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Strategies to reduce musculoskeletal disorders in underground coal mining

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Aims of presentation

- The nature and extent of the problem
- Individually oriented prevention strategies
- The impact of changes in work organisation - future issues and needs

Low back Musculoskeletal disorders

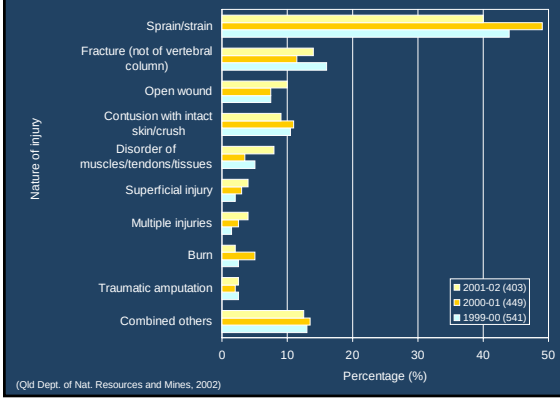
- Strong evidence of association with work related lifting and forceful movements, whole body vibration (WBV) and awkward postures
- WBV may interact with other factors to cause increased risk of back disorder
- Evidence for positive association with heavy physical work
- Insufficient evidence of relationship with static postures
- NIOSH reviews, 2002

NSW Coal Mining Industry

- *between 1996 and 2001 little change in incident rate of sprain and strain injury in coal industry"*
- *Accounted for 68-71 % of all injury claims*
- *Total claim costs averaging 28mill./year for sprain and strain injury*

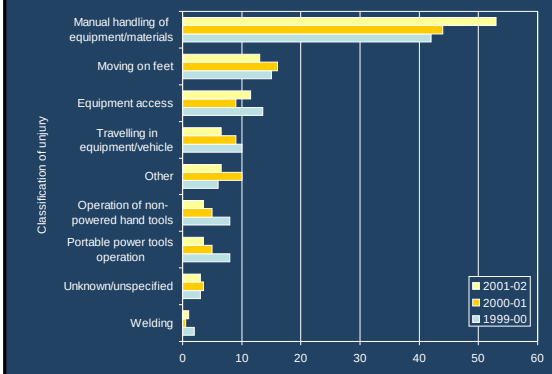
Armour, 2002

Nature of injury



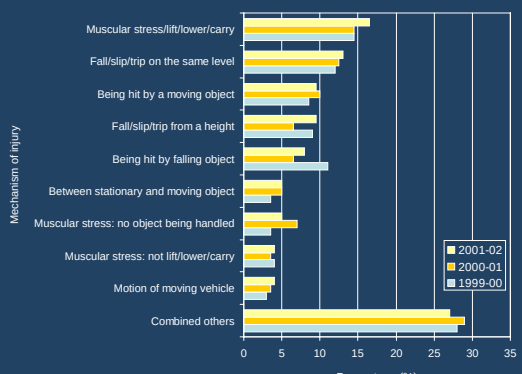
(Qld Dept. of Nat. Resources and Mines, 2002)

Classification of injury



(Qld Dept. of Nat. Resources and Mines, 2002)

Mechanism of injury



(Qld Dept. of Nat. Resources and Mines, 2002)

Difference between better and worse performers

- Little difference in strategies used by better and worst performers
- No apparent benefit of training programs-same types of incidents continue to occur
- *Main difference was variation in management approach and the age of the workforce*

Armour 2002

Common issues to address

- Lack of awareness of high risk areas for injury and targeted strategies to address the issue
- Failure to match work & equipment to operator
- Lack of support for planning and resource processes that could address prevention issues
- Emphasis on injury management rather than prevention

Armour, 2002

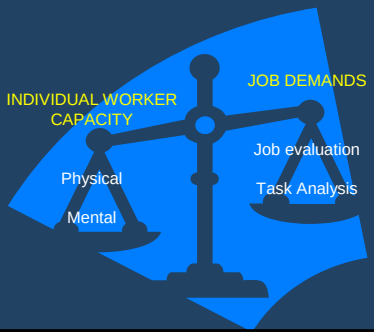
Elite athlete injury management

- Sophisticated selection and matching processes
- Targeted & individualized health maintenance & enhancement programs
- Continuous surveillance
- Excellent support re prevention and rehabilitation

Miner injury management

- Some pre-selection/matching
- Generally non-targeted health maintenance programs
- Limited continuing surveillance
- Work organization more aligned with productivity & more hazardous
- Limited attention to secondary prevention
- More limited access to resources for prevention and rehabilitation

Reducing risk factors



Job redesign

Education & Training

Pre-hire screening

Work organisation

Employee functional fitness screening

- Approach for physically demanding jobs that cannot be re-designed
- Goal is to match the worker's capabilities with the physical demands of the job
- Forms only a part of the overall process and should complement not replace other strategies to reduce injury
- Be based on the performance of experienced workers and the feedback of incumbent workers is essential for validation

(Gledhill et al, 1992)
(Policy proposal discussions, David McFarlane, NSW Workcover, 2001)

Screening protocols and injury

- Medical centre followed over 10 years
- Retrospective comparison following introduction of various injury prevention strategies
- Work related screening protocol most effective in reducing number of more severe back injuries, lost work days and associated costs.

(Nassau, Spine, 1999)

Pre-employment screening and low back pain

- 3020 aircraft industry workers aged from 21– 67yrs- followed for 3 years
- Self report pyscho-social issues, physical examination, medical history and workplace factors
- Once historical data on previous back pain was known information from physical factors added no significant predictive value

(Bigos et al, Spine, 1992)

Screening protocols and injury

- Aircraft industry sheet metal worker
- Targeted prevention strategies including, traditional pre-employment screening, disease specific risk assessment, education and exercise programs, and transitional work programs
- After 3 years number of severe injuries and associated costs decreased.

(Melhorn et al, J.Occup Environ Med, 1999)

To develop and validate a battery of tests that define the physical capabilities required to meet the demands of manual handling in underground mining.

Development of work related test protocol

Focus groups
identified physically demanding tasks

Ranked on basis of physical demand & frequency
1 v.easy ---------- 5 v difficult
1 v. rarely ---------- 5 v.often

Survey (220 miners)
Age
9% <24
38% 25-34
33% 35-44
20% 44+
Years experience
37% < 5yrs
63% 5->15yrs

Discussions with deputies, miners & OH&S personel

6 scenarios
Validation
Scoring
Interpretation of results

Validation against realism and physical demand similarity & physiological demands of the work related tests

Functional capacity predicts ability to handle the task at hand- but other factors are involved

"Changes in the organization of work have far outpaced our knowledge of the implications of these changes for the quality of working life and for safety and health on the job"

National Institute for Occupational Safety & Health, 2002

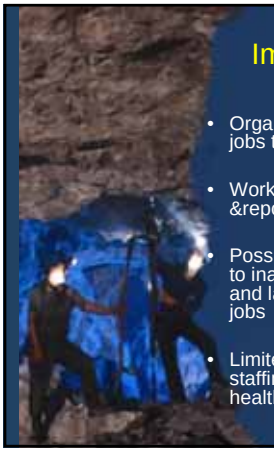
Work organization and musculoskeletal disorders

- Associated with stressful aspects of work organization such as inadequate work/rest cycles, wage incentives, time pressure, overload, low job control, low social support, & repetitive work/lack of task variability.

Landsbergis, 2003

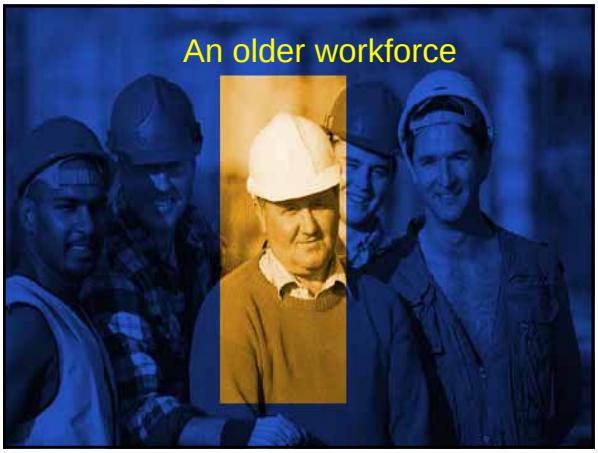
Long hours of work

- Evidence of risk to health and safety from long hours of work found in literature but still limited
- Little known about interaction of long work hours with demanding work schedules- different job characteristics and exposures



Impact of contract labor

- Organizations may shift hazardous jobs to alternative workforce
- Workers less likely to recognize &report hazards & injuries
- Possible increased risk of injury due to inadequate training or experience and lack of familiarity with variable jobs
- Limited data on impact of flexible staffing arrangements on worker health and safety



An older workforce

Ageing workers in the European Union

- More workers in 50+ age group
- Workers over 50 will comprise largest (>30%) of workforce in next 25 years
- Fewer younger workers 25yrs or younger

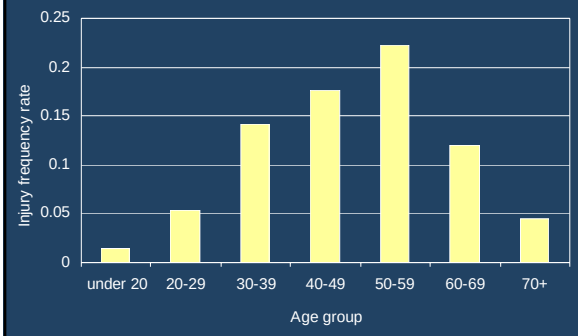
- 2020's will have most significant changes

Injury severity and ageing - Mining

- Majority of severe injuries involve transport related activities
- Injury severity associated with mechanism of injury eg. overexertion, falls and falling objects
- Reduced body resilience and slower tissue repair
- Inadequate matching of skills and functional capacity with job demands

LaFlamme et al, 1996; Hull et al, 1996

Figure 3: Sprain and strain injury incidence rate by age group for NSW coal mines in 2000-2001



Effects of exposure to heavy physical exertion and vibration on vertebral structure

Radiographs of miners and other workers involved in long term (10-21 years) exposure to heavy spinal loading and/or whole body vibration

- Heavy spinal loading associated with decreased intervertebral disc height
- Whole body vibration without appropriate damping of effect decreases disc height

Brinckmann et al 1998

Occupational stress during working life and locomotion impairment in retirement

Occupational stress during working life has significant effect on low back, shoulder/arm impairment and functional independence in retired coal miners.

Charbonnier et al., 1998

OH&S standards

Medical surveillance

- Identify risk factors for poor adaptation to work conditions
- Fitness for particular kind of work is determined

- *Manual handling/vibration*
- Control measures in place to minimize exposures & protect employees from adverse exposure

Issues

- Limitations in health surveillance system
- Need for improved data to better understand worker exposure to risk factors for injury, and to monitor how demands of work are changing
- Need knowledge of what is currently being done in health management & rehabilitation in relation to work organization
- Need for improved procedures/technology to monitor exposure to musculoskeletal loading & determine individual tolerances to this loading
- No well accepted indices to measure & monitor musculoskeletal impairment

Baseline survey of occupational health issues in coal mining

Short and long-term adaptations to work in coal-mining: towards a sustainable, injury free workforce

Injury Prevention and Control (Australia) Ltd

NH&MRC partnerships in injury program

Coal Services Pty Ltd

Continued improvements in injury prevention in mining will require

a) *Targeted rather than blanket approaches*
- knowledge of specific job demands and an understanding of when and how physical capacities are exceeded

b) *The capacity to predict which individuals are most at risk of injury*
- new methods for screening and assessment of risk factors

c) *An evidence base for the short and longer-term effectiveness of injury prevention interventions*

Acknowledgements

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