Contextual Factors for ‘Everyday’ Workplace Injuries: Implications for OH&S and HR Professionals

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ABSTRACT
This paper considers the role of contextual factors in two forms of ‘everyday’ workplace injuries: musculoskeletal disorders (MSDs) and slips, trips and falls (STFs). Most research on these types of workplace injuries has been concerned with immediate, physical causes with comparatively little research focused on a broad systems approach to injury analysis. Drawing on conceptual models, this paper argues that understanding the contextual factors in causation is important to developing effective prevention measures. The paper then draws on an example of applying such a model to demonstrate the value of a systems approach to MSD and STF analysis. The aim is to assist OH&S and HR professionals in their risk assessment and prevention activities related to these injuries.

Keywords: occupational health and safety; work organisation; organisational performance; workplace relations; workplace injuries; risk management

‘Everyday’ workplace incidents and injuries are high-frequency, often low-hazard events that are most commonly recorded in injury reports and analyses of injury data. Such commonplace events are typically in one of two categories: musculoskeletal disorders (MSDs) or slips, trips and falls (STFs). MSDs and STFs are leading workplace injury categories in New Zealand (ACC, personal communication) and in most countries where occupational injury statistics are published (e.g. STF: Health and Safety Commission, 2005; National Institute for Occupational Safety and Health, 2000; MSD: Health and Safety Executive (HSE), 2007; National Research Council – Institute of Medicine (NRC-IOM), 2001).

Attempts at prevention have only had partial success in reducing injury rates for these common injuries. Most research into MSDs and STFs has focused on immediate factors, often physical, leading to considerable progress in understanding their role in injury causation. As a result, while these immediate risk factors for MSDs and STFs are well documented (e.g. Bernard, 1997; Haslam & Stubbs, 2006; Gao & Abeysekera, 2004; Gauchard, Chau, Mur & Perrin, 2001; NRC-IOM, 2001), the wider range of potential risk factors and their role in prevention has not been fully recognised. Furthermore, as Bentley and Haslam (2001), Moray (2000) and Silverstein and Clark (2004) contend, there is strong evidence to
indicate that targeting specific system elements or risk factors is unlikely to yield a satisfactory level of preventative success. Consequently, MSDs and STFs have been fairly resistant to micro-level interventions that fail to address all elements of the broader work system. This indicates that a new approach is required to guide OH&S and HR managers in preventing employee injuries associated with MSDs and STFs.

Rather than the traditional focus on risk factors, this paper instead argues for a broader perspective that incorporates an understanding of the contextual factors that contribute to ‘everyday’ workplace injuries. Contextual factors act to increase the exposure to physical and psychosocial risk factors that underlie the immediate causes of injury. Contextual factors may be defined as social, cultural, economic, political and organisational factors that contribute to creating the conditions under which physical and psychosocial risk factors occur (NRC-IOM, 2001). Unfortunately, relatively little research attention has been paid to the contextual factors that underlie immediate risk factors, nor the mechanisms by which such latent and active conditions interact in producing MSD and STF risk. In addition, systems models developed for the analysis and prevention of high-hazard incidents (e.g. Reason, 1990) have not been applied to everyday workplace injury problems such as MSDs and STFs.

With these concerns in mind, this paper argues for the importance of understanding the role of contextual factors in the aetiology of everyday injuries. Specifically, this paper describes several conceptual models that incorporate contextual factors into the understanding of how to better prevent workplace injuries. The paper then draws on an example of applying such a model to advocate for the value of a systems approach to MSD and STF analysis. The aim is to assist OH&S and HR professionals in their risk assessment and prevention activities related to these injuries.
MODELS OF CAUSATION FOR EVERYDAY INJURIES

Musculoskeletal Disorders (MSDs)

MSDs include a wide range of conditions that affect muscles, tendons, nerves, and supporting structures of the body. In the workplace, these are injuries that are often referred to as sprains, strains or manual handling injuries. MSDs typically occur when the physical and psychosocial demands are too great and result in discomfort, pain or functional impairment for the person involved (Buckle & Devereux, 2002; NRC-IOM, 2001). While ergonomics is very much a leading discipline in addressing MSDs with well-established models of causation (e.g. Buckle & Devereux, 2002), comparatively few models address contextual factors in MSD risk.

In the United States, the National Research Council’s Institute of Medicine (NRC-IOM, 2001: 28) describes MSDs as developing ‘in a broad context of economic and cultural factors and reflecting the interaction of elements intrinsic to, as well as extrinsic to, the individual’ As a result, the NRC-IOM included these factors in a conceptual model for the development of MSD prevention. According to the NRC-IOM (2001), the influence of contextual factors occurs at the industry level via external forces (e.g. unemployment levels, foreign exchange rates), and subsequently impacts on the structure and management of organisations within it (e.g. payment systems, work compression). These factors then impact on the level of exposure to physical risk factors for individual workers (e.g. static postures, repetition, pace of work).

Karsh (2006) developed an integrated model based on an analysis of nine pre-existing MSD models. Karsh’s model identifies how social and cultural factors directly influence both the work organisation and the psychological demands of work. According to Karsh’s (2006) model, the work organisation influences both psychological (e.g. job control, support) and physical (e.g. force, posture) work demands. A similar integrated model was developed by Faucett (2005) which incorporates psychological and social factors. In
Faucett’s (2005) model, emphasis is placed on how management systems and organisational policies aimed at improving worker productivity can play a role as latent failures in MSD risk management.

**Slips, Trips and Falls (STFs)**

STFs are typically recorded in injury statistics as either a ‘fall on the level’ or a ‘fall from a height’. Progress in understanding the role of contextual and situational factors in STFs is even less advanced than that for MSDs. However, several researchers have sought to extend the scope of research attention to a wider range of factors than the traditional, but limited, foot-floor model that dominates the literature. Central to these efforts have been reviews that have included a broader range of factors in STF causation coupled with detailed analyses that takes into account a wider range of contributory factors in workplace STFs (e.g. Bentley & Haslam, 1998, 2001; Gao & Abeysekera, 2004; Gauchard et al., 2001; Kines, 2003). Bentley and Haslam (1998; 2001), for example, identified a broad range of risk factors for postal STFs in the UK. A range of contextual factors (e.g. a culture of delivery speed; rewards for speedy deliveries; work compression through a ‘job and finish’ policy; delivery ‘cut-off’ time targets) were found to impact on at-risk employee behaviour (including moving on foot too fast for conditions; carrying overweight mail bags; taking hazardous short-cuts). The authors described these latent conditions as ‘organisational behaviour-shaping factors’, and described the mechanism by which such factors influenced postal employee behaviour while on delivery, and the interaction between this behaviour and a range of other immediate risk factors (e.g. footwear, underfoot conditions, environmental aspects such as lighting levels).

Other studies have highlighted the role of organisational and design factors for STFs. Bentley, Moore, Tappin, Legg, Parker & Ashby (2005), for example, described a range of latent and immediate risk factors for falls involving New Zealand dairy farmers. Amongst these factors, the authors highlighted the role of work organisational issues and poor design of plant and equipment as important contributors to STFs in milking sheds. An excellent example of how design factors can potentially impact on STF risk was the
necessity for staff to climb up onto the milk hoppers to observe the contents level because the hopper lacked a suitable viewing window.

The same authors, from an analysis of STF risk factors for the New Zealand residential construction sector, produced a conceptual model for the role of a range of contextual and immediate factors in construction STFs (Bentley, Hide, Tappin, Moore, Legg, Ashby & Parker, 2006). The model highlighted the relationship between contextual factors (industry and organisational cultural factors, industry guidelines, design specifications and building standards, the nature of materials for building houses, the manufacture and supply of height-work equipment by contractors and others, and aspects of work organisation), employee work-related behaviour and STF risks. The authors highlighted the use of ladders (rather than scaffolding) as platforms for height work in order to minimise subcontractor costs in a very competitive market as a very good example of the influence of contextual factors directly influencing work practices and STF outcomes. Indeed, falls from ladders were identified as a major injury factor in this research (Bentley et al., 2006).

A recent conceptual model by Bentley (2009) draws on an interactive systems approach to STF analysis. Bentley’s (2009) model focuses on information processing in the mechanism of injury for STF events, and the interaction between latent conditions and active failures/immediate factors in STF causation. The model includes design and work organisation factors as underlying latent conditions, which impact on active failures that increase STF risk including task-related behaviour and information processing that occurs when the individual is exposed to a hazardous situation (e.g. a slip or trip hazard). As Bentley (2009) describes, latent conditions such as poor plant or equipment design, job design, production pressure, operational decisions, and various aspects of risk and safety management can impact on different information processing stages in relation to STFs. Thus, for example, hazard perception can be influenced by environmental and task design, as well as individual factors such as visual ability and perceptual skills.
Studies by Bentley and Haslam (1998; 2001) and Leclercq and Thouy (2004), amongst others, have identified how aspects of task design and task-related behaviour impact on employee perceptions of STF hazards due to the requirement to attend to visual tasks other than monitoring the underfoot surface while walking. This factor is compounded by speed of movement over surfaces where the pedestrian/worker may not adopt the appropriate gait or adjust their pace of movement for conditions underfoot (e.g. ice, mud, obstacles) due to failure to observe the hazard. Bentley (2009) also notes that hazard cognition and decision to avoid the hazard will be affected by factors such as training, production pressure, and a safety culture that emphasises and rewards speed of production/travel such as found for delivery employees in the previously described studies. Hence, a worker may be aware of the presence of an underfoot hazard such as a slippery surface, but take inadequate notice or action to avoid it, due to the greater demands of the task and/or the need to complete tasks at speed. This model should be regarded as a precursor to the development of a theoretical foundation for further research that accounts for contextual factors in STF causation. In addition, it would serve to guide STF risk assessment, approaches to STF investigation and analysis, and STF prevention that seeks to address the whole work system.

**THE VALUE OF UNDERSTANDING CONTEXTUAL FACTORS: MSDs AND THE NEW ZEALAND MEAT PROCESSING SECTOR**

This section outlines the value of understanding contextual factors through a discussion of the key findings of a detailed study of contextual risk factors for MSD injuries in the New Zealand meat processing sector (Tappin, Bentley & Vitalis, 2008). Tappin et al’s (2008) study is a rare example of MSD research that has contextual issues as its level of analysis. The aims of the study were to improve understanding and characterise the role or influence of contextual factors in maintaining the high incidence of MSD in this sector. The qualitative study involved interviews with 237 workers, management, union and safety personnel in 28 processing sites. Thematic content analysis of data collected from this survey resulted in a list of contextual factors which the authors postulated may create
conditions under which greater exposure to physical and psychosocial factors can occur in meat processing. Contextual factors identified were organised under nine general themes. A brief summary of each is provided below:

Cultural influences on MSD risk include factors such as a dominant and firmly entrenched competitive culture that impacts negatively on key health and safety issues such as information sharing on injury prevention improvements – even between plants within the same company. Also, a ‘blame the victim’ attitude pervades much of the industry where MSDs are attributed to factors such as poor technique, lack of resilience and false reporting, which all impede preventative efforts. The machoistic culture supports and respects speed and injury resilience, where pain is typically regarded as inevitable and something to be worked through.

Political and human relations influences on MSD risk include the requirements of regulatory bodies and overseas buyers which were given a higher priority than health and safety concerns. The adversarial relationship between management and the workforce is a further factor as it restricted employee involvement in health and safety and aspects of work design and planning that have implications for MSD risk across the industry. In addition, staff seniority, those long serving workers with the highest ‘seniority numbers’ and greatest job security, acted as a barrier to changes to reduce MSD risk. The training of workers for high seniority tasks and rotation of senior workers to low seniority tasks, for example, were resisted by the more senior workers.

Economic factors influencing MSD risk include fluctuations in exchange rates which place greater emphasis on increasing production and reducing production costs, resulting in reduced staffing levels, reduced recovery time for workers, and reduced training time, and an increased work pace. Buyouts, mergers and plant closures have also led to much change and insecurity for employees in this sector, and serve to add to the potential for MSD risk.
Human resource issues for MSD risk include the problem of resourcing labour for geographically isolated plants, shortages of competent workers due to low unemployment, low wages and limited career structures, and the presence of attractive job opportunities elsewhere. The demands of the work also meant that new entrants to the industry and younger workers were less physically prepared for heavy work, and required greater time to build the necessary conditioning for the job, with a resultant increased MSD risk. A further factor related to training, where on-the-job training arrangements meant that issues such as production noise, divided attention and the passing of bad habits (poor technique) reduced training effectiveness and increased MSD risk.

Seasonality and environmental influences on MSD risk include the fact that workloads during the season (6-9 months of the year) are often very high to keep up with the inflow of stock. New employees recruited during this peak period were at risk of being over-loaded and under-trained, while employees often worked extended hours at an increased pace. These factors led to an increased MSD risk through greater exposure to physical and psychosocial risk factors coupled with lower physical conditioning after time away during the ‘off-season’. Weather fluctuations, such as droughts, act to further exacerbate the problems of seasonality with workloads peaking as farmers are forced to sell stock.

Job demand factors for MSD risk include the impacts of increases in volumes of meat exported and the amount of meat processed per person employed, and productivity increases that have led to high levels of production pressure and a faster pace of work. Additionally, mechanisation has brought further specialisation and speeding up of the production chain, increasing MSD risk and impacting on rehabilitation of injured workers returning to work. The high work pace also affects new entrants who cannot keep up with the pace of work while skills and conditioning are developed. The level of task complexity due to hygiene and other requirements has added greatly to the range of skills workers need but training has not kept pace with these changes.
Job design factors for MSD risk include high levels of specialisation across the industry with little or no variety in the work. Low levels of challenge and job satisfaction may also have a bearing on the experience and reporting of musculoskeletal pain or discomfort. The physical design of plant and production lines means that job design alternatives are limited to task rotation in most cases – and this is strongly resisted due to seniority and other factors. Rotation and other job design alternatives are also seen by management as potentially compromising productivity.

Payment and scheduling systems impact on MSD risk through the use of incentives to maximise output and work pace during the production season and high demand periods. These payment systems such as piece rate working, compression of work hours and bonuses can create high work pace and increased exposure to MSD risk factors. Furthermore, perceptions of low job control and high physical demands are associated with increased areas of pain and poorer general physical health. The nature of the production line means that workers have to keep pace with the fastest worker, increasing pressure on slower workers to keep up so bonuses and incentive payments can be achieved. Payment systems are also barriers to measures to reduce MSD risk exposure as they affect the opportunities for off-line training, adequate breaks and recovery time.

Change factors for MSD risk include the fact that New Zealand’s meat industry has entrenched traditions and is often resistant to change; a serious barrier to attempts to make improvements to health and safety to reduce MSD risk. Management were commonly found to be pre-contemplative about the MSD problem in the sector despite national and company health and safety data indicating cause for concern. The continuation of such management inertia is likely to see calls for improvements that reduce MSD risk exposure go unheeded.
IMPLICATIONS FOR OH&S AND HR PROFESSIONALS

While Tappin et al.’s (2008) study focused on the contextual factors as the level of analysis, this should not be seen as an attempt to minimise the importance of physical risk factors in MSD aetiology. Instead, the value comes from understanding the role that contextual factors play in creating conditions under which immediate risk factors occur. Consequently the researchers were able to develop and communicate a holistic and more robust picture of MSD risk factors than by simply focusing on the physical risk factors in isolation. Such an approach builds on earlier work that has focused on the role of organisational risk factors in MSDs (e.g. Carayon, Smith & Haims, 1999) thereby increasing the range of factors to include cultural and social influences. In doing so, it provides support for models such as that of Karsh (2006), and the tenet that wider cultural, social, economic, and organisational influences can be important precursors to exposure to physical and psychosocial risk factors in the workplace.

Implications for OH&S and HR practice in the management of ‘everyday’ workplace injuries start with the need to ensure approaches to risk management are sufficiently broad so as to consider the potential role of wider systemic factors in injury risk. Hence, hazard and risk assessment processes for MSD and/or manual handling risk should seek to identify the risk associated with different categories of contextual risk discussed in the above study. Similarly, risk assessment should also be cognisant of the potential role of latent conditions such as poor environmental design, task design, job design, or work organisation practices (such as scheduling) on STF risk. Questions to ask in risk management might include: ‘how does the design of our plant impact on risk-related behaviour of our workers’, or ‘what are the implications for MSD risk of non-rotation of staff doing repetitively stressful work’. Of course, hazard control should seek to eliminate, isolate or minimise the presence of each of these risk factors, and where contextual factors are concerned this can be considerably challenging. However, risk management that focuses only on immediate, physical risk factors for workplace injury can only have a limited, short-term impact, while longer-term efforts need to focus on the root cause of such immediate factors – that is, attempting to
identify and address contextual factors, however challenging this might be.

**IMPLICATIONS FOR RESEARCH**

Incorporating a broader understanding of risk factors for MSDs and STFs to include contextual factors gives rise to a number of issues related to the analysis and prevention of everyday injuries. Firstly, an analysis of events that apply a systems approach requires detailed investigative techniques to identify and analyse contextual and latent factors (Bentley, 2009). Epidemiological techniques and injury data analyses can at best only provide information on immediate factors/active failures (see Bentley and Haslam (2006) for an account of the different STF analysis techniques and their relative strengths and weaknesses). However, as Bentley et al. (2006) contend, they may be necessary precursors for a more in-depth analysis of MSD and STF risk factors and their interactions. The use of both incident-centred and incident-independent methods of investigation, including detailed follow-up investigations and observations and interviews with workers, has been shown to be effective in the identification and analysis of a large number of risk factors in different industry settings (Bentley & Haslam, 1998; 2001; Bentley et al., 2005; 2006). Despite this advantage, such an approach does add considerably to the cost of research and practice (Bentley et al., 2005). Analysis that aims to explore the contextual factors may also need to adopt a participative approach to research to engage key industry stakeholders in the research process. Indeed, the perceptions and experiences of a wide range of key informants may need to be considered in exploring these broad issues (Tappin et al., 2008).

In terms of prevention, these studies have indicated that intervention which targets wider political, social and cultural influences is often beyond the control and influence of the industry (Tappin et al., 2008). However, an important first step to managing MSD risk can be in recognising the influence such factors have on what occurs in the workplace, and in moving towards a changed mindset towards reducing the influence of external contextual factors while addressing more directly internal factors such as culture and
payment systems. Change may also require a long-term multi-faceted approach which will make high levels of industry ownership vital if change is to be successful. More crucially, it is clear that intervention targeting latent organisational and design factors underlying MSD and STF risk is necessary if the root causes of workplace injuries are to be adequately addressed.

CONCLUSION

This paper has sought to address a relatively unexplored aspect of occupational health and safety: the role of contextual factors in everyday workplace injuries. While these factors have been well-researched for high-hazard work systems and a multitude of catastrophic events, comparatively little attention has focused on the role of such factors in commonplace high-frequency, low-hazard health and safety issues such as MSDs and STFs. Indeed, MSD and STF studies that take a systems perspective are rare, with most research focusing on immediate factors and physical risks, and consequently our understanding of the role of broader work system factors is limited.

Likely explanations for this narrow approach have been suggested by Bentley (2009), including the fact that STFs are most frequently the result of slips of the foot on the underfoot surface – leading to an overwhelming ‘foot-floor’ focus among researchers; the requirements of industry funders for product development; and the limited array of variables available for epidemiological analysis. While these contributions to the understanding of the physical aspects of MSD and STF risks are indisputable, there is a clear need to integrate such micro-ergonomics perspectives with macro perspectives on occupational health and safety (Wilson-Donnelly, Priest, Salas & Burke, 2005), if understanding and prevention of MSDs and STFs is to encompass interactions between workers, technology, environment, organisation, culture and society (Bentley, 2009). Only through such an approach can interventions that address underlying causes of many workplace injuries be designed and implemented.
REFERENCES


