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# OCCUPATIONAL STRESS

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## Abstract

In 1979, Tony McMichael co-authored a paper showing how occupational stress not only affected mental health; it also exacerbated the effect of chemical and physical hazards on respiratory and skin symptoms. This study was among the first to place occupational stress within the same framework as chemical and physical hazards. It also showed that stress and mental health faced complex assessment challenges, but that these were similar to those faced by the assessment of exposure to chemical and physical hazards, especially in large-scale epidemiological studies.

More recently, occupational stress has been termed a 'psychosocial hazard' by some jurisdictions in an attempt to place it into the existing occupational risk management and risk assessment framework. However, progress has been slow and regulation of occupational stress remains outside standard occupational health and safety practices.

This chapter reviews the current state of the regulation of occupational stress and compares this to the context in which McMichael and colleagues undertook their research over three decades ago. We then trace some of the challenges posed by mainstreaming occupational stress, the role of McMichael and colleagues in laying the foundation for future research and describe recent research undertaken in Australia to achieve this goal.

## Occupational Stress

> Work, so fundamental to well-being, has its darker and more costly side. Work can adversely affect our health, well beyond the usual counts of injuries that we think of as 'occupational health'. The ways in which work is organized – its pace and intensity, degree of control over the

> work process, sense of justice, and employment security, among other things – can be as toxic to the health of workers as the chemicals in the air. (Gordon and Schnall, 2009, p. 1)

One of the first to recognise that the organisation of work could impact the mental and physical health of workers was Friedrich Engels. In 1845, he published *The Conditions of the Working Class*, in which he described physical and mental health problems of workers thought to be caused by the organisation of work and its social and physical environments. A few years later, Karl Marx wrote about how capitalism treated workers as commodities and how this led to the alienation of workers (Marx, 1988). Their groundbreaking work informed subsequent research into the health effects of the organisation of work. However, it was not until the 1960s that systematic and scientific research into the impact of occupational stress[1] began in the USA and in Nordic countries.

The origins of research on occupational stress came from a variety of disciplines, such as management, medicine, sociology and psychology. One of the most influential models of occupational stress, the Job Demands–Control (JDC) model, began with an article published in 1979 by Robert Karasek on the effect of job demands and job control on mental health (Karasek, 1979).

## Tony McMichael's Contribution to Occupational Stress Research

Around the same time as the publication of the JDC model, Tony McMichael co-authored, with James House and other colleagues, a seminal article on the effect of occupational stress on health among factory workers (House et al., 1979). This research into occupational stress was consistent with Tony's lifelong research interests into social and environmental determinants of health, such as the study on lead exposure in pregnancy and its effect on young children (McMichael et al., 1986), discussed elsewhere in this book.

This important work on occupational stress was among the first to place occupational stress within the same framework as chemical and physical hazards. The paper was a response to the insight that much of the research on blue-collar workers concentrated solely on physical and chemical hazards and had not considered how exposure to occupational stress might influence, and possibly amplify, the effects of concurrent exposure to physical and chemical hazards. In addition, while there was recognition at the time that occupational

1 In this chapter, the term 'occupational stress' is used to describe stressors relating to the way work is organised, such as workload and role conflict, rather than the reaction to stressors.

stress was associated with many diseases in both blue- and white-collar workers, most research focused on a single health outcome, instead of a range of health outcomes. House and colleagues were aware that to understand fully the range of health problems associated with occupational stress and the mechanisms by which these effects occurred, multiple exposures to occupational hazards, including occupational stress, needed to be examined.

By way of review, the three aims of their cross-sectional research (House et al., 1979) were to:

1. Document the impact of occupational stress as well as physical and chemical hazards on the health of blue-collar workers.
2. Consider how these hazards combine either additively or interactively to impact on health.
3. Determine the range of health outcomes affected by occupational stress and how these are brought about.

Their sample comprised 1809 male workers who were not in a supervisory role from a tyre, rubber, plastics and chemicals manufacturing plant in the USA.

Occupational stress was measured as self-reported job pressures (workload, responsibility pressure, role conflict, quality concern, job versus non-job conflict) and job gratification (lack of intrinsic or extrinsic rewards, importance rewards, control rewards, general job satisfaction). A number of health outcomes such as angina pectoris, gastrointestinal ulcers, neurosis, itch and rash on skin, persistent cough and phlegm were assessed using a self-report questionnaire. In addition, a subset of workers ($n$ = 353) was evaluated medically for hypertension, heart disease risk, dermatitis and respiratory symptoms. Type A behaviour pattern was also assessed and was used as a predictor variable. Neurotic symptoms were assessed by the Health Opinion Survey, and this measure captured symptoms associated with depression and anxiety. Exposure to physical and chemical hazards was measured in two ways: the first was the industrial hygienist's assessment of respirable particulates in the broad areas of the plant; the second measure was self-reported exposure to dust, fumes and chemicals, which were then combined into a single exposure index.

Analyses controlled for age, education, self-reported exposure to physical and chemical hazards, obesity and a measure of the physical activity required in the job. House, McMichael and colleagues (1979) found that all occupational stress measures were associated with at least some of the self-reported health outcomes. Neurotic symptoms were associated with all job pressure scales and job gratification scales. Similar findings were observed for cough and phlegm.

Angina and ulcers were also affected by a limited number of occupational stress measures (role conflict, job/non-job conflict, interpersonal tension and self-esteem).

Furthermore, although not as strong, similar findings were also observed for occupational stress measures and medically assessed health outcomes. Work pressure variables were generally significantly associated with hypertension, and job gratification variables showed an association with hypertension and high cardiovascular disease (CVD) risk factors. The results overall showed that occupational stress was associated with increased risk of angina, ulcers, neurosis, high blood pressure and other CVD risk factors. In relation to respiratory and skin symptoms, the authors hypothesised that stress alone might not contribute to these symptoms; rather, stress might interact and exacerbate these symptoms in the presence of exposure to physical and chemical hazards. Subsequent analyses examining interaction effects found that an interaction effect was indeed present for respiratory and skin problems. Where there was no exposure to chemical and physical hazards, there was no statistically significant association between occupational stress and respiratory and skin problems. In contrast, among those workers who were exposed to dusts, fumes and chemicals, there was a consistent synergistic effect.

This work by House, McMichael and colleagues (1979) informed subsequent research on occupational stress, such as studies examining the effect of occupational stress on particular health outcomes such as CVD and depression in blue-collar workers (Kawakami et al., 1992). However, only a few studies continued to examine the relationship between both physical and chemical hazards and occupational stress (e.g. Bromet et al., 1992).

In contrast, since 1979, the majority of research has focused on the impact of stress on particular health outcomes such as mental health. This has enabled the evidence of the health impacts of occupational stress to accumulate, especially with several longitudinal studies being conducted. However, much of this research was occurring without consideration of how occupational health hazards were usually addressed in the workplace.

## Occupational Stress: Beginnings and Struggles for Recognition

Tony McMichael's collaboration with James House set the course for the recognition that occupational stress was, indeed, a significant occupational health hazard. Although it was a scientific finding, like many landmark ideas, it had profound political ramifications. Other authors have subsequently

acknowledged how this political dimension has shaped the extent to which occupational stress has been viewed as a health risk that workplaces must address (e.g. Dollard and Winefield, 1996).

Much of the earlier research on occupational stress had focused on individual factors, trying to address occupational stress by focusing on the individual by, for example, increasing coping among workers. This in itself placed occupational stress in a framework quite different from other occupational hazards where the usual approach was to modify the work environment so that most workers were protected from unsafe levels of occupational hazards. Similar to House, McMichael and colleagues, another leading researcher in occupational stress, Dean Baker (Baker, 1985), argued that occupational stress needed to be placed in a similar context as other occupational hazards and that efforts should be directed towards those conditions that could be modified to reduce occupational stress. They noted that the focus on individual perception and susceptibility made it seem that stress affected a special group of workers rather than all workers, and thus moved it away from the public health approach for preventing ill health.

The controversy in recognising and addressing occupational stress is not unique to this particular occupational hazard. The history of occupational health and safety is filled with examples of hazards that have taken decades to be legitimised and become mainstream. Some of the early occupational health and safety legislation in countries such as the UK, the USA and Australia came about to address the high rates of occupational accidents in industries, such as mining and factories, by addressing hazards such as machine guarding, ventilation and inspection of machinery and equipment (Quinlan et al., 2010). Similar to the labelling of some workers as particularly susceptible to the effects of occupational stress, occupational injury itself was once controversial, with the term 'accident proneness' coined in the 1920s to attribute the cause of occupational injury to deficiencies in individual workers, rather than to place the onus on employers to provide a safe work environment.

For policy or legislative interventions relating to occupational hazards that cause non-traumatic health outcomes, accumulation of the scientific evidence and the availability of methods to translate scientific evidence into practical tools that can be applied in workplaces are usually required. Workers who became sick from exposure to hazardous substances were once told that they were 'hypersusceptible', or that it was their diet and hygiene causing their health problems (Corn, 1992). This enabled employers to refrain from taking action to reduce exposure to slate dust. For example, for many decades the US cotton industry denied the link between exposure to cotton dust and byssinosis. It was only when British researchers, who found a link between cotton dust exposure and byssinosis in the UK, began conducting studies in the USA that the industry eventually accepted that exposure to cotton dust should be reduced.

So far, occupational stress has followed a similar trend as other occupational disease-causing hazards. Despite the strong evidence linking occupational stress to a number of health outcomes, the political nature of the issue, including the questioning of the scientific evidence by industry, has led to delayed action. Even when occupational stress is widely acknowledged as a hazard to be addressed, it remains difficult to regulate and provide practical advice for workplaces because, so far, it remains outside of regulatory frameworks in most countries.

## Policy Approaches to Occupational Stress

At the time of this important research by House, McMichael and colleagues (1979), the focus of occupational health and safety legislation was still primarily on occupational injury and physical ill health. The first health and safety legislation in the UK during the 1800s, and on which initial Australian health and safety legislation was based, dealt with protecting children and women.[2] Later, health and safety legislation dealt with physical hazards such as machine-related injuries. Even in the 1970s and 1980s, the main focus of health and safety legislation in most industrialised countries was on reducing the risk of physical injury, such as machine guarding, lighting and ventilating work rooms (Gunningham, 1984). Most legislation was limited to specific types of workers, places of work or operations.

Although legislative reforms in the late 1970s and later began to incorporate general duties of employers to protect the health and safety of their employees, there was still neglect of the work environment and organisational factors that could cause ill health, even though research into occupational stress was taking off at the time. The Scandinavian countries were one exception where legislation was introduced to regulate work environments, including psychosocial working conditions (Elden, 1986).

However, at the end of the 20th century, occupational stress became an important issue in the occupational health and safety framework in industrialised countries. This was, in part, due to the magnitude and cost of occupational stress (International Labour Office, 2000; Parent-Thirion et al., 2007). There was also mounting evidence of the health effects of occupational stress from longitudinal studies (Johnson et al., 1996; Stansfeld et al., 1999; Virtanen et al., 2013).

2 More recent legislations, such as those limiting lead exposure in workers, also followed on from attempts to protect children's health based on the evidence of the adverse effects of lead on children's neurodevelopment.

Improved understanding of the health effects of occupational stress led to policies aimed at reducing exposure, such as limiting work hours and requirements to consider the design of work (such as workload). Europe has been the leader, with several policy initiatives to address this hazard. The 1989 European Directive on Safety and Health of Workers at Work (89/391/EEC) made reference to the design of work and the organisational context of work, although it did not specifically mention occupational stress (Leka et al., 2010). In the 1990s, occupational stress was again indirectly addressed in two European-level directives on work with display screen equipment and the organisation of working time.

Many countries in Europe now have specific legislation addressing occupational stress. These include the Danish Working Environment Act, which requires the assessment of the psychosocial working environment to address occupational stress, and the Law on Health and Safety in Germany, which defines health and safety risks to include forms of work, the amount of work and working time. More specific mentions and requirements to address occupational stress were seen in Italy, with a mandatory assessment of occupational stress. In the Netherlands, the Working Conditions Act and its associated regulations state that workers must be able to have an influence on the rhythm of work and that very high or low workloads must be avoided. In countries such as the UK, USA and Australia, there are direct or indirect requirements to address occupational stress with many advisory tools and guidance materials. However, occupational stress is still not mentioned specifically in health and safety acts and regulations.

There has been some progress in efforts towards placing occupational stress in the risk management framework used in occupational health and safety (Cox et al., 2000). There was recognition that risk management of occupational stress could follow the typical risk management approach with the first crucial step of risk assessment. The outcomes of the risk assessment process can then inform risk reduction strategies in the workplace to reduce occupational stress. This risk management approach for occupational stress was a major step forward in addressing occupational stress; however, the nature of occupational stress still made it a difficult occupational hazard for which to assess risk by those used to dealing with physical hazards and traumatic injuries.

Consequently, despite the large body of knowledge on the harmful effects of occupational stress, it remains a major challenge. This indicates that there is a failure to translate the existing scientific knowledge into practical action and policy.

## Recent Research

Following on from the work of House, McMichael and colleagues (1979), research conducted at The Australian National University has explored ways to place occupational stress in a similar framework as that for physical and chemical hazards. Exposure to occupational health hazards is usually addressed by setting health-based critical exposure levels. Such critical exposure levels are based on dose–response modelling from epidemiological or experimental animal data, providing a quantifiable level of exposure in the workplace that is considered to be adequate to protect most workers. This approach is what Baker (1985) was referring to when he called for a public health approach to occupational stress … as was in place for chemical exposures. Having critical levels of exposure in the workplace enable both regulatory agencies and employers to determine if workplaces have hazardous levels of exposure and, if so, what actions need to be taken to reduce the level of exposure. An example is an acceptable exposure level for noise, which is 85 dB (A) in Australia.

Even though critical exposure levels provide a common method of regulating occupational health hazards, there have been no formal attempts to identify critical exposure levels for occupational stress. The lack thereof makes it difficult for both regulators and employers to undertake risk assessment. Critical exposure levels could also guide in designing and targeting primary level interventions in the workplace (see Figure 4.1).

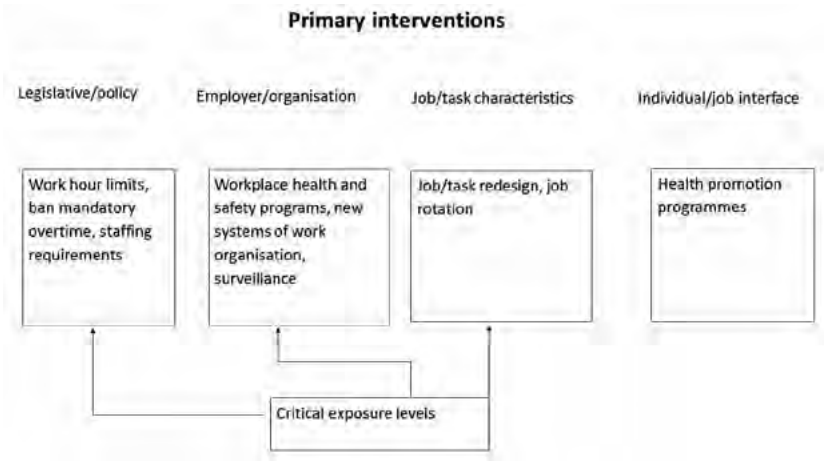


**Figure 4.1 Levels of work organisation primary interventions and where critical exposure levels can be used to inform these interventions.**

Source: Author's work.

A recent study (Kyaw-Myint, 2012) sought to identify critical exposure levels for two aspects of occupational stress: job control (the amount of decision authority and skill usage a person has in his or her job) and job demands (primarily a measure of quantitative workload). This study involved the analysis of two waves of data from 4,004 workers in a prospective cohort study, the Personality and Total Health (PATH) through Life study in south-eastern Australia. Previous research using this data set demonstrated that occupational stress influenced metal health outcomes using both cross-sectional and longitudinal analyses of the data (D'Souza et al., 2003; Strazdins et al., 2011). Critical exposure levels were identified using the benchmark dose method; namely, a dose–response modelling method used to identify critical exposure levels for chemicals (Filipsson et al., 2003).

In addition to attempting to place the regulation and risk assessment of occupational stressors in the same framework as other occupational hazards, this research addressed individual susceptibility, which has been a cause of controversy in relation to occupational stress. Individual factors such as personality and previous mental health status, age, gender and socio-economic status were included in dose–response modelling. Stressors (job demands and job control) were measured using a self-report questionnaire from the UK Whitehall II study, which was shown to have good predictive validity (Stansfeld et al., 1999). Mental health symptoms were assessed using the Goldberg Depression and Anxiety Scale (Goldberg et al., 1998).

The dose–response modelling undertaken in this study also took into account the shape of the dose–response relationship between each stressor and mental health outcomes. This is important because previous studies have shown that occupational stress can have a curvilinear relationship with a variety of outcomes, such as ill health or job satisfaction (e.g. Karanika-Murray, 2010). Job control was found to have a linear relationship with both depressive symptoms and anxiety symptoms. Job demands had a linear dose–response relationship with depressive symptoms and a curvilinear dose–response relationship with anxiety symptoms. Critical exposure levels for both mental health outcomes for each stressor were first identified. Of the two critical exposure levels identified for each stressor (job demands or job control), the most health-protective critical exposure level was then chosen as the final critical exposure level for each stressor. After taking individual factors into account, the critical exposure level for job control was identified as having nine out of 15 different aspects of job control measured in the PATH through Life study (Kyaw-Myint, 2012). For job demands, the critical exposure level was identified as having two out of four different aspects of job demands measured in the PATH through Life study (Kyaw-Myint, 2012). However, the small number of dose groups for job

demands meant that the finding for job demands could be considered only suggestive. Validation of this finding with a more extensive measure of job demands is recommended for future research.

This research was first to adapt the benchmark dose method to identify critical exposure levels for different aspects of occupational stress. It demonstrated that critical exposure levels of job control and job demands could be identified using poor mental health as an outcome measure. These levels can then be used in risk assessment of the work environment, thus addressing the difficulty in managing occupational stress. In addition, it provided a method that could be used in future studies to determine critical exposure levels of other work organisational hazards and other health outcomes. Hence, similar to the seminal work by House, McMichael and colleagues (1979), this study on critical exposure levels for occupational stress legitimised occupational stress as another occupational hazard, enabling the risk of occupational stress to be assessed in the same way as other occupational hazards, such as chemicals.

## Where To From Here?

With this 2012 study, risks associated with occupational stress can now be assessed in a similar framework as other occupational hazards. However, the challenge still lies in the acceptance of applying such an approach to occupational stress by employers and policymakers. The main focus for occupational health and safety remains more tangible hazards such as machine guarding and noise. Occupational stress, being invisible, is likely to remain less of a workplace priority.

The issue of addressing occupational stress is even more challenging because effective interventions require interventions at both the individual level and at the organisational level (LaMontagne et al., 2007). In many smaller workplaces and workplaces where occupational health and safety competes with production and supply-chain pressures, the reliance on individual-level interventions, such as personal protective equipment, over engineering or work design solutions is commonly reported (e.g. Lingard and Holmes, 2001). Redesign of work to reduce high levels of job demands or providing workers with more control over different aspects of their job will be harder to achieve than individual-level interventions such as providing counselling for workers.

Employers may argue that the redesign of work may not be economically or technically feasible because of globalisation and recent events such as the Global Financial Crisis (GFC), which have placed greater demands on employers to minimise costs and reduce pay and workplace conditions. At the same time, economic recessions, such as the GFC, have been shown to expose workers to

a higher level of occupational stressors than non-recession times (Houdmont et al., 2012). However, as stated previously, the challenge faced by occupational stress is not unique. McMichael raised similar economic and political issues when discussing the importance of the need to address the health effects of climate change, especially when there were no clear-cut links between exposure and health effects, as in the case of multifactorial diseases (McMichael, 2001).

Despite the foregoing, there are encouraging signs that occupational stress and poor mental health are considered important issues in the Australian occupational health and safety environment. Mental health is now included in the definition of health in the model Work Health and Safety Act, which has been adopted by most Australian states and territories. Moreover, the new Australian Work Health and Safety Strategy 2012–2022, which is Australia's guiding document on health and safety priorities, identifies mental disorders as a priority occupational disease. Improvements in health and safety through better work design are also included in the Australian strategy. This shows that efforts to reduce occupational stress are gaining momentum in Australia; there is now general agreement by employers, workers and policymakers that the issue of occupational stress deserves attention. Thus, Tony McMichael, in conducting his research into occupational stress, laid the foundation for the work of future researchers and contributed towards the recognition of occupational stress as a legitimate occupational hazard. His work also contributed towards the compelling evidence on the social determinants of health and helped underpin arguments made to address this issue worldwide (Commission on Social Determinants of Health, 2008).

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