

**PREVENTION OF MUSCULOSKELETAL PAIN AND
DISCOMFORT IN SOUTH AUSTRALIAN WORKPLACES:
EVALUATION OF A STAGE OF CHANGE APPROACH**

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DECLARATION

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SUMMARY

INTRODUCTION: There are significant human, social, and business costs associated with work-related musculoskeletal disorders (WRMSD), despite being the subject of extensive research and widespread interventions. A profile of WRMSD can be obtained via workers compensation data, but the distribution of precursor conditions, such as localised body pain and discomfort, are not routinely assessed. Moreover, there is a paucity of data in Australia.

The experience of pain has a psychological component, and it is now believed that psychosocial factors are an independent cause of WRMSD. As a result, psychosocial approaches are increasingly applied to WRMSD prevention. In particular, the Trans-Theoretical model has recently found application in workplaces, and there is some evidence in a UK study of benefit in tailoring interventions using a stage of change (SOC) construct. Here, the interventions are designed to address workers readiness to change behaviour.

AIMS AND OBJECTIVES: The research in this thesis aimed to describe the relationship between psychosocial factors and musculoskeletal pain and discomfort (MSPD) experience in workplace settings, and to evaluate the effectiveness and implementation of a stage of change approach to MSPD prevention.

The objectives of the research were as follows:

1. Determine the prevalence of MSPD in a sample of South Australian workplaces.
2. Examine relationships between MSPD and a range of individual, work, and organisational factors.
3. Evaluate the effectiveness of MSPD prevention interventions informed by SOC, compared with interventions informed only by standard ergonomic advice.
4. Evaluate the implementation of such interventions, based on worker perceptions.

METHOD: This research was designed as a repeated cross-sectional survey, with MSPD as the principal outcome measure. It allowed for a nested cluster-randomised trial at the workgroup level. A purposive sampling method was used to recruit participants in representative companies. Workgroups comprising 10-15 workers were surveyed and

randomised to either a SOC-tailored intervention or a standard intervention, based only on generic ergonomic advice. A total of 406 workers participated in the baseline (pre-intervention) survey and 270 workers participated in the follow-up (post-intervention) survey. Data on workers' demographics, MSPD (including body-region-specific MSPD), job satisfaction and workplace safety climate were collected using previously published survey instruments. MSPD reported at the higher end of a Likert scale was further classified as *severe* MSPD. The questionnaire survey was conducted face to face. A follow-up survey was undertaken after approximately 12 months, with additional questions relating to the implementation of interventions. Both the baseline and follow-up surveys reported the distribution of participant demographic/individual data, prevalence of MSPD and putative predictors of MSPD.

Analysis of the changes over time utilised matched participants (N=240), i.e. workers who participated in both baseline and follow-up surveys. The effectiveness of the stage-matched approach was evaluated by observing the change in MSPD before and after the intervention. The predictors of the change in MSPD were also observed. Workers' perceptions with regard to implementation of the intervention were investigated. Chi-square and multivariate logistic regressions were used for statistical analyses. For the nested randomised trial, a generalised estimation equation (GEE) analysis was used to examine changes over time in the pre- and post- intervention study of both tailored (n= 133) and standard intervention groups (n=109).

RESULTS: The 7-day period prevalence of undifferentiated MSPD in the baseline survey was 40% with the most common sites of MSPD being the shoulder, lower back, and neck areas. Regression analysis revealed an association between MSPD and years of employment, job satisfaction, safety climate, and stage of change. Workers were more likely to report MSPD if they had more than 5 years duration of work; were dissatisfied with their job; had a lower safety climate score, or were in a more advanced stage of change (action and maintenance stage).

In the follow-up survey the corresponding prevalence of undifferentiated MSPD was 49% with similar sites of MSPD as at baseline. Safety climate and SOC were associated with MSPD. The directions of relationships were similar to those in the baseline survey, i.e.

workers with a lower safety climate score or who were in an advanced stage of change were more likely to report MSPD.

Overall, the prevalence of undifferentiated MSPD increased significantly from baseline to follow-up, 40% to 49% ($p=0.008$). The prevalence of undifferentiated MSPD in the standard group increased significantly from 41% to 54% ($p=0.016$), whereas in the tailored group it increased non-significantly from 38% to 46% ($p=0.184$). Overall, severe MSPD also increased from 15 to 20% ($p=0.035$) but was not significantly increased in both groups (Standard: from 17% to 25% ($p=0.09$); Tailored: from 12% to 17% ($p=0.26$)). Increases in MSPD were also observed for shoulder, neck, and lower back. The generalised estimating equation (GEE) analysis found that within each group, the change over time was not significant, although both groups showed higher odds of MSPD at follow-up than at baseline (Standard OR =1.47 95% CI 0.86-2.47); Tailored OR =1.14, 95% CI 0.67-1.93), with the standard group showing a larger change. The time-intervention group effect was not significant (tailored / standard group OR = 0.64, 95% CI 0.40-1.05). The GEE analysis of matched participants found that the consistent predictor of change in MSPD was safety climate and stage of change.

With regard to implementation of the interventions, only about half of the workers were aware of changes in the workplace, but where the changes were reported there had generally been adequate consultation between management and workers. Approximately 35% of workers reported training that had increased awareness of the hazard and reporting procedures. Workers in the tailored group did not appear to be more aware of the interventions and did not have any greater participation in new training.

CONCLUSIONS: Psychosocial variables such as safety climate were significantly correlated with MSPD and increase in MSPD. This is consistent with an aetiological model of WRMSD where psychosocial factors make a significant contribution. Compared with standard ergonomic advice to management, there was some evidence of a benefit of stage-matched intervention for MSPD prevention, especially for the lower back. However, survey data were collected prior to, and during, an economic downturn, which may have introduced confounding by the business cycle.

RECOMMENDATIONS: It is recommended that stage of change, safety climate and job satisfaction be surveyed as part of any comprehensive strategy for the control of WRMSD.

During implementation of any intervention, there should be consultation with the workforce in order to maximise the benefits of a stage-matched approach. Further trials are required to characterise the time trends of psychosocial and organisation factors, and their influence on MSPD outcomes.

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AWARDS, CONFERENCES and PUBLICATIONS

Awards, Conferences and Publication Related to this Research

1. Awards

- November 2010 - The Conference Attendance Grant – by New Zealand Ergonomics Society and the NZES conference committee
- September 2011 - Postgraduate Travel Fellowship 2011 – by The University of Adelaide, Faculty of Health Science

2. Conferences

- 18-19 November 2010 – The 16th Conference of the New Zealand Ergonomics Society – Nelson, New Zealand
- 7-9 September 2011 - 22nd International Conference on EPICOH (Epidemiology in Occupational Health) – Oxford, United Kingdom

3. Publications

- Proceedings of the 16th Conference of the New Zealand Ergonomics Society – A survey of musculoskeletal pain and discomfort and organizational factors in South Australian workplaces - Diana V Doda, Dino Pisaniello, Paul Rothmore, Afzal Mahmood, Janet Hiller, Helen Winefield, Rose Boucaut & Sasha Stewart
- Occupational & Health Environmental Medicine, Sep 2011, vol 68, issue suppl1, A74. Prevention of workplace musculoskeletal disorders based on a stage of change approach: preliminary findings from an intervention study in South Australia – Diana V Doda, Dino Pisaniello, Paul Rothmore, Janet E Hiller, Afzal M Mahmood, Sasha Stewart, Helen Winefield, Rose Boucaut.
<https://icoh.conference-services.net/reports/template/onetextabstract.xml?xsl=template/onetextabstract.xml&conferenceID=2501&abstractID=512539>
- Musculoskeletal pain and discomfort and associated worker and organizational factors: A cross-sectional study- Sasha K. Stewart, Paul R. Rothmore, Diana V.D. Doda, Janet E. Hiller, M.A. Mahmood, Dino L. Pisaniello. (2013) *Work: A Journal of Prevention, Assessment and Rehabilitation*. DOI: 10.3233/WOR-131622, Pre-press

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LIST OF ABBREVIATIONS

BBS	Behaviour Based Safety
CI	Confidence Interval
EMG	Electromyography
ESWC	European Survey on Working Conditions
GEE	Generalised Estimation Equation
ICC	Intra-class Correlation Coefficient
HSE	U.K. Health and Safety Executive
JS	Job satisfaction
MSD	Musculoskeletal Disorders
MSPD	Musculoskeletal Pain and Discomfort
NIOSH	U.S. National Institute for Occupational Safety and Health
NHEWS	National Hazard Exposure Worker Surveillance
OR	Odds Ratio
OWAS	Ovako Working Posture Analysis System
PE	Participatory Ergonomics
PRR	Prevalence Rate Ratio
QEC	Quick Exposure Check
REBA	Rapid Entire Body Assessment
RSI	Repetitive Strain Injury
RULA	Rapid Upper Limb Assessment
SOC	Stage of Change
SC	Safety climate
T1	Time 1 or Baseline
T2	Time 2 or Follow-up
TTM	Trans Theoretical Model
UE	Upper extremities
Undifferentiated MSPD	A 'Yes' response to the question: Have you felt any pain/discomfort in the last 7 days? (Questionnaire in Appendix 1e, Q.1)
WRMSD	Work Related Musculoskeletal Disorders