant correlation (large effect) with Job Demands and a practically significant correlation (medium effect) with Sense of Coherence and Exhaustion.

Canonical correlation was performed between a set of stressors and Sense of Coherence and a burnout set using SAS CANCELL. Shown below are correlations between the variables and their canonical variates, standardised canonical variate coefficients, within-set variance accounted for by the canonical variates (percentage of variance), redundancies and canonical correlations.

*The results of the canonical correlation analysis of stressors, sense of coherence and burnout are shown in Table 7.*

**Table 7***Results of the Canonical Analysis: Sense of Coherence, Job Stress and Burnout*

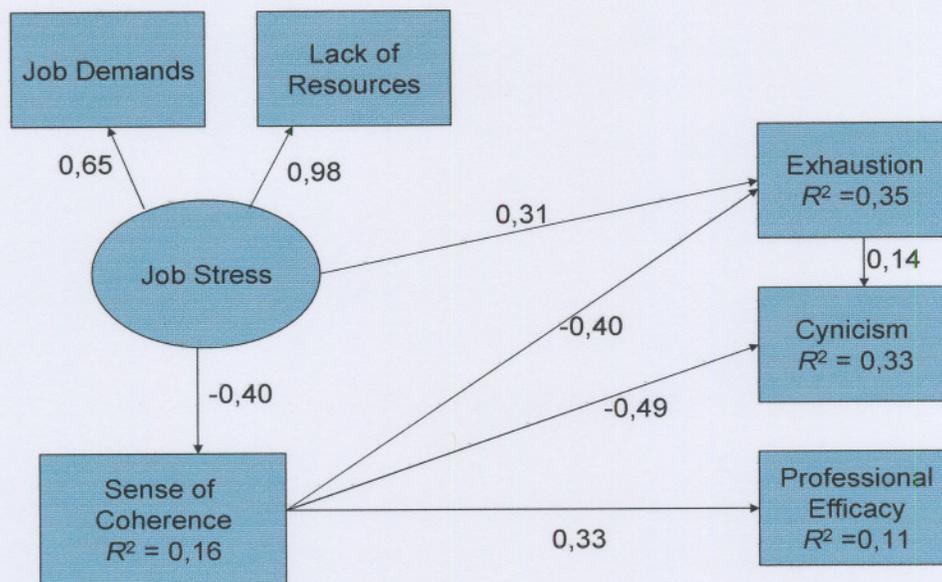
	First Canonical Variate		Second Canonical Variate	
	Correlation	Coefficient	Correlation	Coefficient
<b>Stressor Set</b>				
Sense of Coherence	-0.99	-0.92	0.14	0.56
Job Demands	0.37	0.06	0.47	-0.12
Lack of Organisational Support	0.52	0.12	0.85	1.15
Percentage Variance	0.46		0.32	
Redundancy	0.23		0.03	
<b>Burnout Set</b>				
Exhaustion	0.78	0.56	0.61	0.93
Cynicism	0.78	0.51	-0.44	-0.77
Professional Efficacy	-0.44	-0.36	0.36	0.28
Percentage Variance	0.47		0.24	
Redundancy	0.23		0.02	
Canonical Correlation	0.71		0.32	

The first canonical correlation was 0,71 (50% overlapping variance); the second was 0,32 (10% overlapping variance). With both canonical correlations included,  $F(9, 382,25) = 16,80$ , ( $p < 0,00$ ), and with the first canonical correlation removed,  $F(4, 316) = 4,68$ , ( $p < 0,00$ ). Subsequent F-tests were not statistically significant ( $p < 0,0001$ ). Therefore the first two pairs of canonical variates accounted for the significant relationships between the two sets of variables. However, interpretation of the second canonical variate is questionable because of the relatively small percentage of variance explained by the two sets in the variate (Tabachnick & Fidell, 2002). The first canonical variate, therefore, accounted for the significant relationship between the two sets of variables. Total percentage of variance and total redundancy indicate that the first pair of canonical variates were moderately related, but the second pair was only somewhat related, thus interpretation of the second pair is questionable.

With a cut-off correlation of 0,30, the variables in the stressor set that were correlated with the first canonical variate were Sense of Coherence, Job Demands and Lack of Organisational Support. Among the Burnout variables, Exhaustion, Cynicism and Professional Efficacy correlated with the first canonical variate. The first pair of canonical variates indicates that a weak Sense of Coherence (-0,99), pressures because of job demands (0,37) and a lack of organisational support (0,52) are associated with higher levels of exhaustion (0,78), cynicism (0,78) and lowered Professional Efficacy (-0,44).

The proposed model, including hypothesised relationships, was tested by means of SEM analysis. Results indicated that the model did fit the data adequately,  $\chi^2 (7) = 9,85$ , GFI = 0,98, RMSEA = 0,05, CFI = 0,99, IFI = 0,99 and TLI = 0,98.

*The final model is given in Figure 1.*



**Figure 1**

*Maximum likelihood estimates for the burnout model, (N = 163).*

*Note: all factor loadings and path coefficients are significant at the  $p < 0,01$  level*

The relationships of Lack of Resources and Job Demands to job stress are significant, and the regression coefficient shows Lack of Resources to have a high loading on job stress. Job stress also shows significant loadings on Sense of Coherence and exhaustion. Specifically, the relationship of job stress to Sense of Coherence is negative. The significant negative relationship of Sense of Coherence to Exhaustion indicates a moderating effect for Sense of Coherence between job stress and exhaustion. From this can be deduced that employees' Exhaustion because of job stress is influenced by their level of Sense of Coherence. There is also a significant relationship between Exhaustion and Cynicism. This indicates that employees' Exhaustion also acts to mediate the effect of job stress on their cynicism (job stress and cynicism show a significant correlation). The relationship between Sense of Coherence and Cynicism is also significant, again implying a mediating effect for Sense of Coherence between job stress and cynicism. The relationship between Sense of Coherence and Professional Efficacy is less clear.

Although it might be argued that a strong Sense of Coherence leads to greater experience of Professional Efficacy, a stronger belief in Professional Efficacy might also foster high levels of Sense of Coherence. Since this model still does not highlight causality, both these options are possible.

## **DISCUSSION**

All measuring instruments showed acceptable levels of reliability and validity, pointing to their acceptability for analysis in the current study. A three-factor structure of burnout was confirmed. This included Exhaustion, Cynicism and Professional Efficacy.

The two extracted factors regarding job stress, (job demands and lack of organisational support) support previous research (Spielberger & Vagg, 1999) regarding stressors in organisational environments (JSI).

As far as job stress is concerned, it was seen that interruptions, meeting deadlines, working overtime, dealing with crisis situations and the assignment of increased responsibility were the most severe stressors associated with job demands (see Table 5). These stressors are possibly the result of a much leaner work-force and “flatter” structure in Xstrata Coal SA. After Xstrata Coal SA took over Duiker, restructuring and retrenchments took place. The work-force dropped from 7366 employees to 4137 employees in just six years. This meant adjustments to the new roles that involved much more responsibilities, because there are less people to do the job. Stress because of the lack of organisational support was attributed to fellow-workers not doing their job, poor or inadequate equipment, inadequate salary, poorly motivated co-workers and the lack of opportunity for advancement (Table 5). Combined with stressful job demands (which included the most severe stressors), stress related to a lack of organisational support could result in perceptions of a lack of reciprocity, which will contribute to burnout (Schaufeli & Enzmann, 1998).

The five most severe stressors regarding organisational support were fellow-workers not doing their job, poor or inadequate equipment, inadequate salary, poorly motivated co-workers and the lack of opportunity for advancement (see Table 5).

Equipment, remuneration and opportunities for advancement are organisational factors that can and should be by the employer. Providing correct equipment will aid employees in performing their tasks, while opportunities for advancement can be addressed by careful career planning.

Although the stressors with the highest severity were found in the demands category, structural equation modelling shows a lack of resources to be the strongest contributor to job stress.

A negative relationship exists between Exhaustion and Cynicism on the one hand, and a lack of organisational support and Sense of Coherence on the other. This could be interpreted to mean that those employees with a weak Sense of Coherence, who also experience a lack of organisational support, are more prone to feelings of exhaustion and the development of cynical attitudes towards their work and employer. Sense of Coherence is also positively related to feelings of Professional Efficacy. A possible interpretation is that those individuals with a strong Sense of Coherence also develop positive beliefs about their personal efficacy (Figure 1).

Feelings of exhaustion are positively related to a low Sense of Coherence and high levels of job demands, lacking organisational resources and cynical feelings. This could be interpreted to mean that those employees with a weak Sense of Coherence are more prone to feelings of exhaustion. Those employees who experience an overload of job demands and a lack of organisational support are also more prone to feelings of exhaustion. The negative relationship between Exhaustion and Professional Efficacy can be indicative of higher exhaustion levels eroding feelings of Professional Efficacy.

Cynicism was negatively related to Sense of Coherence. This can be interpreted to mean that employees with a weak Sense of Coherence are more prone to develop negative feelings or cynical attitudes towards their employer and their work.

Job demands was positively related to feelings of exhaustion and negatively to Professional Efficacy.

This could be interpreted to mean that those employees with a high level of job demands also perceive themselves as less efficacious and that they are more prone to exhaustion. This could again lead to lower levels of Professional Efficacy. Lack of organisational support was related to Sense of Coherence and Exhaustion. This could be interpreted to mean that employees who experience feelings of lacking organisational support are likely to experience pressure on their personal Sense of Coherence and increasing exhaustion. High levels of job demands and the lack of organisational support lead to higher levels of exhaustion and erode Professional Efficacy.

The results of the canonical analysis in this study (Table 7) showed that Sense of Coherence combined with job stressors are related to exhaustion, cynicism and Professional Efficacy. This finding confirms the results of Basson and Rothmann (2002) and Wissing, De Waal and De Beer (1992).

Individuals in the mining industry who have a weak Sense of Coherence and experience high job demands and a lack of organisational resources are also those who show high levels of exhaustion and cynicism and low levels of Professional Efficacy.

The structural model showed that Sense of Coherence moderated the effect of job stress on exhaustion. It was shown that job stress impacts on exhaustion and Sense of Coherence, but that a strong Sense of Coherence moderates the effect of job stress on exhaustion. The results suggest that the effect of exhaustion on cynicism is mediated by Sense of Coherence, while the effect of job stress on Professional Efficacy is mediated by Sense of Coherence. This could be interpreted to mean that low Professional Efficacy results because of a weak Sense of Coherence, if one considers Sense of Coherence to be a dispositional characteristic. Accordingly, it seems that Sense of Coherence can act to mitigate the effects of job stress on exhaustion. Sense of Coherence might also protect the employee from developing cynical attitudes towards their work when stress gets worse.

## **RECOMMENDATIONS**

Xstrata Coal SA should pay attention to employees' sense of coherence, job stress and burnout. A combined management and educational approach needs to exist to allow this process to succeed.

Information needs to be provided in an ordered, consistent, structured and understandable format to contribute to the employees' sense of coherence. Training to address sense of coherence development must also be investigated. Roles of employees need to be identified within the greater whole, and thus enhancing the comprehensibility component of sense of coherence.

By ensuring a balance in the load of tasks to be handled and equipping employees with the necessary knowledge, skills, material, instruments and other resources, the employees will increasingly feel that the work expectations are manageable and within their power and that their work is meaningful and of importance to others.

Job stressors in Xstrata Coal SA should be addressed; specifically those related to job demands such as interruptions, meeting deadlines, working overtime, dealing with crisis situations and assignment of increased responsibility. Employees should be given the tools to handle these stressors; they must be properly equipped. This can be achieved by improving and teaching them proper time management techniques.

Their workload should also be assessed. More attention should be given to crisis management interventions and employees must be properly prepared for the increased responsibility of their job.

The issue of frequent interruptions should also be addressed, the open door policy should still exist, but it must be managed and visitors should be screened and people must be urged to make appointments.

One must keep in mind that items related to lack of organisational support included fellow-workers not doing their job. This perception must be investigated, since it seemingly leads to employees putting even more pressure on themselves because they feel that fellow-workers are not doing their job properly and they end up doing others' jobs. A system should be introduced so that workers can be assessed to determine whether they are doing their job or not. If this is not the case, steps should be taken to improve the situation. Supervisors must feel comfortable to delegate tasks and must not feel that it will not be done properly.

More research needs to be done on burnout, job stress and sense of coherence in other coal-mines in South Africa. In Xstrata Coal further research is needed on the engagement (opposite of burnout) factor.

Future research should be longitudinal to pinpoint the causal nature of and determine the relationship between variables so as to ascertain which variables are causes of burnout. Research with the inclusion of personality dimensions should be undertaken to establish the effects of personality differences on burnout dimensions.

## REFERENCES

- Antonovsky, A. (1987). *Unravelling the mystery of health: How people manage stress and stay well*. San Francisco, CA: Jossey-Bass.
- Antonovsky, A. (1991). The structural sources of salutogenic strengths. In C.L. Cooper & R. Payne (Eds.), *Personality and stress: Individual differences in the stress process*. New York: Wiley.
- Antonovsky, A. (1993). The structure and properties of the sense of coherenceSense of Coherence scale. *Social Science and Medicine*, 36, 725-733.
- Arbuckle J.L. (1997). Amos users' guide version 4.0. Chicago: Smallwaters Corporation
- Arbuckle, J.L. (1999). Amos 4.0. Chicago, IL: Smallwaters.
- Bacharach, S. B., Bamberger, P. & Conley, S. (1991). Work-home conflict among nurses and engineers: Mediating the impact of role stress on burnout and satisfaction at work. *Journal of Organizational Behaviour*, 12, 39-53.
- Basson, M.J. & Rothmann, S. (2002). Sense of coherenceSense of Coherence, coping and burnout of pharmacists. *South African Journal of Economic and Management Sciences*, 5(1), 35-62.
- Browne, M.W. & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp.136-162). London:Sage.
- Byrne, B. M. (2001). *Structural equation modelling with Amos: Basic concepts, applications and programming*. Mahwah, NJ: Lawrence Erlbaum.
- Cash, D. (1988). A study of the relationship of demographics, personality, and role stress to burnout in intensive care unit nurses. *Dissertation Abstracts International*, 49, 2585A.
- Cherniss, C. (1980). *Staff burnout*. Beverly Hills, CA: Sage.
- Clark, L.A. & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7, 309-319.
- Dubrin, A.J. (1990) *Effective business psychology* (3<sup>rd</sup> ed.) Englewood Cliffs, NJ: Prentice-Hall
- Feldt, T. (1997). The role of sense of coherenceSense of Coherence in wellbeing at work: Analysis of main and moderator effects. *Work and Stress*, 11, 134-147.
- Flannery, R.B. & Flannery, G.J. (1990). Sense of coherenceSense of Coherence, life stress, and psychological distress: A prospective methodological enquiry. *Journal of Clinical Psychology*, 46, 415-420.

- FOUCHE, E. & ROUIMAH, S. (2001). *Bestuurders se coping met verandering: 'n Kognitiewe benadering*. *Tydskrif vir Bedryfsielkunde*, 27(1), 32-38.
- Frenz, J.R.P., Caplan, R.D. & Harrison, R.V. (1982). *The mechanisms of job stress and strain*. Chichester: Wiley.
- Frenz, A.W., Carey, M.P. & Jorgensen, R.S. (1993). Psychometric evaluation of Antonovsky's sense of coherenceSense of Coherence scale. *Psychological Assessment*, 5, 145-153.
- Fryer, G., Poland, J., Bross, D. & Krugman, R. (1988). The child protective service worker: A profile of needs, attitudes and utilisation of professional resources. *Child Abuse and Neglect*, 12, 481-490.
- Gilbar, O. (1998). Relationship between burnout and sense of coherenceSense of Coherence in health social workers. *Social Work in Health Care*, 26(3), 39-49
- Golembiewski, R.T. & Munzenrider, R.F. (1988). *Phases of burnout: Development in concepts and applications*. New York: Praeger.
- Hobfoll, S.E. (2001). The influence of culture, community and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review*, 50, 337-369.
- Hoyle, R.H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues. In R.H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 1-15). Thousand Oaks, CA: Sage.
- Hu, L-T. & Bentler, P.M. (1995) Evaluating model fit. In R.H. Hoyle (Ed), *Structural equation modelling: Concepts, issues, and applications* (pp. 76-99). Thousand Oaks, CA:Sage
- Jöreskog, K.G. & Sörbom, D. (1988). *LISREL 7: A guide to the program and applications*. Chicago: SPSS, Inc.
- Kalimo, R., & Vuori, J. (1990). Work and sense of coherenceSense of Coherence: Resources for competence and life satisfaction. *Behavioural Medicine*, 16, 76-89.
- Kunzel, R., & Schulte, D. (1986). Burnout and reality shock among clinical psychologists. *Zeitschrift für Klinische Psychologie, Forschung und Praxis*, 15, 303-320.
- Landsbergis, P.A. (1988). Occupational stress among health care workers: A test of the job demands-control model. *Journal of Organizational Behaviour*, 9, 217-239.
- Lever, T., Lucas, M. & Ortlepp, K. (2000). Burnout in psychiatric nurses: Contributions of the work environment and a Sense of CoherenceSense of Coherence. *South African Journal of Psychology*, 30, 36-43.

- MacCallum, R.C., Browne, M.W. & Sugawara, H.M. (1996). Power analysis and determination of sample size for co-variance structure modelling. *Psychological Methods*, *1*, 130-149.
- Marsh, H.W., Balla, J.R. & Hau, K.T. (1996). An evaluation of Incremental Fit Indices: A clarification of mathematical and empirical properties. In G.A. Marcoulides & R.E. Scumaker (Eds.), *Advanced structural equation modelling: Issues and techniques* (pp. 315-353). Mahwah, NJ: Erlbaum.
- Maslach, C. & Jackson, S.E. (1986). *The Maslach Burnout Inventory* (2<sup>nd</sup> ed.). Palo Alto, CA: Consulting Psychologists Press.
- Maslach, C. (1982) *Burnout: The cost of caring*. Englewood Cliffs, NJ: Prentice Hall.
- Maslach, C., Jackson, S.E. & Leiter, M. (1996). *Maslach Burnout Inventory: Manual* (3<sup>rd</sup> ed.). Palo Alto, CA: Consulting Psychologists Press.
- McSherry, W.C. & Holm, J.E. (1994). Sense of coherenceSense of Coherence: Its effects on psychological and physiological processes prior to, during, and after a stressful situation. *Journal of Clinical Psychology*, *50*, 476-487.
- Miller, K.I., Ellis, B.H., Zook, E.G. & Lyles, J.S. (1990). An integrated model of communication, stress, and burnout in the work place. *Communication Research*, *17*, 200-326.
- Mlonzi, E.N., & Strümpfer, D.J.W. (1998). Antonovsky's sense of coherenceSense of Coherence scale and 16PF second-order factors. *Social Behaviour and Personality*, *26*, 39-50.
- Mulaik, S.A., James, L.R., Van Alstine, J., Bennett, N., Lind, S. & Stilwell, C.D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, *105*, 430-445.
- Nunnally, J. & Bernstein, I.H. (1994). *Psychometric theory* (3<sup>rd</sup> ed.). New York: McGraw-Hill
- Rothmann, S. & Van Rensburg, P. (2001, May). *Suicide ideation in the South African Police Services*. Paper presented at the 10<sup>th</sup> European Congress on Work and Organizational Psychology, Prague, Czech Republic.
- Rothmann, S. (2001). Sense of coherence, locus of control, self-efficacy and job satisfaction. *Journal of Economic and Management Sciences*, *5*(1), 41-65.
- Rothmann, S., Malan, M.M. & Rothmann, J.C. (2001, August). Sense of coherence, coping and burnout in a corporate pharmacy group'. Paper presented at the 7th Annual PsySSA Conference, Johannesburg.

- Journal of Advanced Nursing, 26, 20-24.
- SAS Institute. (2000). *The SAS System for Windows: Release 8.01* Cary, NC: SAS Institute Inc.
- Schaufeli, W.B. & Enzmann, D. (1998). *The burnout companion to study and practice: A critical analysis*. London: Taylor & Francis.
- Shaughnessy, J.J. & Zechmeister, E.B. (1997). *Research methods in psychology* (4<sup>th</sup> ed.). New York: McGraw-Hill.
- Shirom, A. (1989). Burnout in work organizations. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology*. Chichester: John Wiley.
- Spector, P. E. (2000). *Industrial and organizational psychology: Research and practice* (2<sup>nd</sup> ed.). New York: John Wiley.
- Spielberger, C.D. & Vagg, P.R. (1999). *Job Stress Survey: Professional manual*. Odessa, FL: Psychological Assessment Resources, Inc.
- Tabachnick, B.G. & Fidell, L.S. (2002). *Using multivariate statistics* (4<sup>th</sup> ed.). Boston, Ma: Allyn & Bacon.
- Tucker, L.R. & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, 38, 1-10.
- Wissing, M.P., de Waal, M. & de Beer, I. (1992, July.). *Sense of coherence* *Sense of Coherence and stress symptomatology*.. Paper presented at 25<sup>th</sup> International Congress of Psychology, Brussels, Belgium.

## CHAPTER 3

### CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

The chapter encompasses conclusions regarding the literature review and the empirical study. Thereafter the limitations of the research are mentioned. Lastly recommendations to solve the research problem and suggestions for future research are presented.

#### 3.1 CONCLUSIONS

The general aim of this study was to investigate the relationship between burnout, job stress and Sense of Coherence in the Xstrata mining group. The following conclusions are derived from the study pertaining to the constructs of burnout, job stress and sense of coherence.

Burnout is conceptualised as a psychological syndrome in response to chronic interpersonal stressors on the job. Burnout comprises of three dimensions, namely exhaustion, cynicism and Professional Efficacy. *Exhaustion* refers to feelings of being overextended and depleted of one's emotional and physical resources. *Cynicism* refers to the interpersonal dimension of burnout and is a negative, callous or detached response to various aspects of the job. *Personal efficacy* refers to the self-evaluation dimension of burnout and includes feelings of competence, productivity and achievement at work (Schaufeli & Enzman, 1998, p. 36)

In this research, indications were that a weak sense of coherence, pressures because of job demands and a lack of organisational support were associated with higher levels of exhaustion, cynicism and lowered Professional Efficacy.

Stress is a particular relationship between an individual and the environment, which is appraised by the individual as exceeding or taxing his or her resources and consequently endangering his or her wellbeing. It is any transactional process in which an organism experiences an alteration of psychological homeostasis.

The coal-mining industry reflects two distinguishable categories of potential stressors. The first reflects the nature of working in the coal-mining industry, such as exposure to underground working conditions. The second category incorporates organisational stressors such as fellow-workers not doing their jobs, poor or inadequate equipment and a lack of opportunities for advancement.

Fellow-workers not doing their jobs, interruptions, meeting deadlines, working overtime and dealing with crisis situations were found to be the five top stressors.

*Sense of Coherence* is a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement (Antonovsky, 1991). This research showed sense of coherence to moderate the effect of job stress on exhaustion. Job stress (i.e. because of the lack of organisational support and job demands) was also directly related to sense of coherence. This means that job stress impacts on exhaustion and sense of coherence, but that a strong sense of coherence moderates the effect of job stress on exhaustion. It is postulated that a strong sense of coherence could increase feelings of professional efficacy, and moderate the effects of exhaustion on the development of cynical attitudes towards ones work.

### **3.2 LIMITATIONS**

The cross-sectional survey research design was applied to determine the relationship between variables and thus the causal nature of these variables is not known. The study was also done in using a limited sample, which makes generalisation to other populations questionable. Gender also represents a limitation in the sense that the majority of the participants were male. Due to the small sample size, the construct validity for members of different ethnic groupings could also not be determined.

### **3.3 RECOMMENDATIONS**

Recommendations for the management of the organisation for future research are made in this section.

#### **3.3.1 Recommendations for the management of the organisation**

Xstrata Coal SA should attend to employees' sense of coherence, job stress and burnout. A combined management and educational approach that builds interventions encouraging a stronger sense of coherence amongst employees should be utilised. The sense of coherence intervention would enhance work life and would assist employees to handle stress better.

This will be achieved by giving more attention to providing information in a consistent, structured, ordered and understandable format to contribute to the employees' sense of coherence.

Employees need to be able to identify their roles within the greater whole, and as such the comprehensibility component of Sense of Coherence will be enhanced. By equipping employees with the necessary knowledge, skills, material, instruments and other resources, and by ensuring a balance of the load of tasks to be handled, employees will increasingly feel that work expectations are manageable and within their power and that their work is meaningful and of importance to others.

Job stressors should be addressed; specifically those related to job demands such as interruptions, meeting deadlines, working overtime, dealing with crisis situations and assignment of increased responsibility. The issue of frequent interruptions should also be addressed, the open door policy should still exist, but it must be managed and visitors should be screened and people must be urged to make appointments. Employees should be given the tools to handle these stressors; they must be properly equipped. This can be achieved by improving and teaching them proper time management techniques.

Their workload should also be assessed. More attention should be given to crisis management interventions and employees must be properly prepared for the increased responsibility of their job.

One must keep in mind that items related to lack of organisational support included fellow-workers not doing their jobs. This perception must be investigated, since it seemingly leads to employees putting even more pressure on themselves because they feel that fellow-workers are not doing their job properly and they end up doing others' jobs. A system should be introduced so that workers can be assessed to determine whether they are doing their job or not. If it is not the case, steps should be taken to improve the situation. Supervisors must feel comfortable to delegate tasks and must not feel that it will not be done properly.

### **3.3.2 Recommendations for future research**

Similar studies need to be replicated in other samples from the coal-mining industry. In Xstrata Coal further research is also needed on the engagement (opposite of burnout) factor.

Future longitudinal research should be conducted to pinpoint the causal nature of and determine the relationship between variables and to ascertain which variables cause burnout.

The inclusion of personality dimensions in future research is strongly recommended to establish the effects of personality differences on burnout dimensions.

Larger sample sizes will also allow for testing of construct equivalence and item bias in multicultural samples.

## REFERENCES

- Antonovsky, A. (1991). The structural sources of salutogenic strengths. In C.L. Cooper & R. Payne (Eds.), *Personality and stress: Individual differences in the stress process*. New York: Wiley.
- Schaufeli, W.B. & Enzmann, D. (1998). *The burnout companion to study and practice: A critical analysis*. London: Taylor & Francis.