

A Review of the Literature on Preventive Occupational Health and Safety Activities in Small Enterprises

Peter HASLE^{1*} and Hans Jørgen LIMBORG²

¹Department of Manufacturing Engineering and Management, Technical University of Denmark, Kgs. Lyngby, Denmark

²TeamWorklife, Copenhagen, Denmark

Received August 31, 2005 and accepted November 24, 2005

Abstract: The scientific literature regarding preventive occupational health and safety activities in small enterprises has been reviewed in order to identify effective preventive approaches and to develop a future research strategy. During the last couple of years, there has been a significant increase in the number of studies of small enterprises, but the research community is scattered between many different disciplines and institutions. There is a lack of evaluation of intervention studies, both in terms of effect and practical applicability. However, there is sufficiently strong evidence to conclude that employees of small enterprises are subject to higher risks than the employees of larger ones, and that small enterprises have difficulties in controlling risk. The most effective preventive approaches seem to be simple and low cost solutions, disseminated through personal contact. It is important to develop future intervention research strategies which study the complete intervention system: from the intermediaries through dissemination methods to the resulting preventive activities of the small enterprises.

Keywords: Small enterprises, Occupational health and safety, Prevention, Literature review

Introduction

Small enterprises cover most of the companies and a large share of the employees in most countries, e.g. in Denmark a total of 98% of all companies have less than 50 employees, covering approximately a third of the total working force. More and more countries have realized the potential of the small enterprises and appreciate that employment and economic growth to a large extent depend on these enterprises. Both political and scientific interests in occupational health and safety in small enterprises have, therefore, grown considerably during the last decade. Many countries have launched programs to support small enterprises. But it is also evident that small enterprises have to cope with severe business constraints in order to survive. Consequently, health and safety is one of the issues that are often pushed aside by the management. However, many researchers have realized the presence of this problem in small enterprises, and research has been steadily growing in recent years. The political interest has also eased the

possibilities of funding of research, and subsequently the literature within this field has been equally expanding.

This paper presents the result of a comprehensive review of the scientific literature on preventive activities in small enterprises. The objective of the review was to extract general conclusions on effective approaches to prevention of injuries and occupational diseases, and based on these conclusions to assess the need for further research on occupational health and safety in small enterprises in Denmark. The result of the review is published in a Danish report¹⁾.

Material and Methods

The search for relevant literature was approached with a rather broad perspective. Keywords were small and medium-sized enterprises with a number of synonyms combined with occupational health and safety, again using a number of synonyms such as accidents, risk, hazard, ergonomics, and work environment. In addition, a number of delimitation criteria were used. The languages were limited to English, Danish, Norwegian or Swedish. Other criteria included publication after 1980 and research from an industrialized

*To whom correspondence should be addressed.

country.

International databases were searched, resulting in a total of 1,200 reference hits. Out of these, approximately 1,000 came from Safety Science and Risk Abstracts, Medline and ISI Web of Knowledge. The rest came from several smaller databases.

The references were sorted in two rounds. In the first round irrelevant references such as lack of focus on small enterprises were excluded. The result was 366 references which were read and assessed. In the second round further 78 references were excluded as irrelevant. In the end 288 references were included in the review. These references covered 109 scientific articles, 76 scientific reports, 67 books or chapters in books, 15 conferences, 8 doctoral theses, and 13 others. One hundred eighty four references were in English. Forty five percent of the references were published 2000–04, 36% 1995–99, and the rest 1980–1994.

The quality of the references was assessed by using the following criteria: contribution of new knowledge, originality of empirical findings, use of theory in design and analysis, and finally whether the reference took the special characteristics of small enterprises into consideration.

Using this assessment as point of departure, the literature was analysed for the understandings and approaches to preventive activities in small enterprises, which are different from similar activities aimed at larger enterprises. The analysis is mainly focussed on the smaller enterprises with less than 50 workers. Enterprises of this size are typically owned and managed by the same person. This condition separates this size of enterprises from the medium-sized ones which are more comparable to larger enterprises^{2,3}.

In this paper we focus on the English language literature, although a few key studies in other languages are included, and due to the restricted space in the paper, it has only been possible to include a limited number of the references.

Research in Small Enterprises

The literature on preventive activities in small enterprises is scattered. It covers several scientific disciplines, including occupational medicine, industrial hygiene, ergonomics, engineering, psychology, and sociology. At the same time, the area also covers many different issues such as specific exposures and adverse health effects, a great number of methods and tools, different ways of supporting the enterprises, economic considerations, and the culture of the small enterprises.

The literature was classified in seven groups with relation to the topic covered. These included: work environment and health (18%), workplace culture (11%), organization of preventive health and safety activities (25%), methods and tools (30%), intermediaries and support systems (32%), regulation and legislation (7%), economy and work

environment (3%). Several references cover more than one topic.

One hundred thirty four references (47%) were related to a specific industrial sector, especially industries which are well known for small enterprises such as construction, agriculture, and certain industries within the manufacturing and service areas. However, references were only included if they contained the keyword small enterprises or a similar synonym. Thus, searching for literature in typical small enterprise sectors may have identified more relevant studies.

In the next sections of the paper we present the main findings of the literature review, divided into five parts: a) Risks in small enterprises, b) Understanding the nature of small enterprises, c) Internal health and safety activities, d) Development of tools and methods, and e) Use of intermediaries to reach the small enterprises. The quality of the research and the implications for further research strategies are issues discussed at the end of the paper.

Risks in Small Enterprises

Many researchers claim that small enterprises have special problems with the work environment. The risk is higher, and the ability to control risk is lower. And research carried out in recent years seems to give a firm base for these conclusions, although it does not have to cover all risks and all types of industries. There is strong evidence for high accident risks in small enterprises⁴⁻⁶. This is especially the case for fatal and other serious accidents. There are also studies indicating that exposure to physical and chemical hazards are larger in small enterprises^{2,7,8}. When looking at sectors with many small enterprises it is even more evident that there is an elevated risk in small enterprises. Examples can, among others, be found in agriculture⁹⁻¹¹), construction¹²⁻¹⁴), wood industry⁷), and printing¹⁵). The literature has only to a limited extent studied the reasons for the higher risk. It is almost taken for granted that the small enterprises have difficulties in controlling risk due to limited human and economic resources. There might be other reasons such as the particular organization of work and the technology, but these issues are only discussed in a few studies¹⁶). As regards the psychosocial work environment there are indications that the situation is quite the opposite. Small enterprises may have a better psychosocial work environment¹⁷), which may be ascribed to the close social relations^{18,19}). It seems, though, that the psychosocial work environment is very dependent on the behaviour of the individual owner and thus vulnerable to emotional stress²⁰). However, very few studies of the psychosocial work environment have been carried out.

Similarly, many studies show that the small enterprises have problems with fulfilling legal requirements for the control of occupational health and safety. The fact of limited

resources is often mentioned in this context^{2, 16, 21–23}). Another important point is that the cost of implementing control measures according to the legal requirement is relatively higher in small enterprises than in larger ones^{24, 25}).

The Nature of Small Enterprises

A number of researchers have studied the special nature and culture of small enterprises^{2, 21, 23, 26–30}). Some of these do not put special emphasis on occupational health and safety. They do, however, provide an important contribution to the understanding of the reactions, motivation and resources of the small enterprises, and as such this type of literature has been used by health and safety researchers.

The references present research on the special features of management, ownership, organization, and social relations of the small enterprises. The point of departure for some of the researchers is the development of the business perspectives of small enterprises^{26, 31}). The owner is emphasised as the dominant actor in relation to any changes made in the small enterprises. Several references document how the personal values and priorities of the owner are determinants of the culture, social relations and the attitude of the enterprise^{21, 22, 30, 32}).

Based on these references, most small enterprises can be described as organizations which have to fight for survival, with the owner as the responsible person who, like an octopus, has to handle many different issues at the same time, and consequently, to no surprise, health and safety is not always high on the agenda. It is this position as both owner and manager, held by one person who has to handle all management issues, which is the key to understanding the nature of many small enterprises. The owner-manager gets a large part of his or hers identity from the enterprise and his or her own beliefs and cultural values are the guidelines for the development of the business. His or her management style is often a patriarchal one, which may be ego-centric and action-oriented, but which also means that he/she assumes a certain responsibility for the employees. Suspicion towards state regulation and external consultants is another important characteristic. It is, therefore, crucial to recognize the position of the owner in order to develop an approach which can foster successful preventive strategies.

Some cases have studied the health aspect of being an owner-manager. It is pointed out that the conditions for these persons can be a rewarding and inevitable lifestyle, but it is also documented that the large responsibility and the often stressful workload can lead to stress or burnout^{28, 33}).

Internal Health and Safety Activities

Most countries have basic requirements that employers must meet as regards the organization of health and safety

activities. It is normally required to establish a management system which should include a health and safety committee, election of safety representatives, and periodical risk assessment³⁴). Small enterprises generally have difficulties in fulfilling these requirements^{2, 21}).

The owner-manager is the key person, and his or her opinions and values constitute the approach of the enterprise to health and safety^{21–23, 29, 35, 36}). But many owners consider health and safety to be the responsibility of the employees³²). At the same time, many owners consider regulation and demands to improve health and safety standards as a financial burden which is too heavy and not realistic for a small enterprise. In combination with the fact that accidents are a rare experience within the individual company, this attitude forms an ad hoc approach to health and safety as a problem to be solved when it occurs²).

It is thus important to develop specific small enterprise approaches to the internal health and safety activities. First of all, it is important to focus on simple and low cost solutions³⁷). Another common obstacle is the professional terminology and conceptual thinking that characterise most regulation and proposals from health and safety professionals. Support “wrapped” in the “health and safety professional” context is often considered irrelevant and not sufficiently specific to be applicable³⁸).

Participation of the employees in health and safety activities in small enterprises is studied in several references^{39, 40}). It is an overall conclusion that formal structures such as safety committees are difficult to establish and sustain because of the informal culture of the small enterprises. Among the more successful approaches to involvement of employees in health and safety activities are regional or roving safety representatives. In this case, one representative covers a number of companies. Experience from Sweden and UK has, although resources is a limiting factor, proved that this idea is a realistic approach to open the possibility of employee participation in the improvement of the work environment.

Tools and Methods Aimed at Small Enterprises

There are many examples of special tools and methods developed for small enterprises. Some pieces of literature cover short descriptions of a large number of different methods and tools^{22, 41, 42}). The most common tool is different types of checklists, including both risk assessment types^{43–46}) and more action-oriented types^{30, 47}). Many checklists are aimed at certain risk factors such as chemicals⁴³) or at certain industries⁴⁸). For most of the checklists there are no indications of effect evaluation and consideration of practical diffusion. Other approaches include tools for the implementation of more comprehensive health and safety management systems, which most often seem to be too complicated for small enterprises to apply^{22, 38}). Another type

of methods is accident prevention^{49, 50}. The study by Rasmussen *et al.*⁵⁰ provides one of the few examples of a careful evaluation that proves the efficiency of accident prevention in farming. The most successful methods seem to be action-oriented, combining health and safety with other management goals, and based on trust and dialogue⁵¹. Often low cost solutions, especially in developing countries, are an important element of the successful approach^{21, 52}.

Intermediaries Working with Small Enterprises

A separate part of the literature within this field covers the many different types of intermediaries which support the small enterprises (for an overview see Walters²³). One approach in the literature is to study the different models of organizations that can function as intermediaries. They can among others be occupational health services²¹, insurance companies⁵³, labour unions⁵⁴, accountants⁵⁵ and public authorities⁵¹. Another approach is to look at the availability of relevant methods for the intermediaries to apply. The literature emphasizes the little effect of written information, whereas personal contact between an intermediary and the small enterprise is a more effectual (and costly) method. The owner relies to a great extent on contact with individuals whom he trusts. An important question in this context is how to organize the contact in a cost-effective way. It is a general experience that it has to be funded independently of the individual small enterprises which are not likely to pay for consultancy services²¹. A significant question is that of the special qualifications needed by the intermediaries^{8, 21, 55}. There is not much attention paid to this issue in existing literature, but the few examples emphasize that the traditional professional qualifications are not sufficient for acquiring the ability to establish the necessary trustful relationship with small enterprises. The ability to develop personal contacts and understand the business environment of small enterprises is the important qualification in this context.

Discussion

It is difficult to identify any kind of common platform for the reviewed studies of health and safety in small enterprises. It is scattered on many disciplines and institutions. In most cases the research is not developed in research communities having health and safety of small enterprises as a main interest. Most of the studies seem to originate from individual researchers who have taken an interest in small enterprises. In some cases the research seems to be initiated by specific research funds aimed at small enterprises. As a consequence of this approach there is a lack of more comprehensive and sustainable research communities.

The main part of the literature has been published in the

last couple of years, and there is a tendency towards descriptive results and quite often repetition among the different contributions. It is rare to see researchers build on the results of others when they have published outside the researchers' primary field of expertise. Another critical point is that many studies seem to lack proper consideration of the special nature and life of small enterprises. In some cases the approach of the research could just as well be directed towards larger enterprises. In other cases the claim seems to be that if it is just a little bit simpler than what is expected for larger enterprises, it would be suitable for small enterprises.

These circumstances may very well be the cause of an important limitation of a large part of the research included in the review. Firstly, it was found that even though a number of methods of how to approach small enterprises are presented, only a limited number of these have been thoroughly evaluated. The missing evaluation both counts for evaluation of effect in the small enterprises and evaluation of the practical applicability. The last point is important in order to develop cost-effective preventive methods. Part of the explanation for the lack of evaluation is probably methodological difficulties in defining control groups and groups for follow-up. Another reason could be that much of the literature is about pilot project development rather than systematic testing of intervention methods.

Two important priorities for future research can be concluded from the critical comments to the reviewed studies. Firstly, it is necessary to improve the quality of the research. Three elements are particularly important: 1) Use of the existing knowledge from earlier research in design and analysis of future studies. 2) Use the special nature of small enterprises as point of departure for the research. 3) Evaluation of the effect of preventive activities. As the goal of research on small enterprises rarely is to find new evidence of causal relations between exposure and health, the evaluation can, in many cases, be limited to more simple measures.

Secondly, it is important to develop more comprehensive research, in order to study the complete intervention system. Cost is a serious constraint for reaching out to a large number of small enterprises, and it is, therefore, necessary not only to develop methods in pilot projects, which work as long as extraordinary funding is available, but also to study the complete system, starting with the intermediary agency, reaching out towards the small enterprises, then continue with the methods to get in contact, and finally to study the effect in the small enterprises, which include both the process of getting the intervention accepted, the intervention itself, and the outcome (Fig. 1).

In spite of the critical comments above, the literature encompasses important learning, which can be used by intermediary agencies and health and safety professionals,

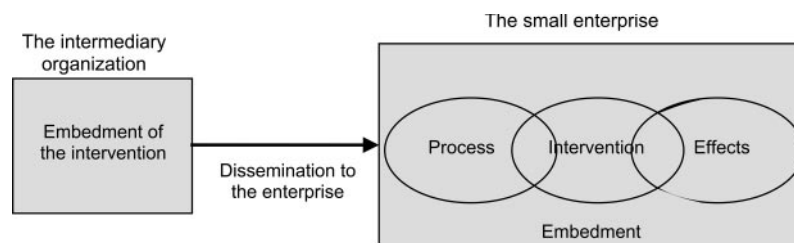


Fig. 1. A model for intervention research in small enterprises.

supporting small enterprises. It is important to take a point of departure in the special nature of small enterprises, especially focusing on the owner-manager. The development of trust and dialogue is crucial. In addition, simple and low cost solutions, taking the limited economic and human resources into consideration, is also a necessity. Based on this approach a wide variety of the developed methods and tools can be applied.

Conclusion

Research in occupational health and safety in small enterprises is a new and rapidly developing field. Important knowledge can be extracted from the literature but it is necessary to improve the quality of the research with emphasis on the use of existing knowledge in new research, exchange of experience between researchers, a higher priority to interdisciplinary studies, and evaluation of the effect of the various interventions. The study of the whole intervention process, from intermediaries through dissemination methods to preventive activities in the small enterprises, must be a priority. Among other things, it is important in order to develop cost-effective programs that can be applied on a larger scale. However, important research results can already now be used by professionals/intermediaries for the development of programs for small enterprises. At the same time, researchers should develop action-oriented research in cooperation with the professionals, working in practice with small enterprises.

Acknowledgements

The study was funded by the Danish Work Environment Research Fund. Thanks to Annette Ledskov and Else Nalholm who have participated in the study.

References

- 1) Hasle P, Limborg HJ, Ledskov A, Nalholm E (2004) Arbejdsmiljøarbejdet i mindre og mellemstore virksomheder—en litteraturanalyse. Dept of Manufacturing Engineering and Management, Technical University of Denmark, Lyngby.
- 2) Lamm F (2000) Occupational health and safety in Queensland and New Zealand small businesses: Influential factors that lead to occupational health and safety compliance and practice. School of Industrial Relations and Organizational Behaviour, Faculty of Commerce and Economics, The University of New South Wales, Sydney.
- 3) Klyver K (2004) Ejerleder, familielever eller ejerlever—En ny forståelsesramme for de mindre ejerledede virksomheder. In: *Iøjnefaldende anderledes?—Forandringsprocesser og ledelse i mindre virksomheder.* eds. by Christensen PR., Damgaard T, Jørgensen TB, 79–102. Jurist- og Økonomforbundets Forlag, Copenhagen.
- 4) European Social Statistics (2002) European social statistics. Accidents at work and work-related health problems. European Communities, Luxembourg.
- 5) Fabiano B, Curro F, Pastorino R (2004) A study of the relationship between occupational injuries and firm size and type in the Italian industry. *Safety Science* **42**, 587–600.
- 6) Stevens G (1999) Features—Workplace injuries in small and large manufacturing workplaces—An analysis of the risks of fatal and non-fatal injuries, including figures for 1994/5-1995/6. *Labour Market Trends* **107**, 19–26.
- 7) Schlunssen V, Vinzents PS, Mikkelsen AE, Schaumburg I (2001) Wood dust exposure in the Danish furniture industry using conventional and passive monitors. *Ann occup hyg* **45**, 157–64.
- 8) Eakin J, Lamm F, Limborg H J (2000) International perspective on the promotion of health and safety in small workplace. In: *Systematic occupational health and safety—Perspectives on an international development.* eds. by Frick K, Jensen PL, Quinlan M, Wilthagen T, 227–47, Pergamon, Amsterdam.
- 9) Lundqvist P, Gustafsson B (1992) Accidents and accident prevention in agriculture. A review of selected studies. *Int J Ind Ergon* **10**, 311–9.
- 10) Myers JR, Hard DL (1995) Work-related fatalities in the agricultural production and services sectors, 1980-1989. *Am J Ind Med* **27**, 51–63.
- 11) Rasmussen K, Carstensen O, Lauritsen JM (2000) Incidence of unintentional injuries in farming based on one year of weekly registration in danish farms. *Am J Ind Med* **38**, 82–9.
- 12) Byung YJ (1998) Occupational deaths and injuries in the construction industry. *Appl Ergon* **29**, 355–60.
- 13) Chen GX, Fosbroke DE (1998) Work-related fatal-injury

- risk of construction workers by occupation and cause of death. *Hum Eco Risk Assess* **4**, 1371–90.
- 14) McVittie D, Banikin H, Brocklebank W (1997) The effect of firm size on injury frequency in construction. *Safety Science* **27**, 19–23.
 - 15) Crouch KG, Gressel MG (1999) The control of press cleaning solvent vapors in a small lithographic printing establishment. *Appl Occup Environ Hyg* **14**, 329–38.
 - 16) Mayhew C (2000) OHS in Australian “micro” small businesses: evidence from nine research studies. *J Occup Health and Safety* **16**, 297–305.
 - 17) Gelin A, Holm A (2002) Fri, frisk och framgångsrik? Om småföretagares hälsa och arbetsmiljö, Stockholm (in Denmark).
 - 18) Cowling M, Storey D J (1998) Jobs in EU Micro Firms. European foundation for the improvement of living and working conditions, Dublin.
 - 19) Limborg HJ (2003) One big family—making the small business an attractive workplace. The European Agency for Safety and Health at Work, Bilbao.
 - 20) Eakin J, MacEachen E (1998) Health and the social relations of work: a study of the health-related experiences of employees in small workplaces. *Soc of Health & Illness* **20**, 896–914.
 - 21) Hasle P (2000) Health and safety in small enterprises in Denmark and the role of intermediaries. Center for Alternativ Samfundsanalyse, Copenhagen.
 - 22) Antonsson A-B, Birgersdotter L, Bornberger-Dankvardt S (2002) Small enterprises in Sweden. Health and safety and the significance of intermediaries in preventive health and safety. 2002:1, Arbetslivsinstitutet, Stockholm.
 - 23) Walters D (2001) Health and Safety in Small Enterprises. European Strategies for Managing Improvement. P.I.E.-Peter Lang, Brussels.
 - 24) Lancaster R, Ward R, Talbot P, Brazier A (2003) Costs of compliance with health and safety regulation in SME’s. Research Report 174. Health and Safety Executive, London.
 - 25) Lancaster R, Maher C J, Alder A (2001) Second Evaluation of the Manual Handling Operations Regulations (1992) and Guidance. Contract Research Report 346/2001. Health and Safety Executive, London.
 - 26) Ram M, Edwards P (2003) Praising Caesar not burying him: what we know about employment relations in small firms. *Work Empl and Society* **17**, 719–30.
 - 27) Vinberg S (2003) Healthy performance in small enterprises: Studies of organizational determinants. Department of Human Work Sciences, Division of Industrial Work Environment, Luleå University of Technology, Luleå.
 - 28) Rahim A (1996) Stress, strain, and their moderators: An empirical comparison of entrepreneurs and managers. *J Small Business Management* **34**, 46–59.
 - 29) Eakin J, Lamm F, Limborg HJ (1998) International Perspective on the Promotion of Health and Safety in Small Workplaces. Paper presented at the Conference on Policies for Occupational Health and Safety Management Systems and Workplace Change. 21-24 September, 1998, Amsterdam.
 - 30) Thurman J, Louzine AE, Kogi K (1988) Higher productivity and a better place to work. Practical ideas for owners and managers of small and medium-sized industrial enterprises(1-2). ILO, Geneva.
 - 31) Beckerus A, Roos R (1985) Affärer som livsstil: Om glädje og tyranni i småföretagandets värld. Liber Förlag, Stockholm.
 - 32) Eakin J (1992) Leaving it up to the workers: Sociological perspective on the management of health and safety in small workplaces. *Int J Health Services* **22**, 689–704.
 - 33) Persson O (1991) Att leva som småföretagare. En studie om företagande, livssituation och stress. Göteborgs Universitet. Psykologiska institutionen, Göteborg.
 - 34) Frick K, Jensen PL, Quinlan M, Wilthagen T (eds) (2000) Systematic Occupational Health and Safety Management—Perspectives on an International Development. Pergamon, Oxford.
 - 35) Barbeau E, Roelofs C, Youngstrom R, Sorensen G, Stoddard A, LaMontagne AD (2004) Assessment of occupational safety and health programs in small businesses. *Am J Ind Med* **45**, 371–9.
 - 36) Mayhew C (1997) Small business occupational health and safety information provision. *J Occup Health and Safety (Aust and NZ)* **13**, 361–73.
 - 37) Champoux D, Brun J (2003) Occupational health and safety management in small size enterprises: an overview of the situation and avenues for intervention and research. *Safety Science* **41**, 301–18.
 - 38) Walker D, Tai R (2004) Health and safety management in small enterprises: an effective low cost approach. *Safety Science* **42**, 69–83.
 - 39) Walters D (2004) Worker representation and health and safety in small enterprises in Europe. *Ind Rel J* **35**, 169–86.
 - 40) Frick K, Walters D (1998) Worker representation on health and safety in small enterprises: Lessons from a Swedish approach. *Int Lab Rev* **137**, 367–89.
 - 41) The European Agency for Safety and Health at Work (2003) Systems and programmes. Improving occupational safety and health in SME: examples of effective assistance. The European Agency for Safety and Health at Work, Bilbao.
 - 42) European Agency for Safety and Health at Work (2004) Promoting health and safety in European small and medium-sized enterprises (SMEs). SME funding scheme 2003-2004. Office for Official Publications of the European Communities, Luxembourg.
 - 43) Balsat A, De Graeve J, Mairiaux P (2003) A structured strategy for assessing chemical risks, suitable for small and medium-sized enterprises. *Annal Occup Hyg* **47**, 549–56.
 - 44) Ruhl R, Lechtenberg-Auffarth E, Hamm G (2002) The development of process-specific risk assessment and control in Germany. *Annal Occup Hyg* **46**, 119–25.
 - 45) Tijssen SCHA, Links IHM (2001) Ways for SMEs to assess and control risks from hazardous substances. In: Reports of an International Workshop held on 26, 27 November 2001, Research Report 014. HSE Books, London.
 - 46) Russell RM, Maidment SC, Brooke IM, Topping, MD

- (1998) An introduction to a UK scheme to help small firms control health risks from chemicals. *Annal Occup Hyg* **42**, 367–76.
- 47) Kogi K (1997) Ergonomics and technology transfer into small and medium-sized enterprises. *Ergonomics* **40**, 1118–29.
- 48) Antonsson A-B (1989) A method to support small companies in improving their work environment—a manual for the plastics industry. *Annal Occup Hyg* **34**, 29–34.
- 49) Wojcik SM, Kidd PS, Parshall MB, Struttman TW (2003) Performance and evaluation of small construction safety training simulations. *Occup Med* **53**, 279–86.
- 50) Rasmussen K, Carstensen O, Lauritsen JM, Glasscock D, Hansen ON, Jensen U (2003) Prevention of farm injuries in Denmark. *Scand J Work Environ Health* **29**, 288–296.
- 51) Mayhew C, Young C, Ferris R, Harnett C (1997) An evaluation of the impact of targeted interventions on the OH&S behaviours of small building industry owners/managers/contractors. Division of Workplace Health and Safety and National Occupational Health and Safety Commission, Canberra.
- 52) Kogi K, Kawakami T, Itani T, Batino JM (2003) Low-cost work improvements that can reduce the risk of musculoskeletal disorders. *Int J Ind Ergon* **31**, 179–84.
- 53) Kbar-Khanzadeh F, Brossia C (2000) Utilization of health and safety consulting services of the Ohio Bureau of Workers' Compensation by small businesses. *Appl Occup Environ Hyg* **15**, 851–4.
- 54) Walters D, Lamm F (2003) OHS in Small Organizations: Some Challenges and Ways Forward. Working Paper 15. National Research Centre for OHS Regulation, Canberra.
- 55) Lamm F (1997) Small Businesses and OH&S Advisors. *Safety Science* **25**, 153–61.