



Review

Psychosocial work stressors as antecedents of musculoskeletal problems: A systematic review and meta-analysis of stability-adjusted longitudinal studies

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ABSTRACT

Although the relationship between psychosocial workplace conditions and musculoskeletal problems has been extensively studied, the causal impact of psychosocial workplace factors in the development of musculoskeletal problems remains unclear. The purpose of the present study was to conduct a systematic review of baseline-adjusted prospective longitudinal studies estimating the lagged effect of psychosocial risk factors on musculoskeletal problems in industrialized work settings. A literature review was conducted by searching the MEDLINE, EMBASE, and PsychINFO databases dated until August 2009. The authors classified studies into categories of psychological work stressors and musculoskeletal problems. Available effect sizes were converted to odds ratios (OR). ORs were then pooled for each stressor–problem relationship using a random-effects model. Additionally, the possibility of publication bias was assessed with the Duval and Tweedie nonparametric “trim and fill” procedure. In total, 50 primary studies fulfilled inclusion criteria. Within these studies at least five effect sizes were available for 23 of the 45 possible psychosocial work stress–musculoskeletal problems relationships, leaving 9 psychosocial variables and four musculoskeletal problem areas for analyses. Of these 23 relationships, pooled OR estimates were positive and significant ranging from 1.15 to 1.66 with the largest pooled OR estimating the relationship between highly monotonous work and lower back pain. The lagged effect of low social support on lower limb problems was the only effect size for which the statistical test for bias was significant. Most psychosocial stressors had small but significant lagged effects on the development of musculoskeletal problems. Thus, organizational interventions to minimize these stressors may be promising in reducing one risk factor for the development of employee musculoskeletal problems.

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Introduction

Musculoskeletal disorders (MSD), especially chronic low back pain, are a prevalent global health problem related to high health-care and economic costs (Andersson, 1999). For example in Germany, most sick leave days (23.3%) in 2005 were due to MSDs that resulted in a gross value loss as high as 15.5 billion Euros (BDP, 2008). The majority of research studying the risk factors associated with the development of MSD has relied on the impact of physical exposures or ergonomic factors at the workplace. However, recently, researchers have also considered psychosocial workplace conditions as risk factors for musculoskeletal problems. Typically, psychosocial workplace conditions have been characterized as existing circumstances that an

individual is exposed to at the workplace (e.g., Hartvigsen, Lings, Leboeuf-Yde, & Bakkeiteig, 2004; Warren, 2000) and that exert their influence on the individual either through psychologically relevant task organization procedures (e.g., time pressure, job control) or through the social work environment (e.g., lack of social support). In fact, a large number of primary studies have documented a substantial association between several psychosocial workplace conditions and musculoskeletal problems (Skov, Borg, & Orhede, 1996; Violante et al., 2004). In an attempt to summarize empirical findings from previous literature, researchers have already conducted several reviews on the topic (Hartvigsen et al., 2004; Steenstra, Verbeek, Heymans, & Bongers, 2005). Yet, results are inconclusive and sometimes also contradictory due to the different inclusion criteria for primary studies and methodological approaches.

Additionally, when considering past research the causal direction of the association between work-related psychosocial risk factors and MSD remains unclear. Even though many researchers

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have argued that psychosocial workplace conditions are a potential antecedent of musculoskeletal problems, from the variety of studies in the literature it cannot be concluded if and which of the studied psychosocial conditions might have a causal role in the emergence of musculoskeletal problems and should therefore be regarded as a psychosocial risk factor relevant for musculoskeletal problems.

A leading way to address the question of causality in field settings is to conduct longitudinal studies. When longitudinal studies adequately control for the stability (or baseline-level) of an outcome (i.e. musculoskeletal problems), longitudinal studies can provide evidence on causality under certain circumstances. Specifically, the lagged effect of a predictor (e.g., psychosocial stressors) at the first measurement occasion on the stability-adjusted outcome variable at the second measurement occasion can be interpreted as a measure of the causal effect of the predictor on the outcome (Finkel, 1995; Zapf, Dormann, & Frese, 1996). Accordingly, in order to assess the impact of psychosocial work stressors on health outcomes, occupational health researchers recommend stability-controlled longitudinal studies, thereby placing strong emphasis on the high quality level of research design and analysis (Zapf et al., 1996).

In recent years, a considerable number of longitudinal studies have investigated the lagged effect of psychosocial workplace conditions on musculoskeletal problems. To our knowledge, these studies have not systematically been integrated to assess fully the magnitude of potential causal effects of psychosocial work stressors on musculoskeletal problems. Thus, the aim of the present investigation was to conduct a systematic review and meta-analysis regarding the influence of occupational psychosocial risk factors on the development of MSD.

Methods

Search strategy

A systematic literature search of MEDLINE (1948 to August 2009), PsychINFO (1872 to August 2009) and Embase (1947 to August 2009) was conducted for studies that looked at the relationship between psychosocial work stressors and musculoskeletal problems. Additionally, reference lists of each of the located articles and key review articles were searched, manually.

When studying the relationship between occupational psychosocial risk factors and MSD, researchers rely on several theoretical models that explain a potential mechanism of how psychosocial conditions at work might affect MSD. The underlying theoretical assumptions for studying the association were derived from two lines of research. One group of studies relies on general occupational stress models like, for example, the well-known Karasek Demand–Control Model or the Siegrist Effort–Reward Imbalance Model (Karasek, 1979; Siegrist, 1996). A second group of studies is based on specific theories explaining the development of work-related MSD with specific risk factor variables (Huang, Feuerstein, & Sauter, 2002; Karsh, 2006). Because of this multitude of theoretical approaches, studies on MSDs typically include a variety of psychological constructs (e.g., job demands, job stress, job insecurity, etc.; see also Table 1).

Thus, database searches were first conducted using combinations of the general terms, e.g. “musculoskeletal disorder(s)”, or “musculoskeletal disease(s)” and for example the general terms “psychosocial/psychological” to cover all potential psychosocial stressors – MSD symptoms links. In a second step, a search was made using combinations of specific psychosocial work stressors (e.g., job control) and specific localizations (e.g., lower back pain). Appendix A provides the search string.

Inclusion criteria

Initially, two authors screened titles and abstracts to identify articles eligible for further review. The primary studies were retained for full-text screening if they were (a) published in peer review journals, in German or English language, (b) reported original data on the relationship between any type of psychosocial work stressor and any type of musculoskeletal problems, and (c) used working populations in industrialized countries, thus allowing the results to be compared. As a consequence, studies reporting results on patients hospitalized due to musculoskeletal disorders were excluded. Articles were retained when either of the two authors believed that an article should be retained.

In the next step, full-text reviews were conducted to identify investigations that met our methodological quality inclusion criteria. Studies were included in the meta-analysis when they (a) were longitudinal studies, (b) measured psychosocial work stressors at the beginning of the study (T1), and (c) additionally controlled for the stability of musculoskeletal problems, by either excluding all persons with or without musculoskeletal problems at baseline or by using a statistical technique to control for the effect of initial musculoskeletal problems. Applying these high quality criteria and including only stability-adjusted studies allowed us to rule out the potential for confounding variables that could affect the results (Zapf et al., 1996). Also an effort was made to identify any studies investigating the (reversed) effect of musculoskeletal problems on subsequent psychosocial work stressors controlling for initial psychosocial work stressors.

Data extraction and classification

First any effect size information was extracted regarding stability-controlled lagged effects linking any type of psychosocial work stressor and any type of musculoskeletal problem. When a study used dichotomous or dichotomized predictor and outcome variables, an effort was made to recover the 2×2 table. In cases where this was not possible, odds ratios (ORs), hazard ratios, or relative risks were extracted for studies with dichotomous or dichotomized variables. For studies combining dichotomous or dichotomized independent variables with continuous outcome measures, information regarding standardized mean differences was extracted. Finally, for studies using only continuous variables, we extracted correlation coefficients or partial correlation coefficients.

The authors classified psychosocial work stressors and musculoskeletal problems into different categories according to the available level of details within the primary studies. Any disagreement between the authors was resolved by consensus. For psychosocial stressors, the following categories were used: “high job demands”, “low job control”, “high job strain”, “high job stress”, “low social support”, “low social support from coworkers”, “low social support from supervisors”, “low job satisfaction”, “low job security”, “monotonous work”, “shift work”, and “overtime work”. For musculoskeletal problems, the following categories were used: “lower back symptoms”, “neck, shoulder, and/or upper back symptoms”, “upper extremity symptoms”, and “lower extremity symptoms”.

Statistical methods

The ORs were used as the effect size metric for the meta-analysis. The advantage of ORs is that standardized mean differences and correlation coefficients can readily be transformed into ORs so that studies reporting this information could be included in our meta-analysis (Cooper, Hedges, & Valentine, 2009). This would

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