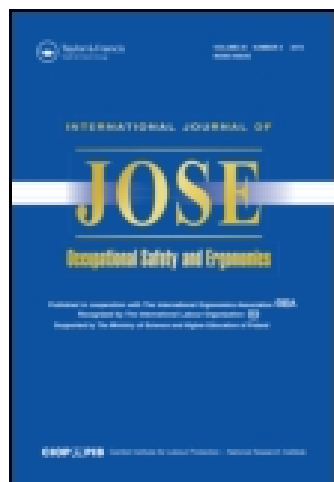


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Mechanical Equipment Injuries in Small Manufacturing Businesses. Knowledge, Behavioral, and Management Issues

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This paper presents findings from an extensive study into factors that impact upon the high rate of injuries due to mechanical equipment, especially in small manufacturing firms. Issues relating to knowledge of health and safety issues and to management practices have been shown to be extremely important with regards to safety in small businesses. Knowledge and awareness of hazards were found to be relatively low and few respondents, especially managers, had received adequate safety training. Managers did not regard the identification and control of risks as a priority. Workplaces generally lacked effective safety management procedures such as safety rules and regulations, procedures for recording and learning from accidents, and clearly defined responsibilities for safety. Some issues requiring further investigation, and some recommendations for improving safety in small businesses, are presented.

small business mechanical equipment injuries

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1. INTRODUCTION

Small businesses face a number of challenges with regard to the implementation of occupational health and safety (OHS) that large businesses do not. It has been claimed that the OHS needs of small businesses have been ignored by State and federal government bodies in Australia, and that OHS information and advice is not reaching small business owners and employees (Mayhew, 1997a). This problem is likely to increase as the number of small businesses increases and many larger firms downsize (Mayhew, 1997b; Mayhew & Quinlan, 1998; Mayhew, Quinlan, & Ferris, 1997).

Definitions of what constitutes a small business vary. For purposes of the present study, a small business was defined as being one of 19 people or less. Although there is considerable diversity among companies of this size, there are a number of common characteristics. Small businesses tend to be personally managed by the owner, do not form part of a larger enterprise, owners frequently have hands-on involvement in production and family members are often involved in the business (Eakin, 1997; Mayhew, 1997a). Because of the direct involvement of owners in the day-to-day running of the business, and the range of tasks that owners and employees are likely to have to carry out, those making business decisions often do not have expertise in all relevant areas. This is particularly true in the area of OHS, where relevant knowledge is often found to be lacking (Fonteyn, Olsberg, & Cross, 1997; Hopkins & Hogan, 1998; Mayhew, 1997a). Problems identified in the management of OHS in small businesses include low levels of awareness of OHS standards; lack of training; limited knowledge of OHS regulations and limited contact with OHS agencies; lack of expertise, time, money, and resources to devote to OHS (Eakin, 1992; Lamm, 1997a; Limborg & Hasle, 1997; Mayhew, 1997b).

The aim of the present research is to investigate factors impacting upon the rate of mechanical equipment injuries (MEI) in small manufacturing firms. Mechanical equipment injuries are of particular concern as they account for a major proportion of traumatic injuries in industry, possibly as high as 28% of all compensable injuries (Worksafe Australia, 1991). The problem is likely to be more severe in small businesses, which face constraints on resources that may have implications for the type and standard of mechanical equipment in use. The manufacturing sector was found to have the highest rate of mechanical equipment injuries in

Australia (Worksafe Australia, 1991); accordingly, this sector was singled out for study. With Australian Bureau of Statistics data indicating that 81% of all manufacturers in New South Wales employ 19 people or less, research into issues facing these companies is timely.

A wide range of factors is likely to affect the rate of MEI in small manufacturing firms. Characteristics of small businesses that have been found to be associated with improved safety performance include educational level of the owners and better organisational management of safety, including assigned responsibilities for safety (Salminen, 1997). Other issues of relevance include a failure to recognise the costs of poor OHS; low levels of understanding and knowledge about OHS; and a failure of preventive policies to address the problems of small businesses (Mayhew, 1997a), as well as the failure of small businesses to access and use OHS information even when freely available (Caple, Hodgson, & Grieg, 1997; Limborg & Hasle, 1997). The present study further investigated the link between OHS, particularly the rate of injuries due to mechanical equipment, and behavioural, managerial and related issues in small manufacturing firms.

2. METHOD

Undertaking research within the small business sector is difficult as small businesses are very difficult to survey. Mail questionnaire methods, for instance, tend to result in an inadequate response rate. Direct contact between researchers and participating companies is preferable, allowing for improved participation and better quality of data (Lamm, 1997b).

Companies were selected from four high-risk sectors of the manufacturing industry: fabricated metal product; specialised metal products and tool makers; paper and paper products; and wood, wood products, and furniture manufacturing. All companies with the words "engineering," "industries," and "manufacturing" in the title were identified from the telephone directory and contacted ($N = 250$). Of these, 92 were of the required size and industry type. Thirty-five of these agreed to take part in the study, producing a response rate of 38%. Although all identified companies of the required size and type were contacted, not all were successfully interviewed. Some refused to participate whereas others proved difficult to interview, due to time pressures, and so forth.

Reasons for refusal to participate are unknown and so the degree of bias in the sample is also unknown. It cannot be assumed that respondents are representative of those who refused to respond.

Interviews were conducted with the 35 owners of small manufacturing businesses. Self-administered questionnaires were filled out by 145 employees of these businesses. In addition, a technical check list was used to rate observations of unsafe conditions associated with mechanical equipment.

Demographic data on the highest level of formal education received showed that 7% of respondents had received primary school education as their highest level of formal education. Thirty-one percent of respondents had received high school education, 51% had a trade or technical college certificate, and 11% of respondents had received a university diploma or degree. The majority of questionnaire respondents (61%) were born in English-speaking countries such as Australia, New Zealand, the USA, and Canada. However, 39% of respondents were from non-English speaking countries. The majority of respondents spoke English at home (69%). A further 6% spoke mostly English, 17% spoke mostly a language other than English at home, and 8% spoke a language other than English at home at all times. Questionnaire responses were received from people from different cultures, with varying degrees of familiarity with English, however, lack of English was one of the reasons suggested for employees not returning questionnaires and the actual numbers of people from a non-English speaking background is, therefore, probably much higher than indicated by the questionnaire responses.

3. RESULTS

3.1. Knowledge and Behavioural Issues

3.1.1. *Knowledge and awareness of hazards*

Of the 118 employees who provided answers to questions regarding knowledge and awareness of hazards in the company, 21 (18%) thought that managers were not aware of the potential dangers of machinery or did not know whether they were aware or not. The managers universally stated that they were aware of the potential dangers of machinery. There seems to be some discrepancy between managers' perception of

their own awareness of potential dangers of machinery, and employees' perceptions of management's awareness of these dangers. It is possible that employees had not seen managers operating machinery. In a few cases, managers handled the "business side" of the company and delegated production responsibility to a foreman. The majority of managers (92%) and employees (90%) agreed that managers understood the way in which the workplace machinery operated.

It is interesting to note that, whereas all managers stated that employees understood enough about the machines to work safely, 13% of employees did not feel that they knew enough to work safely. Reasons given for lack of sufficient understanding were (a) lack of trade-related education and (b) lack of on-the-job training.

3.1.2. Safety training

Fifty percent of employers had never received any safety training, whereas 22% of employees reported that they had never received safety training. The safety training that managers had received tended to relate to the safe use of tools rather than to ways of managing safety in a small business. This suggests that there is a need for safety training for employers, both so that they can pass on safety training to employees and so they can better manage safety in their businesses.

Of those respondents who had received safety training (whether at their current workplace or at a college of Technical and Further Education [TAFE]), it was apparent that the quality and standard of safety training received was perceived by many as unsatisfactory (Table 1). Some of the respondents considered attendance at a First Aid course to constitute safety training. The quality of safety training was not investigated in this study, but was followed up in a later study (see Fonteyn et al., 1997).

Of the 52 people who had received safety training at TAFE, just over half (28%) were satisfied, 17% were dissatisfied, and 29% were neutral. Interview responses indicated that safety training primarily focused on immediate issues associated with working with tools rather than covering general safety issues and safety management.

Although satisfaction with in-house training was quite high, it was clear from interviews with employers that the amount of safety training provided was not significant. Only 3 of the 35 companies provided formal safety training. When asked how many minutes per day were

TABLE 1. Employers' and Employees' Levels of Self-Reported Satisfaction With Safety Training Received

Question	No Training				Total Number of Responses to This Question
	Given (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)	
Satisfaction with safety training received in the general course of working career (employees only)	26 (22)	46 (39)	25 (21)	21 (18)	118
Satisfaction with safety training received in the general course of working career (employers only)	6 (50)	4 (33)	2 (17)	0	12
Satisfaction with safety training received at TAFE (employees only)	66 (56)*	33 (28)	10 (8)	9 (8)	118
Satisfaction with safety training received at TAFE (employers only)	9 (75)*	1 (8)	1 (8)	1 (8)	12
Satisfaction with safety training received at current workplace (employees only)	31 (26)	47 (40)	20 (17)	20 (17)	118

Notes. TAFE—a college of Technical and Further Education, *—not applicable, did not go to TAFE.

spent on safety training, 32 (91%) of respondents could not answer, saying safety was only mentioned in passing. Only 3 (9%) companies sent their employees on a formal safety training course. These data suggest that the amount and quality of safety training that employees in small manufacturing businesses had received at work was inadequate.

3.1.3. Language issues

Interviews indicated that difficulties had arisen at 18 (51%) of the workplaces due to managers and employees failing to understand one another. Thirteen percent of respondents claimed that communication problems had contributed to safety problems and 11% of respondents believed that communication problems due to language differences could contribute to safety problems in the future. Interviews with managers revealed that workers who had poor written and spoken English were instructed how to do jobs via hands-on instruction. Managers admitted

that they had often thought the workers had understood them when in fact they had not. In none of the companies visited was information made available to non-English speaking workers in their native language.

3.1.4. Lifestyle factors

Interviews revealed that in 12 of the 35 companies visited (34%), safety problems had occurred due to employees' alcohol consumption. In the 35 companies, a total of 17 employees had been asked to leave work, either permanently or for the day due to actual or suspected alcohol intoxication. Interview responses revealed that 38% of respondents had witnessed safety problems as a result of alcohol consumption.

Another lifestyle problem, which was reported to have influenced safety, was disabilities. Forty-seven percent of interviewees had either a hearing or back disability, which affected their day-to-day work.

3.2. Management Issues

3.2.1. Management awareness of safety

Although managers considered themselves to be knowledgeable about the hazards and risks in their workplace, the safety audit against the technical check list revealed that the majority of businesses were extremely hazardous. When asked to rate the three most hazardous pieces of equipment in their workplace, those interviewed were able to answer appropriately and demonstrated understanding of the reasons a machine was unsafe. Managers appeared to be reasonably knowledgeable about the hazards of machinery in their workplace but did not relate this to the existence of a safety problem that should be addressed. This indicates poor risk perception and a willingness to accept a high level of hazard as a normal part of doing business. Employers stated that hazards could be managed by having well-trained, competent staff who followed good work practices. Hazards were not seen as something needing to be fixed and, therefore, were not given specific attention. Manager and employee awareness, knowledge, understanding, and attitudes to hazards is an area that needs further study.

3.2.2. Safety procedures

Thirty-seven percent of employees and 42% of managers indicated that there were no specific safety regulations (such as the wearing of personal protective equipment) for their business. Forty-nine percent of employees and 50% of managers indicated that there were specific safety regulations, whereas 14% of employees and 8% of managers did not know. Twenty-one percent of employees and 42% of employers stated that managers did not follow the same safety procedures for wearing personal protective equipment as workers. Questionnaire results revealed problems with the enforcement of safety regulations (see Table 2).

TABLE 2. Responses from Employers and Employees as to Whether or Not Safety Regulations Are Enforced in Respondents' Workplaces

Are Safety Regulations Enforced?	Never (%)	Very Rarely (%)	Some of the Time (%)	Most of the Time (%)	Always (%)	Total Number of Responses
Employee responses	6 (7)	10 (11)	24 (26)	40 (44)	11 (12)	91
Manager responses	0	2 (18)	2 (18)	4 (36)	3 (27)	11

Managers described the difficulties they experienced when they tried to enforce safety regulations. Managers often wanted to maintain "friendly relations" with their employees and felt uncomfortable about "wielding authority." They found it difficult to tell their employees what to do in regards to health and safety. Employers described the frustration they experienced when employees ignored their attempts to enforce safe behaviour (such as the wearing of personal protective equipment).

Respondents were asked if there should be stricter penalties for not adhering to safety regulations. Results indicated that approximately half the managers (50%) and employees (58%) were supportive of the idea of stricter penalties.

3.2.3. Procedures for recording and learning from accidents

Sixteen companies (46%) did not keep an accident record book or any documentation recording accidents. None of the companies analysed their injury experience to determine priorities for injury prevention. Without a written account of accidents and hazards, important details

are often forgotten. In the companies where accidents were not recorded, interviewees could not recall all the events that had jeopardised safety in the company and could often not remember details of accidents they had seen or experienced. Furthermore, whether or not the hazard or accident was reviewed or fixed was often not known. Without a written account of hazards and accidents, neither managers nor employees can learn effectively from past safety problems.

3.2.4. Responsibilities for safety

Table 3 shows responses to the question "Who manages safety in your organisation?"

TABLE 3. Respondents' Understanding of Who Manages Safety in Their Workplace

Who Manages Safety? Responses From:	Management (%)	No One (%)	We Look After Ourselves (%)	Safety Committee (%)	Safety Representative (%)	Total Number of Responses to This Question
Managers	10 (83)	0	2 (17)	0	0	12
Employees	73 (66)	20 (18)	7 (6)	9 (8)	1 (1)	110

The majority of managers knew that safety was their responsibility, however, only 66% of workers thought that management managed safety. One company had a safety committee and one had a safety representative. Eighteen percent of employees indicated that no one managed safety in the workplace, and 6% of employees indicated that they "looked after themselves." In the small manufacturing businesses participating in our study, there was no cohesive safety structure and no clearly defined safety regulations or procedures to follow.

4. DISCUSSION

Although the number of companies was relatively small, a number of common features emerged with regard to issues affecting the management of occupational health and safety. These features are worthy of further study.

Results of the study showed that employers believed the use of machinery to be intrinsically hazardous and that the solution was

well-trained people and good work practices. The employers surveyed did not appear to apply basic safety practices and procedures such as assessing equipment for safety before purchase, recording and following up accidents, checking the workplace for unsafe features, defining and enforcing safety rules, or providing instruction and training for employees. Although managers stated that they realised that they were responsible for safety, they did not recognise that poor supervision and management were contributing causes of accidents. This is consistent with the findings of Salminen (1997), who reported that small businesses with better safety performance were those with better management systems in place, including designated responsibility for the management of OHS. In the present study, employers often did not have basic safety procedures in place and appeared not to know that such procedures were expected. There was a lack of defined procedures in safety as well as other areas. Improvements are unlikely to occur unless management recognises the need for change.

Lack of training was found to be a major problem, both with regard to training in the use of machines as well as specific safety training. This study could not indicate the full extent of the lack of training and education because those who did not return questionnaires probably included a higher percentage of people with poor educational background in comparison to those who did respond to the questionnaire. Employers have a responsibility to provide training in the workplace but frequently had received less safety training than their employees. Training of employers was particularly poor. Not only was the percentage trained lower than that of employees, but the nature of their training did not relate to their role as manager of a business.

In addition, contacts with supportive organisations were poor and managers did not have the time, means, or inclination to pursue OHS information. This confirms findings from other studies. Salminen (1997) reported that managers with higher levels of education were more likely to have safer businesses; Mayhew (1997a) also reported that small business managers were usually unaware of their lack of OHS knowledge and did not know where to start searching for OHS advice or information. This is consistent with the findings of the present research. Given the severity of the physical safety problems identified in the participating firms, the lack of awareness of employers concerning safety management practices and procedures, and the attitude that hazards are a normal part of doing business are critical issues.

Improvements to this situation may require a combination of enforcement and education. There is a need to find effective mechanisms to disseminate critical safety knowledge to employers. It appears that small business managers receive less OHS information from external bodies than do large companies and tend to scan and then disregard it, but when faced with a need for more information prefer to seek help from friends or other small business owners without further consulting the material available (Cagle et al., 1997). If currently available written material is not being read, adding to this may not be helpful. Whereas small business owners do not know how to redesign hazardous tasks and often do not recognise when a danger exists, they are interested in improving efficiency and profitability (Mayhew, 1997a). Mayhew (1997b) identifies several key issues for the provision of OHS information to small businesses. Such initiatives need to consider the limited spare time owners and managers have, their preferences for personalised contact and for specific, relevant and practical information. Cagle et al. (1997) further suggest that information can be disseminated through professionals such as accountants, solicitors, and medical doctors as well as other, more established sources such as employer associations, unions, government departments, and insurance companies. It is important that small businesses develop the knowledge and skills to assess and manage risks, but it is also important that the information and methodologies developed for small businesses be seen to be appropriate and not too complicated (Bibbings, 1996).

Training needs should also be addressed. Although those who received trade-related training had mostly also received safety training, others had not. Even managers with trade-related training did not often fulfil their management responsibilities under legislation. Safety training, as part of trade or similar courses, should include a component on legislation and safety management and should be included in the education system at a number of different levels.

If issues of knowledge, awareness, and motivation are addressed, physical improvements may follow but attention is also needed to the resource constraints faced by small businesses. Attention may be needed to a regulatory approach limiting the availability of old or second-hand equipment that does not meet minimum safety standards; however, many small businesses would find the cost of replacement of unsafe equipment prohibitive. It is worth noting, however, that although some physical problems were beyond the resources of the company to fix, in

many cases improvements could be made with few resources. One promising approach to improving safety in small enterprises has been reported by Kogi and his co-workers. This focuses on the use of peer networks and the identification of local good examples, with emphasis on using personal contacts and sharing good OHS ideas. Such approaches have been found to be effective (Kogi, 1997; Limborg & Hasle, 1997). There is scope for further investigation into the usefulness of this approach.

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