

# A preliminary investigation of workplace stress in platinum miners using subjective and objective measures

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# Outline of presentation

- Introduction
- Definitions
- Methodology
- Results
- Conclusions

# Introduction

Theme for ODAM 2011: Research for the Missing Link

The workforce in the SA mining industry is changing

- More females

- Older workers

- Chronic medical conditions -TB and high blood pressure

To inform decisions about

- Safer workplaces

- Healthier workers

Knowledge on workplace stress is one of the missing links in mining

# Aim of the study

Hypothesis :

Workplace stress in the mining environment will affect health and safety outcomes in the workforce that could result in accidents and injuries, as well as poorer worker health.

- Paucity of documented information on workplace stress in the multi-cultural and multi-lingual SA mining industry
  - Characteristics
  - Prevalence
  - Measurement tools
- Increased knowledge of the specific characteristics and incidence of workplace stress could assist in the understanding and preventing of accidents and injuries.

# Definitions

## *Work place Stress*

- Work place stress can be defined as the harmful physical and emotional responses that occur when the psychological and/or physiological requirements of the job do not match the capabilities or needs of the worker.
- Mining industry- extremely harsh conditions
- Need information on the workplace stress experienced by mineworkers
  - as result of work in different areas/occupations
  - male and female

# Workplace Stress

CSIR Centre for Mining Innovation, Human Factors  
Research Group

- subjective and objective tests
- an exploratory study in a platinum mine

This paper

- the subjective self-reported measurement using the Job Content Questionnaire and;
- the objective measure of salivary cortisol concentration levels

Several theories on workplace stress

- Job demand–control theory
- JCQ developed by Karasek et al. in 1998
- Focuses on current job content and requirements, measuring the quality of the work environment
- Contains simple language
- Short 18 –items
- A four-point Likert scale

# Salivary cortisol levels

- Biochemical characteristics of the human, in relation to environmental or personal stimuli, produce physiological responses and significant links with psychological stress have been shown
- Method in psychoneuroendocrinological research assess the activity of the hypothalamus-pituitary-adrenal(HPA)-axis
  -
- Salivary cortisol levels in studies in other industries



# Research questions

- Do miners experience workplace stress and if so, is there a difference between the experience of stress for female and male miners and does the workplace influence the level of the stress?
- Do salivary cortisol concentrations correlate with self-reported measures of workplace stress in miners?

# Methodology

34 volunteer platinum miners

- 21 underground miners - 13 surface miners
- 13 males and 11 females

Mean age of the participants was 37 years

- Females ranged between 21 and 43 years
- Males ranged between 25 and 57 years

# Data collection

## *Job content questionnaires*

- Translated into isiZulu, seTswana, seSotho
- Conducted individually by vernacular speakers in the volunteers preferred language

## *Salivary cortisol concentrations*

- Before and after shift
- Salivette™ method
- Chewed cotton swab stored in the double-chamber Salivette™ and stored at -20°C until assay
- Analysed at Wits Medical School of Pathology, using the Salivary Cortisol Kit for research (Sarstedt Ltd).

# Results – Job content

- 80% of participants indicated they experience low level of control over their work
- 60% of the participants experience high levels of psychological demand
- 80% of participants report high levels of physical demand in their job.
- 90% of participants report low levels of social support in their workplace.
- 75% of participants report high levels of noise

# Results – males vs females

- No difference between females and males in the categories control, psychological demand and physical demand
- Males in the sample experienced greater social support within their job context than females
- Males reported more stress from the noise in the environment than females
- The results seem to indicate that there is very little difference between the workplace stress experienced by females and males

# Results – underground vs surface

- Statistically significant differences were found for physical demand, social support and noise
- Unexpected finding that surface workers reported higher physical demand than the underground workers
- The noise levels experienced as very high for the surface workers may also be due to the nature of hammering and equipment noise in the workshops.
- The low social support reported was more evident for the underground workers than for surface miners

# Results – salivary cortisol levels

- Before-shift levels
  - within normal limits for early morning levels (at least half an hour after rising)
- After-shift levels
  - Significant correlations with 3 JCQ subsections
    - physical demand ( $r = 0.41964$ )
    - social support ( $r = -0.52318$ ) and:
    - noise ( $r = 0.41988$ )

# Results – salivary cortisol levels

- Gender comparisons
  - Weak correlations and not significant
    - Female ( $r = -0.01973$ )
    - Male ( $r = 0.0992$ )
- Workplace comparisons
  - Significant correlations only found between salivary cortisol level and social support subsection
    - Surface ( $r = -0.53672$ )
    - Underground ( $r = -0.42146$ )



# Conclusions

- JCQ measured moderate workplace stress in platinum miners
- JCQ useful tool in this environment - distinguishes between genders and workplaces
- These results indicate that the job content (social support in particular) of platinum miners appears to be a source of workplace stress and that they may be at risk for the health symptoms that are reported to follow prolonged exposure to stress.
- 3 subsections of the JCQ were found to be significantly correlated with salivary cortisol concentrations
- With larger samples and further validation of these results salivary cortisol concentrations and the JCQ may be a useful tools for miners at risk for workplace stress.

**Thank you**

