

Original Article

A Model for Design of Tailored Working Environment Intervention Programmes for Small Enterprises

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Objectives: Small enterprises have higher exposure to occupational hazards compared to larger enterprises and further, they have fewer resources to control the risks. In order to improve the working environment, development of efficient measures is therefore a major challenge for regulators and other stakeholders. The aim of this paper is to develop a systematic model for the design of tailored intervention programmes meeting the needs of small enterprises.

Methods: An important challenge for the design process is the transfer of knowledge from one context to another. The concept of realist analysis can provide insight into mechanisms by which intervention knowledge can be transferred from one context to another. We use this theoretical approach to develop a design model.

Results: The model consist of five steps: 1) Defining occupational health and safety challenges of the target group, 2) selecting methods to improve the working environment, 3) developing theories about mechanisms which motivate the target group, 4) analysing the specific context of the target group for small enterprise programmes including owner-management role, social relations, and the perception of the working environment, and 5) designing the intervention based on the preceding steps. We demonstrate how the design model can be applied in practice by the development of an intervention programme for small enterprises in the construction industry.

Conclusion: The model provides a useful tool for a systematic design process. The model makes it transparent for both researchers and practitioners as to how existing knowledge can be used in the design of new intervention programmes.

Key Words: Small enterprises, Intervention, Programme theory, Realist analysis, Construction industry

Introduction

It is generally accepted that small enterprises with less than 50 employees have higher exposure to occupational hazards than larger organisations [1]. Small enterprises often have limited resources to prioritise these risks and to improve the working

environment [2,3], and they often have difficulties in complying with legislation [4,5]. Furthermore, it seems that regulation, control, and campaigns aiming at improving the working environment in small enterprises only have had limited effect [6,7]. The most important reason for this challenge is the cost of reaching out and engaging with small enterprises, both for different stakeholders such as labour inspectors and advisory services. In addition, other important constraints for small enterprises are a lack of trust in public authorities and limited resources to follow up on inspections and information material [4,5,8].

Small enterprises constitute a major challenge for the soci-

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ety's effort to improve occupational health and safety (OHS) as they, on one hand, have extensive needs, and on the other hand, are difficult to reach. Regulators, practitioners, and researchers have therefore looked into the possibilities of designing support programmes which meet the specific needs of small enterprises [6,7,9,10]. It is generally agreed that it is necessary to tailor support programmes to the specific needs and context of small enterprises. However, there are only limited discussions in the literature about how to carry out such tailoring. Working environment programmes should be evidence based, and it is obvious that tailoring must build on the existing knowledge of control and prevention of occupational hazards. However, tailoring support programmes is not a simple process as it needs to be based on a variety of different sources of knowledge. Thus, it is necessary to transfer knowledge from one field to another with smaller or larger contextual differences. It is likely that the existing knowledge will not fit exactly to the specific target group which can be different in terms of size, work tasks, socio-economic context, etc. It is therefore necessary, given the different circumstances, to make the best judgement about the possible effects based on the accessible evidence.

This paper addresses the challenges of designing intervention programmes for small enterprises by presenting a systematic model for the tailoring process. The design model includes the contextual features which are important to take into consideration when designing programmes for small enterprises. We demonstrate how the model can be applied in practice by the development of an intervention programme for musculoskeletal disorders (MSD) in the construction industry as part of a nationwide Danish support programme for small enterprises. Finally, we discuss the applicability of the model on a broader scale.

Materials and Methods

This paper uses three methodological approaches. First, we build a theoretical model for the design of programmes targeting small enterprises based on a realist analysis [11,12]. Secondly, we review the literature on small enterprises in order to outline the characteristics of these enterprises compared to larger enterprises. We use the existing reviews [7,10,13] as the point of departure, and supplement with new literature identified through citations search and targeted search for small enterprise characteristics in social science fields such as business and entrepreneur research. We use this review to identify the design parameters to include in our model. Thirdly, we apply the model on an intervention programme for small construction enterprises. In order to do so, we review selected literature

on the construction industry which focuses on two aspects: The first aspect is additional general characteristics of small construction enterprises, and the second aspect is literature on MSD and related interventions in construction. The analysis of the literature is supplemented with interviews with stakeholders in the construction industry, e.g., experts from employer associations, unions, and labour inspectors, as well as owner-managers from small construction enterprises. The interviews are carried out in order to include practical experience from a Danish context. This data is subsequently used for the application of the model on the development of two specific intervention programmes for small construction enterprises.

Results

A model for designing working environment programmes for small enterprises

Interventions always build on assumptions on how and why the intervention will work. These assumptions constitute a programme theory for the intervention [14]. We suggest using the concept of programme theory together with the realist analysis as a framework for the design of tailored support programmes for small enterprises. This approach has recently been suggested as useful in the working environment research [15,16].

Realist analysis [11,12] focuses on explaining the underlying mechanisms by which a programme is expected to work and the contextual constraints which can hamper or further its implementation. The central question in a realist analysis is what works, for whom, and under what circumstances? [11,15] Such considerations add valuable information to the explanation of the causes for the outcome of intervention programmes.

The mechanisms [12] are assumptions about what it is that will initiate or trigger changes, and the subsequent actions by the target groups in order to implement changes which engender the desired outcome. The ways mechanisms work depend on the context of the target group. By context, we refer to situational opportunities and constraints that affect the occurrence and meaning of organisational behaviour [17]. In a workplace setting, the context is constituted by factors which can influence the attitude and practice relating to the working environment. These factors include national and global policies and developments, such as financial markets and regulations, as well as norms and values inside or outside the company or the sector [16].

The same mechanisms may not necessarily work in all target groups. It may for instance be quite different mechanisms that may lead to a reduction in heavy lifting in the health care sector where the main problem is the manual handling of pa-

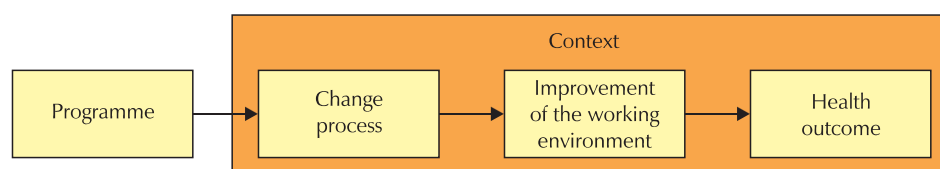


Fig. 1. A model for the causal chain in the programme theory for working environment programmes.

tients; in the construction industry, lifting heavy construction materials and heavy equipment is the primary concern.

Hasle and Limborg [7] have developed a model for reaching out to small enterprises with intervention programmes. The model emphasises the need for inclusion of not only the concrete changes of the working environment but also the process in which small enterprises are approached and motivated to start a change process. We suggest integrating the realist analysis into this model and thereby emphasising the role of context and the distinction between the changes in the working environment, such as less heavy lifting, as well as the changes which allow for the reduction in heavy lifting. The result is a simple causal model which is depicted in Fig. 1.

The causality of the model can be used to construct a stepwise procedure for the design of working environment programmes. The idea is to start from the right side of the model and subsequently work backwards through the causal chain in order to end up with a full designed programme. The design procedure therefore has five steps:

1. Defining the OHS challenges of the target group (*health outcome*).
2. Selecting methods and solutions that can improve the working environment by reducing the exposure and thereby producing the intended health outcome (*improvement of the working environment*).
3. Developing theories about mechanisms which can motivate the target group to initiate change. On the general level, there are three main mechanisms: regulation, incentives, and information [18] (*change process*).
4. Analysing how the specific context of the target group may influence motivation and implementation of the intervention (*context*).
5. Designing the programme which builds on the results of the four preceding steps (*programme*).

The application of the model must build on the best available knowledge. However there will rarely be evidence at hand which fits exactly to the working environment problems in question and the context of the specific sector. It is therefore necessary to transform evidence from one context to another and to identify other types of valid knowledge where traditional evidence is not available. Particularly for small enterprises, the available evidence on effective intervention programmes is

limited. Therefore, in order to transfer evidence from other contexts into intervention programmes aimed at small enterprises, it is of importance to understand the context of small enterprises. In the next section, we analyse the contexts of small enterprises in order to show how the understanding of the context can be used to develop design recommendations.

Context features of small enterprises

In this section, the focus is on the particular features of small enterprises, which constitute the context that must be taken into consideration in order to create programme theories for efficient interventions aimed at this target group.

There is no universally recognised definition of small enterprises. In this paper, we build on the European Union [19], which defines micro enterprises as enterprises having 1-9 employees, and small enterprises as enterprises having 10-49 employees. One important feature of the special context in both micro and small enterprises is the ownership and management. Almost all micro enterprises have only one level of management, and most of them will be owned by the same person who also functions as the manager (the owner-manager). The same is most often the case for small enterprises, although there can be more than one level of management when the size of the enterprises moves towards 49 employees. In the following, micro- and small enterprises will be treated as one, and collectively termed as small enterprises [20].

Small organisations which are part of a larger corporation, such as supermarkets, petrol stations and bank branches, are not to be considered as small enterprises as they can draw on the resources from the corporation they are a part of. The working environment in such enterprises does not seem to be more hazardous than such environment in larger ones [1].

The contextual themes, important for designing small enterprise programmes, take the point of departure in the fact that they are small, which allows the owner-manager, the key person, to create close social relations between the owner-manager and the employees. This characteristic subsequently influences the perception of the working environment. In the following paragraphs, we discuss three themes in more details.

The first theme is the *owner-manager role* with limited management resources, which is the main difference compared to larger enterprises. This difference is the main reason for the

high level of occupational hazards as well as for the difficulties in the application of systematic working environment control measures [7]. Owner-manager's role has been studied for decades [3,21,22], and an important result is that the owner-manager, to a large extent, takes his or her identity from the firm. Owner-managers often have low growth ambitions and they prefer personal relations with customers, suppliers, and other external actors.

The second theme is *social relations*. Relations between senior management and employees in larger enterprises are to a great extent impersonal, whereas small enterprises are marked by close personal relations where everybody knows each other [23-25]. These personal relations make it possible to create informal organisations of work without written procedures

and to create social obligations toward each other [26-28]. The owner-managers feel a certain obligation toward the health and safety of his or her employees but also tend to push the responsibility to the employees [3,29]. At the same time, employees have a certain level of solidarity with the firm, which among other things limit the inclination to raise controversial issues, for instance, issues about the working environment.

The third theme concerns the *perception of the working environment*. This is one of the many issues for owner-managers and it is most often considered to be peripheral compared to the necessities of daily operations and the fight for survival of the business. The working environment activities therefore tend to be unsystematic and have an ad hoc character [2,6,7]. One important consequence is that owner-managers tend to under-

Table 1. The context features of small enterprises

Small enterprise context features	Description	Design recommendations
Owner-manager role		
Limited management resources [2,7,29]	The owner-manager often has to take care of all tasks such as sale, billing, planning, personnel, health and safety, and purchase of equipment and materials.	Strongly restricted use of owner-manager time.
Identity as an entrepreneur [3,30-32]	The owner-manager takes his or her identity from the business and it is important for the owner-manager to appear as a decent person.	Application of methods which do not include direct or indirect criticism of owner-manager.
Low growth ambitions [21,33,34]	Most owner-managers give priority to personal control and therefore, avoid too much growth of the business. The return on investment is often not the most important factor as long as the enterprise thrives, yet, cost is important.	Return on investment in working environment improvements is not necessarily the best selling point. Direct cost has to be minimised.
Personalised external contacts [3,7,35]	The owner-manager prefers personal contact to customers, suppliers, officials, and advisors.	Support provided through trusted personal contacts.
Social relations		
Informal work organisation [23-25]	Work functions and personnel policies are not formally described but based on direct agreements between owner-manager and each individual employee.	Limited inclusion of written procedures and policies in support programmes and utilisation of quick decision making.
Social obligations [24,25,27,28,30,36]	The close relations create psychological obligations toward each other. Both owner-manager and employees often use the family term to describe the firm.	Utilisation of the personal dialogue and the concern for each other.
Perception of working environment		
A peripheral issue [3,7]	Health and safety of employees is but one small issue compared to securing daily operation and survival.	Integration of the working environment into other management goals and limited time consumption.
Underestimation of risk and overestimation of knowledge [2,3,26]	Owner-managers believe risk is controlled and low due to the rare occurrence of injuries, and they therefore believe that they have the necessary knowledge to control risk.	Point of departure in already accepted risks and transfer of knowledge through trusted partners (e.g., other owner-managers or employees).
Ad hoc and retrospective approach [2,6,37,38]	Risks are acted upon when incidents bring them to surface. Traditional systematic health and safety management is considered unnecessary and bureaucratic.	New systematic practices built on existing approaches with limited formalisation ambitions.

estimate risks and overestimate their own knowledge of the necessary control measures [3,26]. Moreover, owner-managers look for indications from clients, partners, and employees for an acceptable standard of the working environment [3].

Each of these themes has important implications for designing support programmes. Table 1 provides a more detailed description of the content and the consequences in terms of possible design recommendations.

These general recommendations have to be expanded when it comes to designing programmes targeted at small enterprises in a specific sector. We show in the next section how the methodology is used to develop intervention programmes for the construction industry as part of a Danish support programme for small enterprises.

Application of the model in the construction industry

The prevention packages

The Danish government established the Prevention Fund in 2007 with an annual budget of 50 million EUR in order to reduce wear and tear at workplaces and also to prevent exclusion from the labour market. The focus is on the long-term effects of physical strain in the musculoskeletal system along with psychosocial exposures [39,40]. Small enterprises found the application procedure too complicated and the result was that almost no small enterprises received support from the Prevention Fund.

In order to meet the needs of small enterprises, in 2010, the Prevention Fund developed a new strategy called “prevention packages” which are predefined interventions consisting of a specific description and a budget [41]. The prevention packages were launched on January 2011 aimed at the construction industry and the elder care sector. Later in 2011 and in 2012, other sectors, such as auto repair, passenger transport, cleaning, wood industry, and children day care centres, received packages. More sectors will be covered during the years to come. The budget of the prevention packages consist of financial support for salaries and for various auxiliary costs during the implementation process. Enterprises apply for support through a simple web-based application procedure, and implementation of each package is expected to last three to six months.

It was decided at a political level that the specific content of the prevention packages should be based on evidence related to a specific sector. The evidence covers research results from intervention studies on the specific sectors. Reports and studies from the sector as well as quantitative and qualitative data from inspections from the Danish Working Environment Authority are also included in the evidence base. Additionally, qualitative

data from workplace visits and experiences from labour unions and employers’ associations are included in the design process.

These sources are used to develop programme theories as to how prevention packages could work in the target group of small enterprises. The sources are used to identify the most common OHS problems in the sectors and to select the intervention methods which can be used to solve these problems. They furthermore form the basic understanding of the specific context of each sector used for the concrete design of the prevention packages for each of the sectors.

The authors of this paper were involved in the development of the prevention packages, and the design model presented above was applied in the development procedure.

The construction industry

The construction industry serves as an example of how the model has been used in the development of the prevention packages. The aim was to target enterprises with less than 10 employees as the construction industry is dominated by enterprises of this size. In addition to the financial support for the implementation of the packages, it was also possible to offer an adviser from the Working Environment Authority who could guide the workplace through the process. The prevention packages for the construction industry only focused on MSD due to the politically decided frames for the prevention fund even though it is recognized that accidents as well as other risk factors, such as dust and noise, also constitute major problems in this sector. In addition, one of the conclusions drawn from Table 1 is the need to target interventions in small enterprises toward very concrete issues which are recognized and accepted by owner-managers. Tying the prevention packages to a recognized issue, such as heavy lifting, is therefore important in order to make the intervention easy to grasp for the owner-managers in construction.

In regards to the first step of the model, a literature search found that the working environment challenges of the construction industry include high exposure to physically demanding work tasks, such as heavy lifting and carrying as well as awkward working postures [42-44]. It is also well documented that construction workers have a high prevalence of MSD, sickness, absence, and early retirement [43,45].

Literature on safety interventions in construction is extensive whereas literature on MSD interventions in construction is somewhat more limited [46-49]. However, a literature search revealed a number of relevant intervention studies, reviews, and conceptual models related to the prevention of MSD among construction workers [50-61]. Yet, none of them focussed specifically on small enterprises and it is therefore a challenge to

adapt the efforts to the context of small enterprises.

In the second step of the model, which is concerned with selecting appropriate methods and solutions, it was necessary to use the general knowledge on MSD prevention from other sectors, mainly from the manufacturing industry, and to transfer this knowledge to the construction industry. In addition, experience from practitioners in the field was also included in order to identify the most appropriate solutions. From the analysis in the second step of the model, a decision to focus on the reduction of heavy lifting using technical equipment and to improve planning was made.

Regarding the third step of the model concerning knowledge of mechanisms that can motivate the target group to initiate change, the overall incentive in the prevention packages was the economic support to enterprises, which included compensation for the working time used for implementation of the intervention. One important question in this respect is how to secure the improvements are maintained after the cessation of economic support. As economic resources are scarce in small enterprises, it was important to develop interventions which could be sustained for no or very limited additional cost after the support ended. In addition, the design of reach out activities was also included in this step. Owner-managers of small enterprises will rarely be active in searching for new knowledge of the working environment [3]. It is therefore necessary to use intermediaries, who are entrusted to carry the information about the prevention packages to the owner-managers. For the construction industry, the promotion of the prevention packages has been carried out by labour inspectors in a targeted campaign as well as by the employers' associations and unions.

The general context features of small enterprises, as outlined in Table 1, also apply to the construction industry. In addition, data about the specific context, which refers to the fourth step of the model, was collected from studies of small enterprises in the construction industry both related to the working environment and to other research fields [62-69]. Data was also collected from interviews with employers' associations, unions, labour inspectors as well as visits to small construction enterprises. Among the important contextual factors are the temporary nature of the work, few facilities at the firm's home addresses, a high level of employee discretion, and the difficulties in planning the work due to, e.g., limited possibilities for the owner-manager to control the construction process. At construction sites, bigger and stronger stakeholders are often represented, and it may be difficult to coordinate many small tasks which may lead to delays and a subsequent necessity to move staff and materials around.

In the fifth and final step, the above mentioned results

serve as the basis for the design process in which the question is how to facilitate the next link in the model. Some examples of the questions are: Can the use of lifting equipment considerably reduce lifting? What kind of assistance will be necessary for enterprises in order to apply lifting equipment on a broader scale? How can the idea of lifting equipment be promoted to small enterprises? What sector specific context elements should be included in the design in order to make successful implementation more likely? The result was two prevention packages that reflect the occupational hazards and follow the design recommendations above. The prevention packages developed were 1) "Heavy lifting and use of technical aids" and 2) "Improved planning and coordination".

The aim of the prevention package "Heavy lifting and use of technical aids" was to provide enterprises the knowledge of relevant technical aids and how to plan the use of aids in both short- and long-term projects. The focus was on the integration of technical aids in the daily operations. The package included financial support for renting technical aids for try-outs for relevant tasks for a longer period at construction sites. Specific agendas regarding assessment meetings of the try-outs were included in the package.

The prevention package "Improved planning and coordination" involved the introduction and implementation of new planning tools in order to optimise the process of making offers for new projects and the subsequent planning of daily working tasks. An important point in the process was the dialogue about the preparation of offers between the owner-managers and the adviser from the Working Environment Authority. A tool for the working environment assessment of offers and work plans was prepared for this process. In addition, different tools for a more systematic daily planning of work tasks was introduced, such as kick-off meetings at the start of new building projects and regular toolbox meetings at the construction sites. The aim of the package was to reduce physical wear and tear and to improve cooperation between owner-manager and the employees in the enterprise.

Table 2 outlines how the general design recommendations for small enterprises from Table 1 have been utilised for the design of the prevention packages for the construction industry. For each of the two packages, the general recommendations have been transformed to a specific design of the intervention which is based on the context of the construction industry.

The experience from the first year was positive; 145 enterprises received a grant for the prevention package "Heavy lifting and use of technical aids," and 49 enterprises received a grant for the prevention package "Improved planning and coordination". A systematic evaluation of the prevention packages

Table 2. Design of the prevention packages for the construction industry

Design recommendations	Heavy lifting and technical aids	Improved planning
Owner-manager role		
Strongly restricted use of owner-manager time.	Main emphasis on practical application at construction sites.	Working environment elements integrated in the existing offer preparation. Planning meetings to take place at construction sites.
Application of methods which do not include direct or indirect criticism of owner-manager.	Use of a traditional risk oriented checklist is ruled out.	Use of a traditional risk oriented checklist is ruled out.
Return on investment in working environment improvements is not necessarily the best selling point. Direct cost has to be minimised.	Economic support for use of time and renting equipment; cost-benefit calculations are not included.	Economic support for use of time; cost-benefit calculations are not included.
Support provided through trusted personal contacts.	A personal advisor from the Working Environment Authority.	A personal advisor from the Working Environment Authority.
Social relations		
Limited inclusion of written procedures in support programmes and quick decision making.	Most meetings to be held at construction sites without written agendas or minute writing. Two planning meetings with main conclusions to be written on a poster.	A prepared checklist for assessment of offers. Results to be included in offers. No other writing. Two planning meetings with main conclusions to be written on a poster. Other meetings at the construction site.
Utilisation of personal dialogue and concern for each other.	Most decision to be made on the spot at meetings at the construction sites with the involvement of employees.	Main decisions during preparation of offer to be made directly in dialogue between owner-manager and advisor. Follow-up meetings on the spot at the construction sites with the involvement of employees.
Perception of working environment		
Integration of the working environment into other management goals and limited time consumption.	Use of technical aids which reduce lifting and at the same time increase productivity.	Improvement of sustainability of the offers by assuring that costly working environment measures are included.
Point of departure in already accepted risks and transfer of knowledge through trusted partners (e.g., other owner-managers or employees).	The use of lifting equipment widely recognised. The package addresses the likewise accepted problem of getting acquainted with new equipment and adaptation to concrete circumstances.	Planning difficulties widely recognised - especially for small enterprises with limited control of construction sites and capacity for planning.
New more systematic practices built on the existing approaches with limited formalisation ambitions.	Linked to the existing practice of using new equipment, and then building new practices around more systematic try-outs of equipment.	Linked to the existing practice of writing offers to clients, and then building new practices by systematically checking the need for inclusion of working environment measures. Making existing construction site meetings more systematic.

will be carried out at a later stage.

Discussion

The demand for knowledge on evidence-based interventions on the working environment is growing, yet, our example from the construction industry shows that in spite of an extensive search for literature, the desired information is not always available. Our review of the literature revealed that the scientific evidence

on MSB interventions was limited for the specific target group of very small (micro) enterprises in the construction industry. The challenge was to find a way to use the available evidence in order to tailor the prevention packages to small enterprises in the construction industry. In order to do so, the realist analysis of mechanism and context suggested by Pawson and Tilley [11,12] has proven to be a useful tool to transfer the rather limited scientific evidence into circumstances where it has never been tested. Further, knowledge gaps had to be filled with the

best judgement of researchers and practitioners in the field. At times, we had to move from “known knowns to known unknowns” as Pawson et al. [70] put it, and try to make the best judgement about qualified solutions. An example can be the use of lifting aids, which has been tested in very different contexts, such as manufacturing and health care but not in small construction enterprises.

Another problem is that there is little intervention research aimed at enterprises of this size. One important explanation is that it is difficult to design intervention studies which meet the methodological standard quality criteria. It is difficult and expensive to approach many small enterprises in order to reach a suitable population size; they are reluctant to participate in time consuming interventions, and many small enterprises have a short life span [7]. Most intervention studies are therefore aimed at larger enterprises. This point is emphasised by the fact that the only systematic review of intervention studies aimed at small enterprises found only very few studies which fulfilled the quality criteria [10]. It is thus necessary to transfer knowledge from other fields to small enterprises in order to prepare qualified intervention programmes.

The important point of this paper is that the process of transferring knowledge from one field to another and making judgements about known-unknowns has to be done in a systematic way. It will make the design process transparent and thereby make it possible to criticise the design and subsequently to learn from the results of the completed intervention. We have therefore developed a model for such a systematic design process. The model builds on a realist analysis and this is used to build the programme theory for mechanisms which should make the programme work. However, one of the major constraints for the transfer of knowledge from one field to another is that numerous intervention researches do not include proper information about the concrete implementation procedure as well as the context of the intervention [71,72]. It is therefore difficult to judge how a specific intervention could be transferred to another context when little is known about how it was implemented in the first place.

In scientific intervention studies, new approaches can be tested. Yet, at the societal level, intervention programmes aimed at a general application need to be built on the best available evidence. However, the concrete evidence will always be fragmented. There will be holes of known-unknowns which have to be filled in one way or another in order to develop a workable programme. Our suggestion is to use a systematic model to develop the programme theory for the intervention programme. By making a systematic analysis of the context and make explicit judgements about the transfer of knowledge,

it is possible to outline a transparent programme theory which can be the subject for critical assessment by researchers and practitioners. The principle for the assessment will be the guidelines suggested by Pawson and Tilley [12] on evaluating when the programme works, for whom it works, and under what circumstances it works. Such an assessment can then be used to improve the elements in the programme, or alternatively, to abandon the programme if it turns out that the programme theory is not working as expected.

The experience from the development of the preventive packages also indicates that by making the design criteria and the programme theory transparent, it is possible to design rather detailed activities which take the specific context into consideration. An example in the prevention packages for the construction industry is the approach to overcome resistance toward meetings and systematic procedures as a waste of time by linking meetings to existing activities already going on at the construction sites and already taking place in the process of preparing offers to clients.

The model we have suggested in this paper is based on a theoretical analysis of the present knowledge of small enterprises in general and in small construction enterprises in particular. There is therefore a need to test the model in practice. Does the actual design of the prevention packages fit to the very small (micro) enterprises in construction in such a way that they are attracted to the packages and that they are able to implement the packages in practice? Another question is whether the model can be applied outside the specific context of the politically decided Prevention Fund in Denmark which provides economic support for small enterprises. There is also a need to test the model on other sectors in other countries with different intervention contexts. Nevertheless, we believe that the model based on a realist analysis provides a possible solution to the problem of transferring knowledge from one field to another, which is a problem any researcher and professional inevitably will confront in the design of an intervention aimed at specific sectors in a specific context.

In conclusion, it can be emphasized that small enterprises have higher risk of occupational injuries than larger enterprises and they have fewer resources to control the risk. The evidence on effective interventions in small enterprises is limited, and it is therefore necessary to transform evidence from other contexts into the practical circumstances of the small enterprises in order to develop efficient support programmes.

In order to do so, we have developed a design model for this process which is based on a realist analysis. It includes the available evidence, which in most cases, have to be transformed from another context. Furthermore, this model makes

it possible to make qualified judgements on how to fill the knowledge gaps where traditional evidence is not available. For small enterprises, there are large knowledge gaps because most intervention research takes place in larger enterprises, and this situation is expected to continue in the foreseeable future.

We have demonstrated how the method can be used in the development of a practical intervention programme aimed at small construction enterprises, and how the transparency opens the possibility for critical discussions and thereby improvements of both design criteria and design conclusions. It would be useful to test the method in the development of other intervention programmes both for small and larger enterprises. Even for larger enterprises in well-researched sectors, a broad intervention programme will often meet knowledge gaps which have to be filled in a systematic and transparent way.

It is important for future intervention research that the context of the interventions gets described more thoroughly as this knowledge is important for the transformation of intervention evidence into other contexts.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

References

- Sørensen OH, Hasle P, Bach E. Working in small enterprises - Is there a special risk? *Saf Sci* 2007;45:1044-59.
- Walters D. Health and safety in small enterprises: European strategies for managing improvement. Brussels (Belgium): Peter Lang; 2001. 404 p.
- Hasle P, Limborg HJ, Kallehave T, Klitgaard C, Andersen TR. The working environment in small firms: responses from owner-managers. *Int Small Bus J* 2012; 30:622-39.
- Baldock R, James P, Smallbone D, Vickers I. Influences on small-firm compliance-related behaviour: the case of workplace health and safety. *Environ Plann C Gov Policy* 2006;24:827-46.
- Vickers I, Smallbone D, James P, Baldock R. Understanding small firm responses to regulation: the case of workplace health and safety. *Policy Stud* 2005;26:149-69.
- Champoux D, Brun J. Occupational health and safety management in small size enterprises: an overview of the situation and avenues for intervention and research. *Saf Sci* 2003;41:301-18.
- Hasle P, Limborg HJ. A review of the literature on preventive occupational health and safety activities in small enterprises. *Ind Health* 2006;44:6-12.
- Eakin J, Lamm F, Limborg HJ. International perspective on the promotion of health and safety in small workplace. In: Frick K, Jensen PL, Quinlan M, Wiltshagen T, editors. *Systematic occupational health and safety management- Perspectives on an international development*. Amsterdam (Netherlands): Pergamon; 2000. p. 227-47.
- Legg S, Olsen K, Lamm F, Laird I, Harris LA, Hasle P. Understanding the programme theories underlying national strategies to improve the working environment in small businesses. *Policy Pract Health Saf* 2010;8:5-35.
- Breslin FC, Kyle N, Bigelow P, Irvin E, Morassaei S, MacEachen E, Mahood Q, Couban R, Shannon H, Amick BC 3rd; Small Business Systematic Review Team. Effectiveness of health and safety in small enterprises: a systematic review of quantitative evaluations of interventions. *J Occup Rehabil* 2010;20:163-79.
- Pawson R. Evidence-based policy: A realist perspective. London-Thousand Oaks-New Delhi: Sage Publications; 2006. 208 p.
- Pawson R, Tilley N. Realistic evaluation. London-Thousand Oaks-New Delhi: Sage Publications; 1997.
- MacEachen E, Kosny A, Scott-Dixon K, Facey M, Chambers L, Breslin C, Kyle N, Irvin E, Mahood Q; Small Business Systematic Review Team. Workplace health understandings and processes in small businesses: a systematic review of the qualitative literature. *J Occup Rehabil* 2010;20:180-98.
- Bickman L. The functions of program theory. *New Direct Progr Eval* 1987;33:5-18.
- Olsen K, Legg S, Hasle P. How to use programme theory to evaluate the effectiveness of schemes designed to improve the work environment in small businesses. *Work* 2012;41(Suppl 1): 5999-6006.
- Pedersen LM, Nielsen KJ, Kines P. Realistic evaluation as a new way to design and evaluate occupational safety interventions. *Saf Sci* 2012;50:48-54.
- Johns G. The essential impact of context on organizational behavior. *Acad Manag Rev* 2006;31:386-408.
- Vedung E. Public policy and program evaluation. New Brunswick-London: Transaction Publishers; 1997.
- Small and medium-sized enterprises [Internet]. Luxembourg (Luxembourg): Eurostat. 2012 [cited 2012 Mar13]. Available from: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Small_and_medium-sized_enterprises.
- Lamm F. Occupational health and safety in Queensland and New Zealand small businesses: influential factors that lead to occupational health and safety compliance and practice. Sydney (Australia): The University of New South Wales; 2000. 736 p.
- Scase R, Goffee R. The real world of the small business owner. London (UK): Croom Helm; 1980. 166 p.
- Storey DJ. Understanding the small business sector. London (UK): Routledge; 1994. 355 p.

23. Matlay H. Employee relations in small firms: a micro-business perspective. *Empl Relat* 1999;21:285-95.
24. Marlow S, Patton D. Minding the gap between employers and employees: the challenge for owner-managers of smaller manufacturing firms. *Empl Relat* 2002;24:523-39.
25. Tsai CJ, Sengupta S, Edwards P. When and why is small beautiful? The experience of work in the small firm. *Hum Relat* 2007;60:1779-807.
26. Hasle P, Kines P, Andersen LP. Small enterprise owners' accident causation attribution and prevention. *Saf Sci* 2009;47:9-19.
27. Nadin S, Cassell C. New deal for old? Exploring the psychological contract in a small firm environment. *Int Small Bus J* 2007;25:417-43.
28. Atkinson C. An exploration of small firm psychological contracts. *Work Employ Soc* 2008;22:447-65.
29. Eakin JM. Leaving it up to the workers: sociological perspective on the management of health and safety in small workplaces. *Int J Health Serv* 1992;22:689-704.
30. Down S. Narratives of enterprise: crafting entrepreneurial self-identity in a small firm. Cheltenham (UK): Edward Elgar; 2006. 144 p.
31. Reynolds PD. Sociology and entrepreneurship: concepts and contributions. *ET&P* 1991;16:47-70.
32. Watson TJ. Entrepreneurial action, identity work and the use of multiple discursive resources: the case of a rapidly changing family business. *Int Small Bus J* 2009;27:251-74.
33. Beaver G. Small firms: owners and entrepreneurs. *Strateg Change* 2003;12:177-83.
34. Curran AD. Bolton 15 years on: a review of some of the small business research in Britain, 1971-1986. London (UK): Small Business Research Trust; 1986.
35. Persson O. Att leva som småföretagare: en studie om företagande, livssituation och stress. Göteborg (Sweden): Göteborgs Universitet, Psykologiska Institutionen; 1991. Swedish.
36. Limborg HJ, Hvenegaard H, Thoft E, Kierbyholm T, Christensen EL, Åside CT. One big family-making the small business an attractive workplace. Brussels (Belgium): European Agency of Safety and Health; 2003.
37. Antonsson A. Strategies for success? Managing chemical risks in small workplaces: a review of Swedish practice. Stockholm (Sweden): IVL Swedish Environmental Research Institute; 2007. Report No.: B1717.
38. Birgersdotter L, Schmidt L, Antonsson A. Systematisk arbetsmiljöarbete i småföretag - vad kan externa aktörer som regionala skyddsombud och företagshälsovård göra för att få SAM att fungera? Stockholm (Sweden): IVL Swedish Environmental Research Institute; 2004. Report No.: B1589. Swedish.
39. Lov om Forebyggelsesfonden [Law on the Prevention Fund] [Internet]. Beskæftigelsesministeriet (Denmark): Ministry of Employment. 2007 [cited 2011 Jul 21]. Available from: <https://www.retsinformation.dk/forms/r0710.aspx?id=31112>. Danish.
40. Aftale om Forebyggelsesfonden [Agreement on the Prevention Fund] [Internet]. Beskæftigelsesministeriet (Denmark): Ministry of Employment. 2009 [cited 2011 Jul 21]. Available from: <http://www.bm.dk/Beskaeftigelsesomraadet/Et%20godt%20arbejdsliv/Arbejdsmiljoe/Forebyggelsesfonden/~media/BEM/Files/Dokumenter/Pressemeddelelser/2009/Aftaletekst%20-%20forebyggelsesfonden.ashx>. Danish.
41. Aftale om at forny Forebyggelsesfonden [Agreement to renew the Prevention Fund] [Internet]. Beskæftigelsesministeriet (Denmark): Ministry of Employment. 2011 [cited 2011 Jul 21]. Available from: <http://bm.dk/da/Aktuelt/Pressemeddelelser/Arkiv/2009/1104%20Aftale%20om%20at%20forny%20Forebyggelsesfonden.aspx>. Danish.
42. Alavinia SM, van den Berg TI, van Duivenbooden C, Elders LA, Burdorf A. Impact of work-related factors, lifestyle, and work ability on sickness absence among Dutch construction workers. *Scand J Work Environ Health* 2009;35:325-33.
43. Engholm G, Holmström E. Dose-response associations between musculoskeletal disorders and physical and psychosocial factors among construction workers. *Scand J Work Environ Health* 2005;31(Suppl 2):57-67.
44. Alavinia SM, van Duivenbooden C, Burdorf A. Influence of work-related factors and individual characteristics on work ability among Dutch construction workers. *Scand J Work Environ Health* 2007;33:351-7.
45. Arndt V, Rothenbacher D, Daniel U, Zschenderlein B, Schuberth S, Brenner H. Construction work and risk of occupational disability: a ten year follow up of 14,474 male workers. *Occup Environ Med* 2005;62:559-66.
46. Lehtola MM, van der Molen HF, Lappalainen J, Hoonakker PL, Hsiao H, Haslam RA, Hale AR, Verbeek JH. The effectiveness of interventions for preventing injuries in the construction industry: a systematic review. *Am J Prev Med* 2008;35:77-85.
47. Oude Hengel KM, Blatter BM, van der Molen HF, Joling CI, Proper KI, Bongers PM, van der Beek AJ. Meeting the challenges of implementing an intervention to promote work ability and health-related quality of life at construction worksites: a process evaluation. *J Occup Environ Med* 2011;53:1483-91.
48. Ringen K, Stafford EJ. Intervention research in occupational safety and health: examples from construction. *Am J Ind Med* 1996;29:314-20.
49. Johnson KA, Ruppe J. A job safety program for construction workers designed to reduce the potential for occupational injury using tool box training sessions and computer-assisted biofeedback stress management techniques. *Int J Occup Saf Ergon* 2002;8:321-9.
50. Holmström E, Ahlberg B. Morning warming-up exercise-effects on musculoskeletal fitness in construction workers. *Appl Ergon* 2005;36:513-9.

51. Borstad JD, Buetow B, Deppe E, Kyllonen J, Liekhus M, Cieminski CJ, Ludewig PM. A longitudinal analysis of the effects of a preventive exercise programme on the factors that predict shoulder pain in construction apprentices. *Ergonomics* 2009;52:232-44.
52. Rwamamara RA, Lagerqvist O, Olofsson T, Johansson BM, Kaminskas KA. Evidence-based prevention of work-related musculoskeletal injuries in construction industry. *J Civ Eng Manag* 2010;16:499-509.
53. van der Molen HF, Hoonakker PL, Lehtola MM, Hsiao H, Haslam RA, Hale AR, Verbeek JH. Writing a Cochrane systematic review on preventive interventions to improve safety: the case of the construction industry. *Med Lav* 2009;100:258-67.
54. van der Molen HF, Sluiter JK, Frings-Dresen MH. The use of ergonomic measures and musculoskeletal complaints among carpenters and pavers in a 4.5-year follow-up study. *Ergonomics* 2009;52:954-63.
55. van der Molen HF, Mol E, Kuijer PP, Frings-Dresen MH. The evaluation of smaller plasterboards on productivity, work demands and workload in construction workers. *Appl Ergon* 2007;38:681-6.
56. Burdorf A, Windhorst J, van der Beek AJ, van der Molen H, Swuste PHJJ. The effects of mechanised equipment on physical load among road workers and floor layers in the construction industry. *Int J Ind Ergon* 2007;37:133-43.
57. van der Molen HF, Sluiter JK, Hulshof CT, Vink P, van Duivenbooden C, Holman R, Frings-Dresen MH. Implementation of participatory ergonomics intervention in construction companies. *Scand J Work Environ Health* 2005;31:191-204.
58. van der Molen HF, Sluiter JK, Hulshof CT, Vink P, van Duivenbooden C, Frings-Dresen MH. Conceptual framework for the implementation of interventions in the construction industry. *Scand J Work Environ Health* 2005;31(Suppl 2):96-103.
59. Hess JA, Hecker S, Weinstein M, Lunger M. A participatory ergonomics intervention to reduce risk factors for low-back disorders in concrete laborers. *Appl Ergon* 2004;35:427-41.
60. Rinder MM, Genaidy A, Salem S, Shell R, Karwowski W. Interventions in the construction industry: A systematic review and critical appraisal. *Hum Factors Ergon Manuf Serv Ind* 2008;18:212-29.
61. Ludewig PM, Borstad JD. Effects of a home exercise programme on shoulder pain and functional status in construction workers. *Occup Environ Med* 2003;60:841-9.
62. Gillen M, Kools S, McCall C, Sum J, Moulden K. Construction managers' perceptions of construction safety practices in small and large firms: a qualitative investigation. *Work* 2004;23:233-43.
63. Holmes N, Lingard H, Yesilyurt Z, De Munk F. An exploratory study of meanings of risk control for long term and acute effect occupational health and safety risks in small business construction firms. *J Safety Res* 1999;30:251-61.
64. Jensen PL, Laustsen S, Jensen E. Development of the relationship between small building contractors and developers in order to meet OSH requirements. *Policy Pract Health Saf* 2010;8:37-55.
65. Lingard H, Holmes N. Understandings of occupational health and safety risk control in small business construction firms: barriers to implementing technological controls. *Constr Manag Econ* 2001;19:217-26.
66. Zalk DM, Spee T, Gillen M, Lentz TJ, Garrod A, Evans P, Swuste P. Review of qualitative approaches for the construction industry: designing a risk management toolbox. *Saf Health Work* 2011;2:105-21.
67. Navarro E. A review of construction workers motivation: 1968-2008. *Revista de la Construcción* 2008;7:17-29. Chilean.
68. Gillen M, Kools S, Sum J, McCall C, Moulden K. Construction workers' perceptions of management safety practices: a qualitative investigation. *Work* 2004;23:245-56.
69. Weinstein MG, Hecker SF, Hess JA, Kincl L. A roadmap to diffuse ergonomic innovations in the construction industry: there is nothing so practical as a good theory. *Int J Occup Environ Health* 2007;13:46-55.
70. Pawson R, Wong G, Owen L. Known knowns, known unknowns, unknown unknowns: the predicament of evidence-based policy. *Am J Eval* 2011;32:518-46.
71. Neumann WP, Eklund J, Hansson B, Lindbeck L. Effect assessment in work environment interventions: a methodological reflection. *Ergonomics* 2010;53:130-7.
72. Kristensen TS. Intervention studies in occupational epidemiology. *Occup Environ Med* 2005;62:205-10.