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Feasibility of carrying out an ergonomics intervention study to prevent the incidence of musculoskeletal disorders

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Research Report

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Feasibility of carrying out an ergonomics intervention study to prevent the incidence of musculoskeletal disorders

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This work examines the feasibility of assessing the effectiveness of workplace ergonomic interventions to prevent the onset of musculoskeletal disorders (MSDs). It reviews existing models of causation of MSDs and the scientific literature on interventions to prevent MSDs. It describes relevant epidemiological methods and research protocols.

Many previous studies of the risk factors for MSDs have not been able to assess causation and the need remains for intervention studies of high methodological quality to do this. A longitudinal Cluster Randomised Trial is the most appropriate study design for assessing MSD causation in an occupational setting. Measurement of injury rates generally requires very large samples and/or long follow-up times to provide adequate statistical power. It is likely that the study would need to be carried out across multiple employers.

Because of the scale of the MSD problem, it is recommended that HSE consider funding or part-funding a study designed to test the effectiveness of workplace ergonomics interventions to prevent the onset of episodes of musculoskeletal disorders. Consideration should be given to making the study a multi-centre, possibly international, collaborative study. Such a study would be high risk due to the scale and duration needed and the practical and organisational difficulties involved.

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- Feedback mechanisms or cascading effects
- Several important considerations were not specified, particularly indication of specific magnitudes, duration of exposure or latency periods.

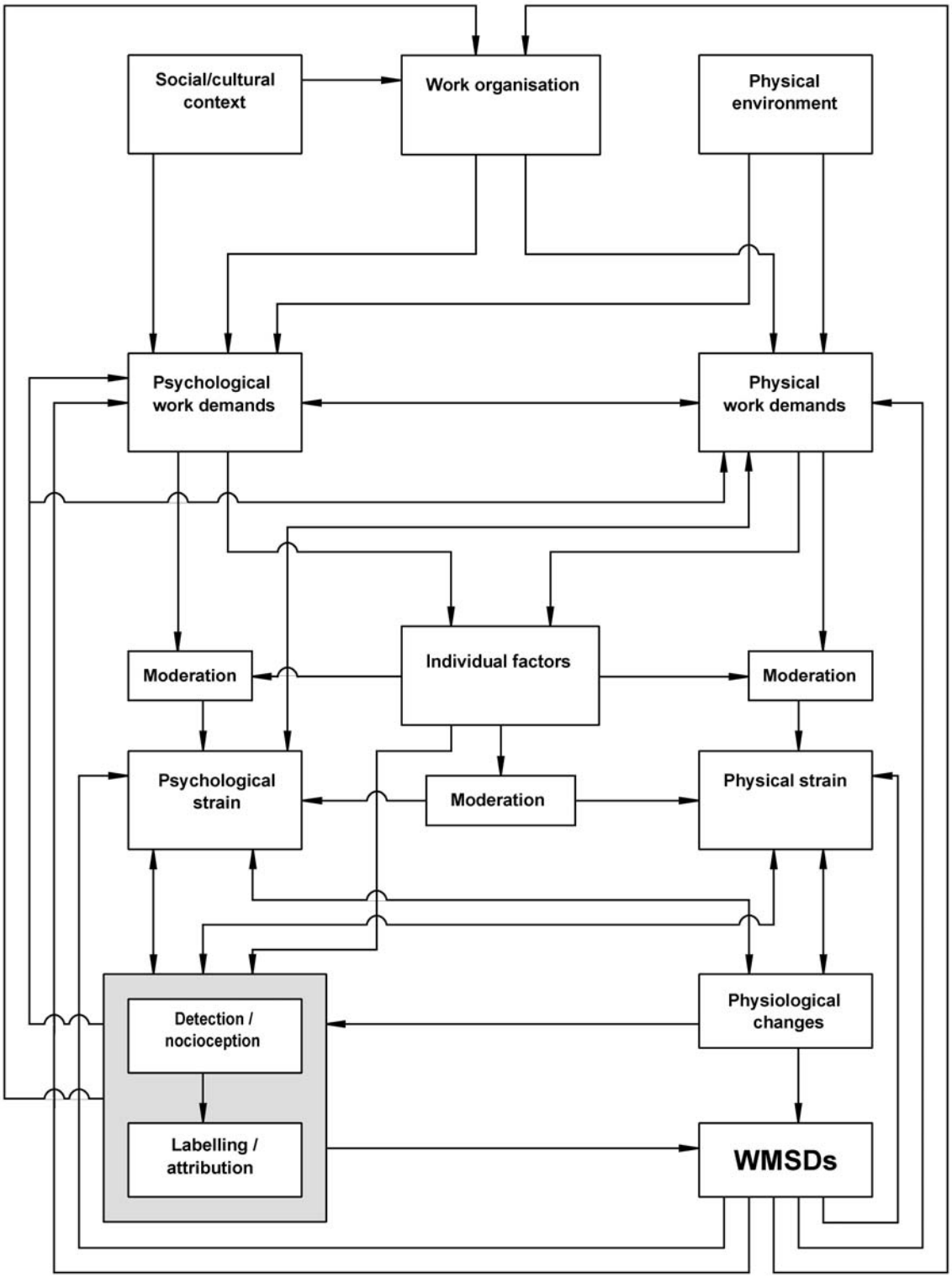

Figure 1. Karsh's integrated model for WMSD causation

Table 4. Summary of intervention effectiveness (Karsh *et al.*, 2001)

Intervention	*Results*			*Study design*						
Number of studies (percentage of studies)	*Positive*	*No effect*	*Mixed*	*Experimental*	*Quasi-experimental*	*Pre-post one group*	*Post only non-equivalent comparison*	*Post only, one group*	*Other*	*Total*
Back belt	2 (25%)	4 (50%)	2 (25%)	4 (50%)		2 (25%)			2 (25%)	8
Training		6 (29%)	14 (67%)	7 (33%)	7 (33%)	5 (24%)		1 (5%)	1 (5%)	21
Tools/technologies	4 (40%)		5 (50%)		1 (10%)	7 (70%)	1 (10%)			10
Exercise	4 (29%)	2 (14%)	8 (57%)	7 (50%)	1 (7%)	5 (36%)			1 (7%)	14
Job design		1 (100%)				1 (100%)				1
Multiple component	19 (40%)	1 (2%)	27 (57%)	2 (4%)	3 (6%)	29 (62%)	2 (4%)	4 (9%)	7 (15%)	47
Total	29 (29%)	14 (14%)	56 (55%)	20 (20%)	12 (12%)	49 (49%)	3 (3%)	5 (5%)	11 (11%)	101

Table 5. Epidemiological study designs

Type of study	*Timing*	*Form*	*Main features*	*Pros*	*Cons*
Cross-sectional	Cross-sectional	Observational	Association vs. causality Incidence/prevalence cases	Useful for generating hypothesis	Unable to establish causality
Repeated cross-sectional	Multiple cross-sectional (over time)	Observational	Cross-sectional data are recorded in a succession of surveys at two or more points in time, with new sample on each occasion.	Permit measurement of differences or change in variable over time Used to located sleeper effects (connections between events that are widely separated in time)	Unable to detect changes within individual as a different group is measured each time
Panel	Multiple cross-sectional (over time)	Observational	Same individuals studied repeatedly.	Can detect and establish the nature of individual change	Panel attrition due to refusals, changes of residence or death of respondent Course of events between discrete recording points remains unknown Conditioning of individuals
Ecological	Cross-sectional/ Longitudinal	Observational	Population level (grouped)	Use of readily available data Useful when risk factor measurement at individual level is particularly prone to error	Can only analyse population level /not individual level May encounter ecological fallacy
Cross-over	Longitudinal	Experimental/ Intervention	Analyse accounting for paired data	Cheap Limits within individual variation Smaller sample size	Lacks statistical power in detecting treatment effect Carry-over effects Only suitable for long-term conditions with intervention providing short-term relief Takes longer

Type of study	*Timing*	*Form*	*Main features*	*Pros*	*Cons*
Case-control	Longitudinal	Observational	Retrospective Selection of cases/controls Matching	Suitable for rare diseases Quick and cheap Multiple risk factors can be studied Smaller sample sizes than equivalent cohort studies Able to evaluate confounding and interaction	Suffer from bias error Observer/respondent bias No time sequence Can investigate only 1 disease outcome Provide approximate estimates of relative risk
Cohort	Longitudinal	Observational	Exposure/outcome measurement	Suitable for rare exposures thus able to study wide range of diseases Give sequence/causality Multiple diseases can be studied simultaneously	Loss to follow-up Expensive and time-consuming Not suitable for rare diseases Conditioning of individuals Exposure may change
Nested case-control (based on cohort)	Longitudinal	Observational	Exposure/outcome measurement	Provides results before the cohort finishes Saves resources Individuals matched Limits bias error	Not suitable for rare diseases Conditioning of individuals
Trial	Longitudinal	Experimental/ Intervention	Intervention	Can demonstrate causality Compares interventions efficiently Control for confounding	Can be costly Ethical issues with giving experimental interventions Selection bias (restricting generalisability of results)

Figure 4. Gantt chart for the hypothetical project