From INSTITUTE OF ENVIRONMENTAL MEDICINE
Karolinska Institutet, Stockholm, Sweden

EVALUATING OCCUPATIONAL HEALTH INTERVENTIONS: DESIGN, IMPLEMENTATION, AND EFFECTS

Emma Cedstrand

Stockholm 2023

Published by Karolinska Institutet.
Printed by Universitetsservice US-AB, 2023

ISBN 978-91-8016-821-2

EVALUATION OF OCCUPATIONAL HEALTH INTERVENTIONS: DESIGN, IMPLEMENTATION, AND EFFECTS

THESIS FOR DOCTORAL DEGREE (Ph.D.)

By

Emma Cedstrand

The thesis will be defended in public on the 27th of January, 2023
Venue: Tor, Solnavägen 4, 113 65, Stockholm

Principal Supervisor:
Ph.D. Gun Johansson
Karolinska Institutet
Institute of Environmental Medicine
Unit of Occupational Medicine

Co-supervisor(s):
Associate professor Anna Nyberg
Uppsala University
Department of Public Health
and Caring Sciences

Associate professor Theo Bodin
Karolinska Institutet
Institute of Environmental Medicine
Unit of Occupational Medicine

Opponent:
Professor Ulrica von Thiele Schwarz
Mälardalen University
School of Health, care and social welfare &
Karolinska Institutet
Department of Learning, Informatics, Management and Ethics

Examination Board:
Professor Eric Berntson
Swedish Defence University
Department of Leadership and Command & Control
Division of Stockholm

Associate Professor Marit Christensen
Norwegian University of Science and Technology
Department of Psychology

Professor Gunnar Bergström
Högskolan i Gävle
Akademin för hälsa och arbetsliv &
Karolinska Institutet
Institute of Environmental Medicine

To all participants from the collaborating organisations. Without you, this thesis would never have happened.

POPULAR SCIENCE SUMMARY OF THE THESIS

Do you know someone who has suffered from exhaustion or burnout? Sadly, many people will answer yes to that question, as stress is a growing problem in many countries. Stress, anxiety and depression are examples of poor mental health, becoming Sweden's most common cause of sick leave. Many employers are aware of the serious consequences stress can have for their employees. It is common to offer wellness benefits, such as yoga, meditation, a free gym card or a time management course. While well-intended, these offers are all directed to the individual, helping employees handle stress and avoid symptoms rather than improving those aspects of working life that contribute to people getting stressed in the first place.

Research shows that how our work is organised and how we interact with each other can have a great impact on us and contribute to poor mental health. We know that, e.g., unfair treatment, having too much to do, being excluded from important decisions, and lack of support from co-workers and the manager can negatively affect a person's well-being. Unfortunately, we know less about how to improve these aspects of the work environment. Therefore, our research tries to answer what employers should do to improve the work environment and promote employees' mental health.

To answer this question, we looked at two equally essential parts when trying out new solutions: the changes we suggest and people's motivations to engage in them. We know, for example, that it is common that patients don't take their prescribed medicine, even though they know that the medicine is proven effective. The example illustrates the importance of focusing on the treatment and people's motivation to accept it or their reasons for being sceptical. We refer to these parts as the intervention and the implementation

We evaluated two interventions (treatments) and to what extent these interventions were implemented (whether people took the medicine). We also investigated participants' opinions about the design of one of the interventions. One of the interventions targeted teachers and home care workers. That intervention focused on involving employees and increasing the dialogue between workers, managers at all levels and politicians. The workers were asked what they wanted to improve in the work environment to have less stress. Their suggestions were then turned into action plans.

The other intervention took place in a construction company. Together with representatives from all levels and parts of the company region, we co-created the intervention and how it should be applied. We co-created to ensure the employees trusted the intervention would decrease their stress and that implementing it was feasible. When the employees were asked about what worked well and what did not, they reported low role clarity. Therefore, the intervention focused on creating clear expectations, goals and roles for managers and employees.

We learnt that the intervention targeting the teachers and home care workers led to very few changes in how the work was organised and how people behaved. We can conclude that many

employees took the treatment (were exposed to the intervention), but it did not change the work environment or their well-being (stress).

Our results further showed that within the construction company, there was a noticeable improvement in role clarity for white-collar workers, but the intervention did not lead to decreased stress. We saw that the participants accepted the intervention and adhered to it. In other words, they trusted the positive effects of the medicine (intervention) and therefore took it, which caused some change. It did not decrease stress, but it improved role clarity. Since role clarity is a predictor for burnout among construction workers, we believe it is worth trying the same intervention in similar settings to test if the same or better effects can be reached.

We found three critical factors to engaging people in the suggested intervention, creating a behavioural change. First, we need to check whether the organisation is ready for change, which requires that employees have sufficient resources (staffing and IT structures). Second, the intervention must be integrated into daily company practices and aligned with company goals. Third, we must investigate which work environment aspects work well and which don´t to ensure the intervention matches the participants' needs. Finally, co-creating an intervention with various stakeholders seems promising to improve the implementation.

ABSTRACT

Background: Poor mental health, e.g. stress, anxiety, and depression, in the workplace is a challenge worldwide due to the individual suffering and its impact on sickness absence and productivity loss, causing societal costs. The World Health Organisation classifies stress as the health epidemic of the 21st century. Psychosocial working conditions, i.e., how work is organised and the social interplay at work, are health determinants. Thus, psychosocial hazards are one explanation for work-related mental ill-health. Interventions aiming to improve the psychosocial work environment are recommended. Still, there is a scarcity of studies evaluating occupational health interventions targeting psychosocial working conditions to prevent mental ill health. Also, the existing evidence of the effectiveness of such interventions is inconclusive. Implementation failure is described as one main obstacle to succeeding with these interventions. To tackle the global challenges of work-related stress, we need a better understanding of what can be done in the workplace to prevent employees from becoming ill due to workplace stressors.

Aim: This thesis aims to contribute to knowledge on how stress-related ill health can be prevented in the workplace and develop our understanding of the design and implementation of occupational health interventions.

Methods: This thesis comprises three papers that evaluate two occupational health interventions to improve the psychosocial work environment and mental health. The interventions were conducted within the human services (**I**) and construction industry (**II** & **III**), respectively.

In study **I**, we applied an embedded mixed methods design to evaluate a participatory intervention to improve the psychosocial work environment and mental health (burnout and quality of sleep) within a municipality in Sweden. We utilised a controlled trial and a process evaluation exploring fidelity and participants' reactions to the intervention activities, learning experiences, and changes in behaviours and work routines. We collected data through documentation, interviews and three waves of questionnaires. Differences in outcome variables (questionnaires) over time were calculated using t-tests for partially overlapping samples to handle partly different study populations at each time point caused by employee turnover and drop-out. We analysed the interview data by applying a thematic analysis.

The second and third studies were conducted in a large Swedish construction company. In study **II,** we investigated the participants' satisfaction with engaging in the co-creation process, perceived knowledge, and skill development through interviews. In total, eight men and four women participated. We applied a thematic analysis to analyse the data.

In study **III**, we used a controlled trial to evaluate the potential effects of the co-created intervention on the psychosocial work environment and self-reported stress. We collected data on the outcomes with online questionnaires at baseline, 12, and 24 months. We also assessed adherence to the intervention and dose delivered (i.e., fidelity). Marginal means models

adjusting for missing data patterns were applied to estimate potential differences in outcomes between groups over time.

Findings: Neither of the interventions improved the long-term outcomes of burnout and stress, respectively. We found different effects of the municipality and construction industry interventions on the psychosocial working conditions. Within the municipality, we found detrimental effects of the intervention on social support from the manager, empowering leadership, control of work pacing, and role clarity. Within the construction industry, there was a noticeable improvement in role clarity for white-collar workers in the intervention group compared to the control group.

The implementation fidelity, i.e., whether the intervention activities were delivered according to plan, was moderate in both projects. However, the process evaluation within the municipality project showed that the intervention activities led to few changes in attitudes, behaviours, and work routines. On the contrary, adherence to the construction industry intervention increased during the trial.

The results of paper **II** showed that the co-creation participants reported increased learning about the psychosocial work environment and mental health. The respondents perceived the intervention and the implementation strategies as relevant and feasible. Thus, involving different stakeholders and allowing the organisation to decide the intervention activities and the implementation strategies seem to have enabled a good contextual fit.

Conclusions: The program theory, i.e., intervention developed within the construction company, can potentially improve role clarity for white-collar workers. Three design principles stand out regarding their positive effect on the implementation: organisational capability and incentive systems to promote health, aligning the intervention with existing organisational objectives and practices and conducting a needs assessment. The co-creation process in the construction industry seems to have positively affected the above-mentioned design principles. Thus, co-creating occupational health interventions seems promising to improve the implementation.

LIST OF SCIENTIFIC PAPERS

This thesis builds on three scientific papers. In the text, I will refer to the papers by their roman numerals I – III.

I. **Cedstrand E,** Nyberg A, Sanchez-Bengtsson S, Alderling M, Augustsson H, Bodin T, Mølsted Alvesson H, Johansson G. A Participatory Intervention to Improve the Psychosocial Work Environment and Mental Health in Human Service Organisations. A Mixed Methods Evaluation Study. International journal of environmental research and public health, 2021 18;7.

II. **Cedstrand E,** Mølsted Alvesson H, Augustsson H, Bodin T, Bodin E, Nyberg A, Johansson G. Co-Creating an Occupational Health Intervention within the Construction Industry in Sweden: Stakeholder Perceptions of the Process and Output. International journal of environmental research and public health, 2021, 18;24.

III. **Cedstrand E,** Augustsson H, Alderling M, Sánchez Martinez N, Bodin T, Nyberg A and Johansson G. Effects of a co-created occupational health intervention on stress and psychosocial working conditions within the construction industry: A controlled trial. Frontiers in Public Health, 2022, 10.

OTHER RELEVANT PUBLICATIONS

Cedstrand E, Nyberg A, Bodin T, Augustsson H, Johansson G. Study protocol of a co-created primary organizational-level intervention with the aim to improve organizational and social working conditions and decrease stress within the construction industry - a controlled trial. BMC PUBLIC HEALTH 2020 20;1 424-

CONTENT

LIST OF ABBREVIATIONS AND DEFINITIONS

AR	Action Research
BCW	Behaviour Change Wheel
CONSORT	Consolidated Standards of Reporting Trials
CBPR	Community-based participatory research
HR	Human resources
JDC model	Job Demand Control model
JDCS-model	Job Demand Control Support model
JDR theory	Job Demand Resource Theory
MAR	Missing at Random
MNAR	Missing Not at Random
MRC	Medical Research Council
Occupational health intervention	Planned, theory-based actions that aim to improve workers' health and well-being (1)
Organisational intervention	Planned, behavioural, theory-based actions to change the way work is organised, designed and managed (1)
PAR	Participatory action research
PMM	Pattern Mixture Models
PSC	Psychosocial Safety Climate
RCT	Randomised Control Trial
TIDieR	Template for intervention description and reporting
SMBM	Shirom Melamed Burnout Measurement

1 INTRODUCTION

In most developed countries, mental disorders such as stress, depression and anxiety are leading causes of sickness absence and long-term work incapacity (2, 3). In Sweden, stress-related diagnoses, such as acute stress reaction and burnout, are increasing the most (4). Stress threatens workers' well-being by increasing mental (5) and physical health risks (6). Also, stress is a leading cause of serious workplace accidents (7). It causes individual suffering and is costly for organisations and society (8, 9) due to sickness absence, productivity loss and work incapacity. In the European Union alone, the annual price tag of work stress amounts to €20 billion (9).

Health theories of conditions in the psychosocial work environment (5, 10-12) that contribute to stress or burnout—for example, high job demands, low job control, high workload, or low social support are well supported. However, knowledge of evidence-based program theory, i.e., which methods or interventions can improve these psychosocial factors, is limited (13). Yet, scholars agree on the potential of primary organisational interventions (13, 14) targeting how work is organised, designed or managed (1). Occupational health interventions (15) are one example of organisational interventions, targeting psychosocial hazards in the work environment instead of the individual stress response. Hence, we have knowledge of health theories (16); however, we lack evidence-based program theory.

Occupational health interventions involve three stages: 1) design, 2) implementation, and 3) evaluation (17). The lack of evidence-based program theory stems from different challenges within each stage. Yet, one overarching feature is the fact that we study real-world changes in organisations and the organisations have their objectives related to the core business. This fact has implications for the design, implementation and evaluation of occupational health interventions, which will be described in detail in the literature review. Another general consequence of the fact that we study real-world changes is that the intervention and the implementation must be studied simultaneously. In other settings, researchers can divide this process into two steps. Take the development of a new drug as an example. First, the intervention (i.e., the active ingredient/the medicine) is tested in laboratories and on humans in double-blinded, randomised controlled trials (RCT) where the so-called noise, e.g., confounders and the placebo effect, can be controlled. Once the researchers can ensure desired results, the second phase begins: getting physicians to prescribe the medication correctly and patients to adhere to the treatment (i.e., implementation research). However, the two steps need to be combined in searching for effective occupational health interventions, making it even more challenging to design, implement, and evaluate these interventions.

Further, research on the effectiveness of organisational interventions concludes that the intervention content and implementation process are equally crucial to reaching successful outcomes (18, 19). Hence, when studying occupational health interventions, one cannot have one (i.e., intervention) without the other (i.e., implementation).

With that said, this thesis focuses on intervention effectiveness and the design and implementation of occupational health interventions. The work aims to add to the

understanding of how adverse psychosocial working conditions can be improved and stress-related ill health among human service occupations and construction workers can be prevented. The thesis includes studies of the effectiveness and implementation of two occupational health interventions on the psychosocial work environment and stress [I, III] and an evaluation of the design process of one of the interventions [II].

2 LITERATURE REVIEW

2.1 THEORY AND DEFINITION OF STRESS

The first definition of stress was coined in 1936 by Hans Selye (13), who defined it *as "the non-specific response of the body to any demand for change."* This biologically oriented definition was later expanded based on theories highlighting the interaction between an individual and the environment as an antecedent to the stress response (14). The interaction builds on the individual appraisal of a stressor and determines the extent and duration of a stress response. A psychological description of stress is that an individual is likely to perceive stress if the demands exceed personal resources (15). Applied to the work context, this means that stress occurs if an employee cannot balance the work demands (environment) with its resources, and he or she interprets this as threatening. However, an experience of stress must not lead to ill health (16). Stress is an adaptive response and prepares the individual to defend him or herself from an instant threat. It is suggested that insufficient recovery periods, causing repeated or prolonged activation of the stress response, explain stress-related ill health. The prolonged activation damages the physiological systems involved in the response (17). Stress-related mental ill-health in one of its more severe forms is called burnout. If a person is exposed to chronic emotional and social stressors on the job, it could lead to burnout (18). Maslach's operationalisation of burnout (19), applying the three dimensions of exhaustion, cynicism, and inefficacy, is commonly used to measure it.

The term stress is used in at least two ways. The first is to explain the exposure, i.e., a stressor within the work environment; e.g. The second is to describe the physiological and psychological individual response, i.e., stress reaction. In this thesis, we have included self-reported stress (stress and burnout) as an outcome in both effectiveness studies.

2.1.1 Health theories of stress in work contexts

Two models that dominate the work-stress literature are the job-demands-control model (JDC model) and the job demands-resources theory (JDR theory) (14, 20). Karasek introduced the JDC model (21), highlighting the damaging effects of heavy workloads combined with limited decision latitude (control). Later, social support was recognised (22) as another buffering factor to job demands. The extended model is known as the job-demands-control-support model (JDCS model).

The JDR theory is widely used among researchers and practitioners who want to promote employee well-being and builds on the JDC model (23). Within this theory, job demands are physical, social, and psychological efforts that can render certain physiological and psychological costs, such as exhaustion (24). Job resources are the physical, social, psychological, and organisational aspects that are functional in achieving work goals, reducing job demands and psychological costs, or stimulating personal growth and development. The theory underlines that employees who experience many job resources can cope better with their job demands, decreasing the risk of experiencing strain and burnout

(25, 26). The JDR theory offers two significant advances (27) compared to the JDC model. First, it broadens the concept of resources from only including control and support. For example, role clarity is another relevant resource impacting mental health (5, 20) at the workplace and is of focus in this thesis. Second, it provides engagement as a mediating factor for performance. The theory proposes that resources can foster engagement and not only act as a buffer to the demands. Hence, the theory introduces a more salutogenic view of the impact of work design.

Other models which have gained attention due to their explanatory value of work stress are the theory of effort-reward imbalance (9), perceived procedural and relational justice (9), work-family conflict (14), and, more recently, the Psychosocial Safety Climate (PSC) (28). The PSC aims to reflect an organisation's values, procedures, and practices to enhance employees' mental health (28). Research shows that PSC correlates negatively with burnout and mental ill-health (29, 30) and relates positively with work engagement and productivity (31).

2.1.2 Occupational predictors of stress-related disorders

Long working hours, high job demands, low job control, low social support, and role stress are psychosocial hazards that increase the risk of stress-related disorders in general (5, 21). However, the results vary to some extent for the specific target groups of this thesis.

Teachers (22) and home care workers (23) in Sweden report high workloads and low decision authority (22). Teachers also report a lack of support from management (22), and home care workers experience a sense of being controlled rather than trusted by the management (23). Over time, there has been an adverse development of job demands and decision authority in human service industries in Sweden (24). Teachers and elderly care workers are two large occupational groups within these industries. Thus, improvements in these risk factors seem warranted to enhance mental health among teachers and home care workers.

For construction workers in Europe, a recent meta-analysis (20) shows that low job support, job insecurity, and role overload (i.e., high demands/workload and high work pace) are predictors of mental ill-health. Role conflict, role ambiguity (unclear roles), interpersonal conflict, and low job support predicted the specific outcome of burnout. Hence, the target groups share the risk factors of high workload and lack of support. At the same time, low decision authority stands out in human service industries, while job insecurity, role conflict, and role ambiguity appear to be specific risk factors within the construction industry.

2.1.3 Prevalence of stress-related disorders

2.1.3.1 Teachers and home care personnel (i.e., human service occupations)

Working with human services within the health and social care industry is associated with an increased risk of sick leave due to stress-related mental disorders in Sweden (25). Also, teachers face a high risk of experiencing high stress levels contributing to burnout (26, 27). Further, other occupational groups with high sickness absence are carers, care assistants, and assistant nurses in home care and nursing homes (25).

2.1.3.2 Construction workers

Construction workers in Sweden have high levels of sickness absence compared to other occupational groups, but not due to stress-related disorders (25). However, once put on sick leave, professionals (engineers, first-line managers) in Sweden face a 25% increased risk of the cause being stress-related compared to all other occupations (25). Also, a Swedish report on mental ill-health among trade workers concludes that stress and lack of planning were among the main perceived health risks (28). Further, the increased risk of trade workers dying from suicide has been highlighted internationally (29, 30). Finally, perceived stress is a leading cause of workplace accidents (7, 31) and only in Sweden are 1000 serious workplace accidents reported yearly. Hence, an increased focus on mental health within the industry seems justified (32).

2.2 OCCUPATIONAL HEALTH INTERVENTIONS TO TACKLE STRESS

Interventions to address work-related stress are increasing but are still mainly secondary or tertiary (36-38). Secondary interventions are directed at individuals at risk of developing stress responses. Tertiary interventions focus on treating existing diagnosed conditions. On the other hand, primary interventions are preventive and aim to deal with organisational factors as causal stress agents. Such interventions can also be called organisational interventions, which Nielsen (2013) defines as *"planned, behavioural, theory-based actions to change the way work is organised, designed and managed in order to improve the health and well-being of participants*" (1), page 8. One example of organisational interventions is occupational health interventions (15), targeting the stressors in the psychosocial work environment rather than the individual stress response.

2.2.1 Intervention setting

The setting of the two intervention projects was one municipality (teachers and elderly-care workers) and one construction company. Both are large Swedish organisations with Human Resources (HR) and Health and Work environment specialists. Further, the organisations share a structure for worker participation, which several Swedish work environment provisions suggest. Sweden has legislation and regulations governing employers regarding work environment management. The Work Environment Act is the guiding legislation, and several provisions regulate specific areas, i.e., work environment risks. One overarching regulation applying to all employers is “Systematic Work Environment Management”, which states that employers must investigate risks, take action and follow up on activities to prevent ill health and accidents at work (33). The employees are represented by local and regional safety delegates to ensure employee participation.

Further, in 2016 the work environment authority issued new provisions specifying the organisational and social risk management regulations to prevent poor mental health. The provisions placed more demanding requirements on the employer and highlighted three areas within the organisational and social work environment: workload, working hours and victimisation. The regulations emphasize the importance of involving managers and workers.

For example, they recommend employers to involve employees when defining the organisational and social work environment goals. The two target organisations wanted to take action on these new provisions, and this thesis studied interventions are examples of strategies to operationalise the new requirements.

2.2.2 Intervention design

There are several approaches for designing public health interventions (e.g. smoking cessation, increased physical activity etc.), and in several respects, these interventions overlap with occupational health interventions. However, looking specifically at frameworks for developing occupational health interventions, there are fewer. I will describe three approaches: two target occupational health interventions and one target complex interventions. I have summarised the core elements of each method and how these elements overlap in Table 1.

Table 1. Comparison of core elements in three frameworks for designing occupational health or complex interventions.

1. The psychosocial management approach (PMA)	**2. The Sigtuna principles for designing, implementing and evaluating organizational interventions**	**3. A new framework for developing and evaluating complex interventions**
Use a participatory approach Ensure support from managers Communication (inform everyone) Establishing a steering group	Ensure active engagement and active participation among key stakeholders	Engage stakeholders
Consider readiness for change (individual, organizational) Risk assessment and feedback Auditing existing systems	Understand the situation (starting points and objectives)	Consider context Identify key uncertainties
	Align the intervention with existing organizational objectives	
	Explicate the program logic	Develop, refine, and (re)test program theory
	Prioritize intervention activities based on effort gain balance	
	Work with existing practices, procedures and mindsets	
Monitoring	Iteratively observe, reflect and adapt	Develop, refine, and (re)test program theory Refine intervention
	Develop organizational learning capabilities	
		Economic considerations
Drivers of change (identify)		

The first approach is the evidence-based psychosocial management approach (PMA) (34), which is commonly used when designing occupational health interventions (35). It consists of four phases: (1) *the initiation phase,* where the overall intervention strategy is developed; (2) *the screening phase* that identifies the problem areas to target; (3) *the action plan phase,* where the intervention activities are developed and, (4) *the implementation phase*. Nielsen et al. (2010) summarised this approach after reviewing several European countries' strategies for improving employee health and well-being. They found many common aspects and procedures, which the five phases reflect. They also identified core elements to consider

within each phase. Examples are management support, establishing a steering committee and applying a participatory approach, i.e., involving stakeholders.

The second approach is the Sigtuna principles for designing, implementing, and evaluating organizational interventions for maximum impact (15). The principles were co-produced by academics and practitioners from different disciplines to address scientific rigour and practical relevance. They outline eight principles to consider during the design, as seen in Table 1.

A third approach is the new framework for developing and evaluating complex interventions by the UK Medical Research Council (MRC)(36). The first framework version was created in 2006 (37) and focused mainly on how researchers could answer whether the intervention was effective, stressing theory-based interventions. The newer version also addresses known implementation challenges, scalability and cost-effectiveness, emphasising early and robust engagement with patients, practitioners, and policy-makers. The framework describes six core elements to consider throughout the four outlined phases: development or identification of the intervention, feasibility, evaluation, and implementation. The core elements of the three approaches are shown in Table 1.

The guidelines overlap to a moderate extent regarding the content. The first statement in the Sigtuna principles, i.e., ensuring stakeholder engagement through co-creation, resembles the first principle of the PMA and the MRC framework. Also, all three frameworks recommend considering contextual factors and identifying the end-users need for change. On the other hand, the PMA does not underline using a program logic which they do in the Sigtuna principles and the MRC guidelines. Further, two of the Sigtuna principles relate to aligning the intervention goals and activities with existing objectives and procedures. None of these is mentioned in the other two frameworks. Finally, the Sigtuna principles and the PMA appear more applicable as they describe each principle in more detail and give rich examples of how to put them into practice.

Both the Sigtuna principles (15) and the new framework by the MRC (36) were published after we initiated both intervention projects included in this thesis. However, the principles, i.e., the core elements they summarised, have been described elsewhere (37-39). Thus, we have applied the suggested core elements to various degrees in the two projects.

2.2.2.1 Means for reaching the goal – co-creation

In the development, i.e., the design phase of occupational health interventions, researchers can choose to co-create the intervention and implementation strategies with stakeholders from the studied organisation. Co-creation, also called co-production or co-design, has emerged in parallel in different academic sciences, including business studies, design, and computer science (40).

Co-creating occupational health interventions is a suggested method to better tailor interventions to their unique context and end-users' needs (15, 41) and to enhance knowledge

translation (42, 43) between researchers and the community. Knowledge translation is about disseminating research, i.e., bridging the know-do gap (42).

According to Jackson and Greenhalgh (44), co-creation is getting increased attention because it aligns with four contemporary notions within applied health services research. The first is the call for pragmatic randomised controlled trials created and executed in real-world conditions. The second is the increasing efforts to embed complex interventions in a local organisational context. The third is the growth of multistakeholder research collaborations. The final notion is to go beyond just talking about end-users and stakeholder involvement in the research process and instead make them participate.

Within health service research Jackson and Greenhalgh (44) define co-creation as: *"academics, consumers, clinicians, and service organisations working together from the outset to frame relevant research questions, create research designs that map real-world environments, and commit to implementing the research and its findings in the broader health service community"*, (p. 283). Their definition captures the essence of co-creation within public health and pinpoints the process's crucial features. For example, who should be involved, what should be co-created, and acknowledging the importance of context and the implementation process. However, there is a plethora of co-creation definitions (40, 42, 45).

2.2.2.2 History of collaborative research practices

Also, there is a flora of collaborative research practices within social sciences, which resemble the use of co-creation. A non-exhaustive list is community-based participatory research (CBPR), action research (AR) and participatory action research (PAR) (40). There are two prominent lineages in the development of these practices (46). The first is the northern tradition, which stems from the German social psychologist Kurt Lewin's ideas on how to solve social, real-world problems through an iterative process of inquiry, action and reflection on the results of those actions. He questioned change as a linear process that researchers could understand objectively from the outside. He advocated that the participants, i.e., end users, must be involved in the process. Lewin called this action research.

The second lineage is the southern tradition, heavily influenced by the Brazilian teacher Paulo Freire who, among others, was inspired by Marx. Freire built on Lewin's thoughts that action is fundamental because it is required to change reality. Further, he argued that community members, i.e., the oppressed, should be involved as agents in the research process, using their increased knowledge and political consciousness to challenge the sources and structures of oppression. Hence, the southern tradition holds an emancipatory approach. It isn't easy to place the different practices on a continuum as the definitions vary by local context and stakeholders' ideology. However, according to Wallerstein, Duran (46), organisational action research and associated practices focusing on the pragmatic use of knowledge can be found at the left end of the continuum, see Figure 1. PAR approaches like CBPR are to be found at the opposite end.

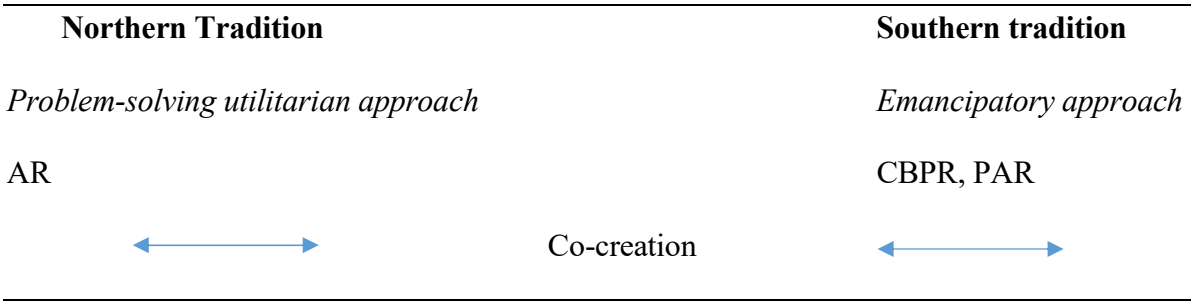

Figure 1. An overview of the association between the Northern and Southern traditions of collaborative research and the three collaborative research practices community-based participatory research (CBPR), Action research (AR), and Participatory action research (PAR). Co-creation can be positioned differently depending on a project's context and goal.

The question then is where to place co-creation on this continuum and if applicable. I argue it can be positioned differently depending on the context and goal. In line with this, Leask, Sandlund (41) suggest that when co-creating a public health intervention, one should define which collaborative research practice, i.e., AR, PAR etc., is guiding the design. Also, Abildgaard et al. (47) highlight that researchers need to be transparent in what they mean by applying a participatory approach. Hence, whether one frames the research as AR, co-creation or participatory research, it is crucial to describe the goal, who is involved and state what the stakeholders have a saying over.

Our goal of using co-creation in the construction industry was to enhance the psychosocial work environment. We thought our chances of successfully identifying relevant interventions and implementing them were best if we applied co-creation. The driving principles for us were an equal partnership and the co-creation of the intervention and implementation strategies. Striving for equal partnership acknowledges power imbalances between stakeholders and recognises the unique knowledge and perspectives all parties can bring to the table. However, equalizing power is not a goal in itself. It's a means to create a more usable product. That product could be health services, public health interventions or knowledge. Hence, our way of practising co-creation is more to the left on the continuum in Figure 1.

2.2.2.3 The guiding framework for our co-creation process

In the construction industry project (papers II and III), we applied parts of the Leask, Sandlund (41) framework for co-creating public health interventions. We chose this framework because it targets similar interventions to ours. They define co-creation as: *"collaborative public health intervention development by academics working alongside other stakeholders"* (p. 2 in Leask, Sandlund (41)). Their definition is similar to that of Jackson and Greenhalgh (37). However, unlike that definition, they did not include the development of implementation strategies. We, therefore, added this to our definition in line with research highlighting its importance (48, 49).

The framework (41) is summarised in four steps: *Planning, Conducting, Evaluating and, Reporting*. *Planning* is about stating the study's aim and deciding who to include in the co-

creation process. The authors highlight the importance of narrowing the purpose down, formulating the objective with end-users and other stakeholders, and being precise when choosing the target group (end-users). *Conducting* refers to how the co-creation process can be carried out, for example, what activities are suitable and how to ensure buy-in and commitment. Leask, Sandlund (41) propose evaluating both the co-creation process and the effectiveness of the co-created intervention on the outcomes. Areas to address in the evaluation of the co-creation process are satisfaction with engaging in the process, perceived knowledge and skill development. They recommend that the effectiveness evaluation follows a positivist framework and suggest an RCT design if feasible. *Reporting* is about how to report the findings. They recommend applying a checklist such as the Consolidated Standards of Reporting Trials (CONSORT) or TIDieR (template for intervention description and reporting).

2.2.2.4 Program theory and logic models

Applying a relevant work stress theory within intervention research is recommended when designing and evaluating the intervention (16, 50). Developing a program theory (i.e., a clear idea or model of how the intervention should work) is one way (51). It outlines the hypothetic order of change, preferably guided by the chosen theory. Hence, it is a strength if the intervention outcomes are linked to the components of the intervention via a relevant work stress theory. Using a logic model is one way to illustrate this. Using program theory and logical models when evaluating interventions may help interpret the results. If the intended outcomes are fulfilled or not, the program theory can help explain whether this was due to theory or implementation success or failure. I will give examples of implementation (Figure 2 A) and theory (Figure 2 B) failure using the intervention program logic depicted in Figure 2. The intervention aims at improving health among participants by giving them access to apples, expecting their levels of vitamin C to rise. If the apples are not delivered nor eaten, we will define it as an implementation failure. Hence, we cannot know whether our health theory works or not. However, if the apples are delivered and eaten, and we can show improved health among the participants. Still, no increase in vitamin C levels; the intervention suffered from theory failure. A different causal mechanism can probably explain the health improvements in this case.

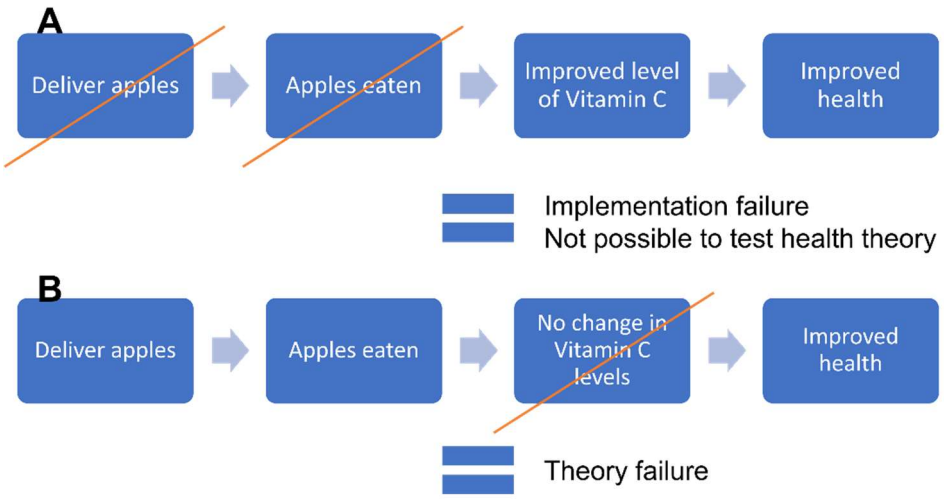

Figure 2. Outlined examples of (A) implementation failure and (B) theory failure.

2.2.3 Implementation

2.2.3.1 Implementation research and the implementation process

The implementation process is fundamental to succeed with an intervention, i.e., achieving the intended outcomes (19, 52, 53). Still, even if intervention research requires a focus on implementation strategies and outcomes, it is not equivalent to implementation research. Implementation research focuses on different implementation strategies' effects on the intervention uptake (76). The intervention within implementation science is typically evidence-based; hence, implementation research aims to promote the systematic uptake of these methods (77). On the other hand, intervention research aims to test interventions in natural settings, evaluating whether the intervention works. However, a prerequisite for commenting on the intervention's effectiveness is that the study participants have adhered to the intervention, i.e., the intervention has been implemented.

2.2.3.2 Crucial factors to succeed with the implementation

Research has identified some core factors for succeeding with the implementation of an intervention. The most highlighted ones within occupational health are: Participation among stakeholders (47, 54), Support from senior and line managers (14, 55-58), Fit of the intervention into the workplace context (14, 50), Aligning interventions in already existing structures (15), and Readiness for change (59, 60). All these factors are considered in one or several of the three approaches for designing occupational health interventions described above. Hence, a successful implementation starts in the design phase.

A participatory approach, i.e., involving stakeholders in planning and designing the intervention and implementation, has been emphasised (47, 53, 54). Thus, many interventions have a participatory design. However, it is often not stated how the stakeholders have been involved (47), making it difficult to replicate and draw conclusions about the successful

participatory approach. Abildgaard et al. (47) have created a multidimensional model of the participatory approach. Researchers can use the model when designing or assessing interventions. The four dimensions are content, process, directedness, and goal. The content considers what is to be changed, for example, what kind of working conditions we target. The process reflects how the goals (content) should be fulfilled. The stakeholders could be involved to different degrees in this process, for example, regarding the amount and form of intervention activities. Directedness refers to what extent employees are directly involved in the decision-making of content and process, whether all end-users are involved or if representatives are used. Regarding the goal, the authors highlight the importance of clarifying why we apply a participatory approach. If the involvement of end-users has a meaning in itself or if we use a participatory approach to reach other goals like high implementation fidelity or intervention adherence. I argue that utilising co-creation to design and implement occupational health interventions is a way to employ a participatory approach to reach other goals (i.e., high implementation fidelity). It means that the intervention content necessarily does not have to be participatory, yet the design process is participatory when stakeholders are involved.

Senior management involvement is also crucial for implementing and sustaining an organisational intervention (38). Senior management commitment has also been recognised as vital to managing work-related stress (56). Further, line managers' roles in occupational health interventions have been emphasised as they function as a link between employees and senior management and therefore are responsible for translating senior management decisions into concrete actions. When developing and implementing interventions, they will lead the way to behaviour change, converting the desired changes into everyday practices (61). However, research investigating the effect of specific manager behaviours on intervention outcomes is scarce (62). One study (55) evaluating the influence of line managers' behaviour on intervention outcomes concluded that line managers' attitudes and actions positively predicted changes in self-rated health and workability. However, line managers don't operate in a vacuum. They depend on a context enabling time and resources for them to be active in the implementation (57), which brings us to the importance of fit of the intervention into the workplace context (50, 63).

Nielsen and Randall (14) suggest that the workplace context comprises two dimensions: omnibus and discrete. The omnibus context refers to the organisation’s general situation and culture before and during the implementation. The discrete context is about parallel events alongside the intervention, such as reorganisations or other change interventions. As the context seems to have a high impact on the outcomes of an intervention, tailoring intervention activities and implementation strategies to the workplace context is recommended (14, 50, 64). Traditionally, researchers have focused mainly on theory to guide the creation of interventions. However, they must also consider and utilize different stakeholders’ knowledge regarding structures and values (50). Considering context is intertwined with the following core factor: aligning the intervention with existing structures and objectives. Alignment is essential for several reasons, where one is to avoid unwanted side effects of the

intervention, which could emerge without consideration of how it may affect other areas (65). Also, trying to target performance (i.e., organisational objectives) and mental health in tandem can enhance stakeholder engagement as they realize the intervention is not only a side project but also contributes to core business objectives (66).

The last factor, organisational readiness for change, has been proven a critical precursor to successful change implementation (60, 67). Readiness for change reflects capability and motivation components that can be measured at an organisational or individual level (67). Readiness or organisational readiness for change has been defined differently (65), and several measurements exist (59, 68). The readiness for change measure by Randall (59) has been explicitly used in evaluating organisational-level stress management interventions. The measure includes four questions capturing the participants' trust in the intervention. Another measure is the scale by Lehman, Greener (69), which contains four areas capturing the individual faith, i.e., motivation to implement the intervention and the organisational capability to do so. Organisational capability is operelationised in Institutional resources, reflecting available offices, staffing, and training resources.

2.2.3.3 Behaviour change theory to promote change

Implementing an intervention is, in most cases, equivalent to creating a behaviour change. Within implementation research, there has been a strong emphasis on using behaviour change theory to underpin the implementation strategy. Since there is a wealth of psychological behaviour change theories and they are not the primary focus of this thesis, I will describe one well-known and highly cited framework: the Behaviour Change Wheel (BCW) (70). The framework is a synthesis of 19 behaviour change models. The BCW aims to facilitate the design, description and evaluation of behaviour change interventions.

The BCW consists of three parts or layers, where the inner layer contains the COM-B model outlining three essential components of behaviour change. The COM-B model suggests that people need capability (C), opportunity (O), and motivation (M) to perform a behaviour (B). The middle layer outlines nine intervention functions or activity categories to influence behaviour change. Examples of these functions are Enablement, Training, and Restrictions. The third layer comprises seven policy categories that can support the intervention functions. The framework has been used to guide intervention design in various healthcare settings, for example, smoking cessation (71) and alcohol reduction (72).

2.2.4 Evaluating occupational health interventions

Organisational interventions are challenging to evaluate (36, 63), and research suggests applying elaborative evaluation frameworks to uncover the so-called black box. Therefore, it is vital to disentangle which components of the intervention support or impede the desired change. Traditionally the gold standard for evaluating organisational interventions has been the randomised controlled trial (RCT) (14, 73). However, since it has been suggested that the implementation process can moderate or mediate the organisational intervention’s effect, it is recommended to complement the effectiveness evaluation with a process evaluation.

There are often several steps in developing evidence-based interventions, perhaps starting with a small pilot study, followed by an efficacy and effectiveness study, and finishing with the dissemination and implementation studies. An efficacy trial is when a treatment or intervention is tested under highly controlled conditions, favouring internal validity. This stands in contrast to trials in real-world settings such as primary care or the workplace, promoting external validity. Thus, interventions targeting the organisational level within organisations cannot be tested in efficacy trials.

2.2.4.1 Outcome evaluations (effectiveness evaluations)

The RCT is an excellent design to explain cause and effect, and randomisation avoids selection bias (75, 78). However, it is not always feasible to apply (79), and it is argued that one should choose the study's design in considering its research questions (80). Hence it is sometimes not feasible or desired to use this design. Instead, research suggests other designs. One commonly used design is the cluster RCT (81), where instead of randomising individuals, you randomise, for example, departments or other groups of individuals within organisations. This means that at least two levels are included, the department (cluster) and its members (workers). The advantages of this design in organisational interventions are that the analysis and evaluation target the same level as the intervention, and the design is often more feasible to apply. Another commonly used alternative to the RCT is the controlled trial (81). This design utilises the same principles as the RCT but without randomisation when allocating intervention and control groups. Instead, a matched control group is chosen as the reference group. The researchers can match a control group on known factors such as age or gender. This method can be preferable for ethical or practical reasons.

2.2.4.2 Process evaluations

When conducting effectiveness studies, a process evaluation aims to investigate the implementation process in relation to the intervention outcomes. A nested process evaluation within an intervention trial can contribute to knowledge on if the intervention was delivered as intended (fidelity), perceived quality of implementation, clarify causal mechanisms and identify contextual factors influencing the results (14, 39). There are several theoretical frameworks deriving from different disciplines for how to conduct process evaluations (14, 39, 74, 75). Also, looking at implementation research, where the main aim is to evaluate the implementation process, yet the term process evaluation is not used, we find additional recommendations on essential implementation outcomes. The recommendations by Proctor et al. (2011) are highly cited (76). However, a systematic review of applied process variables within stress management interventions (77) found that half of the included studies did not reference process evaluation literature. The review also concludes a significant heterogeneity among reported process variables in the articles, which the number of different theories and models can explain. For an overview and comparison of suggested implementation outcomes in three commonly used frameworks, see Figure 3. The different frameworks overlap considerably; however, the Proctor paper emphasises fidelity, i.e., whether the intervention was implemented according to plan. Implementation research highlights the need to evaluate

implementation fidelity (78, 79). However, the concept has received less consideration in workplace interventions even though the MRC guidance does include the concept. The Nielsen framework does not explicitly refer to fidelity, but they do mention keeping track of what has been delivered to whom and to what extent. Another difference between the frameworks is the context focus, which is included in the MRC guidelines (39) and the Nielsen framework (14). Still, Proctor et al. (2011) do not have it as a specific outcome.

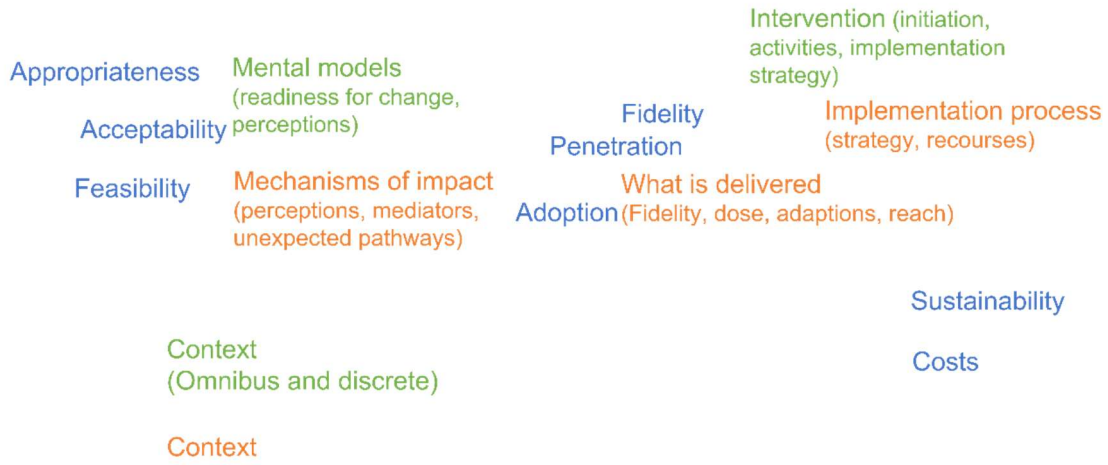

Figure 3. Comparison of outlined implementation outcomes in Implementation outcomes by Proctor (78), Model for process evaluations by Nielsen and Randall (14), and Process evaluation of complex interventions by Moore et al. (39). The colours of the framework names correspond with the colours in the Figure.

In this thesis's first study, we utilised the MRC guidance (61) and the evaluation framework by Nielsen and Randall (45). In the third study, we focused on evaluating fidelity, and we were inspired by Proctor et al. (2011) and the MRC guidance (39).

2.2.5 Intervention effects

The published reviews on organisational interventions to promote mental health and well-being indicate limited to moderate effects. The most recent systematic review (80) found that flexible work interventions, i.e., flexibility in schedules or work location and self-scheduling, showed the most positive effects on well-being. Also, they concluded that engaging end-users in the intervention or implementation was related to a positive change in well-being outcomes regardless of intervention type. Another systematic review covering only organisational interventions to improve employee health concluded that the interventions' positive effects were somewhat limited (52). Of the 39 included studies, half demonstrated positive effects on health outcomes, with three out of the four high-quality studies showing no positive results. The successful interventions were comprehensive, simultaneously tackling material, organisational, and work-time-related conditions.

In addition, a review of reviews (81) on the mental health effects of workplace interventions also recommends comprehensive interventions or multi-component programs based on their findings. They included 38 reviews, of which seven were of high quality, and over a thousand

individual studies for preventing and improving mental disorders. Most interventions had an individual focus. Nonetheless, organisational interventions with positive effects on decreasing stress and burnout symptoms focused on increasing work impact and flexible work time. Further, another systematic meta-review on workplace interventions for common mental disorders (82) found moderate evidence for organisational interventions enhancing employee control. The reviews analysed 481 individual research studies. Last, another meta-analysis (83) in the field, including 36 experimental studies, found cognitive behavioural techniques (secondary and tertiary interventions) most effective in improving employee health. Organisational interventions generated no effects.

In summary, the evidence of organisational interventions' positive impact on mental health and well-being is limited. Changing flexibility in schedules or work location and self-scheduling demonstrates the most reliable benefits.

Most research evaluating organisational interventions in specific settings has been conducted within healthcare settings (84). The target populations for this thesis are teachers, nursing workers within elderly care, and blue- and white-collar workers within the construction industry. Below is a summary of the effects of organisational interventions on mental health and well-being for the three specific study populations.

2.2.5.1 Home care workers (assistant nurses, care assistants and nurses within home care)

To the best of my knowledge, only one scoping review specialises in workplace interventions' effects on home care workers (85). The review included 16 studies, of which three were of decent quality (RCT or quasi-experimental) and studied effects on health or well-being. One of the studies (86) investigating the impact of work-time influence on health and well-being found no positive health effects. The second study (87) focused on the education and training of caregivers lacking formal competence. They found employees adhering to the e-training program (i.e., intervention) rated improvements in their working life and well-being. Finally, the third study (88) was a randomised controlled trial of a total worker health intervention with one half-day and twelve monthly two-hour meetings. Topics for the meetings were different aspects of the work environment and team dynamics, such as Functional fitness, Mental health and Healthy eating habits. The study reported positive effects for the intervention group compared to the control group for experienced community of practice, fruit and vegetable consumption, and several safety behaviours. However, they did not find any improvements in mental health. Hence, there is a scarcity of organisational interventions to improve mental health and well-being for home care workers.

2.2.5.2 Teachers

The only review involving teachers (89) concludes low-quality evidence that organisational interventions improve teachers' well-being and retention rates. The interventions targeted the stressors in the work environment rather than the stress response. However, the review only included four studies. Further, one cluster randomised trial (90) among preschool teachers

found no evidence that participating in the intervention to improve the working environment by focusing on the core task at work affected job satisfaction, exhaustion, or sleep disturbances. However, they found positive effects for the intervention group compared to the control group regarding the incidence of short-term sickness absence during a 29-month follow-up. Another controlled trial (91) among teachers found no effects of the intervention on the health outcomes need for recovery and vitality. The evaluation was of a participatory organisational occupational health intervention.

2.2.5.3 Construction workers (blue-collar workers)

Recently, Greiner, Leduc (32) published a systematic review on the effectiveness of organisational-level workplace mental health interventions in construction. They identified four eligible studies with a total sample size of 260 participants. Only one study was rated as being of moderate quality. That study showed a considerable but non-significant decline in sick leave days. The intervention addressed physical and mental health: the latter focusing on worker empowerment.

Further, one systematic literature review (51) covering five studies on workplace interventions to improve mental health within male-dominated workplaces has been published. They defined a male-dominated industry as one with more than 70 per cent male workers. Construction workers were included, among other branches. The included studies were conducted in Japan (3) or Finland (2), with three RCTs: s, one case-control study, and one cohort study. One of the RCTs:s (57) aimed at improving psychosocial working conditions to enhance mental health and performance. Hence, it was a primary organisational intervention where the authors concluded that the interventions might effectively improve workers' mental health outcomes.

3 RESEARCH AIMS

The aim of this thesis is to contribute to knowledge on how stress-related ill health can be prevented in the workplace and to develop our understanding of the design and implementation of occupational health interventions.

The specific aims of the included studies are:

Study 1: To evaluate the effectiveness and implementation of a participatory intervention designed to improve psychosocial working conditions and decrease symptoms of burnout among teachers and elderly care personnel.

Study 2: To investigate the participants' (a) experiences of the co-creation and learning processes and (b) perceptions of the intervention activities and implementation strategy.

Study 3: To evaluate the effectiveness of a co-created occupational health intervention within the construction industry and assess implementation fidelity.

4 MATERIALS AND METHODS

The thesis includes three articles based on two intervention projects, see Figure 4. Article I reports on a controlled trial and process evaluation of a participatory organisational intervention within human service organisations. In articles II and III, we studied a co-created intervention project within the construction industry. In articles I and III, we evaluated the effectiveness and implementation of the two interventions, and in article II, we investigated the co-creation process (design).

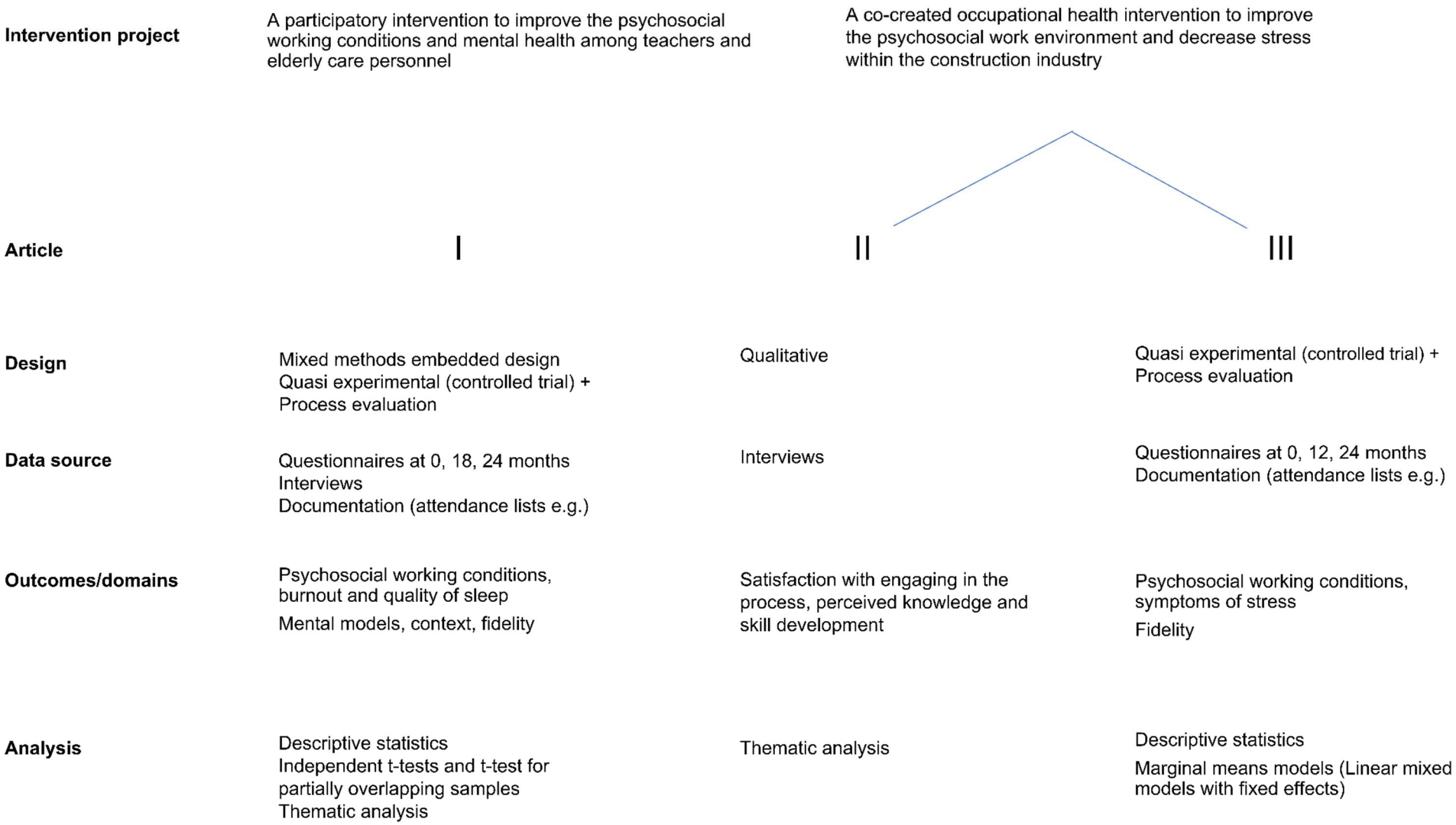

Figure 4. Overview of the intervention projects, design, data source, outcome/domain and analysis for the included articles in this thesis.

Firstly, I will describe the two interventions, how they were designed and implemented and in which setting. Then, I will describe the participants, data collection and analysis for each paper.

4.1 A PARTICIPATORY ORGANISATIONAL INTERVENTION WITHIN HUMAN SERVICE OCCUPATIONS

The first intervention targeted teachers and home care personnel in a middle-sized municipality in Sweden. The administrations of early childhood and childhood education and social services were enrolled. For an overview of the organisation's structure and groups involved in the intervention, plus the control groups, see Figure 5. The enrolled administrations are female-dominated.

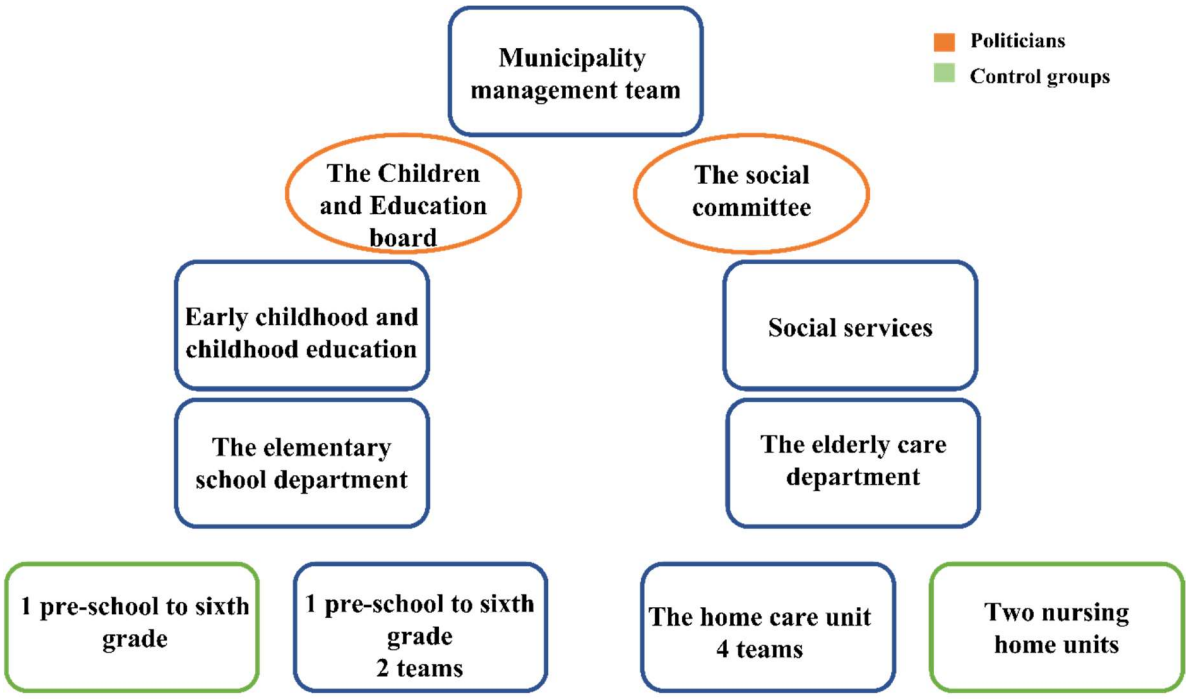

Figure 5. Overview of the groups involved in the municipality intervention, plus the control groups.

The intervention aimed to promote mental health by enabling dialogue on workplace stress-related challenges identified and prioritised by frontline employees. Further, "leading for health" was an aim of the intervention.

The intervention content targeted enhancing employee control among other job resources and demands and was built on the JD-R theory (92) and the ERI model (93). The JD-R theory and the ERI model were used to guide frontline workers and managers in forming action plans, encouraging a simultaneous focus on reducing demands, increasing resources and identifying any imbalances regarding efforts and rewards. This process characterised the intervention component horizontal dialogues. For a complete description of the logic model of the expected change order, see Figure 6. After reviewing the project plans and discussing them with the municipality project leader and the consultants, the research team outlined the logic

model. We discussed it with the municipality project leader, who reviewed it and gave feedback. We created a logic model to disentangle the assumed effects of each intervention component to know which psychosocial factors to evaluate.

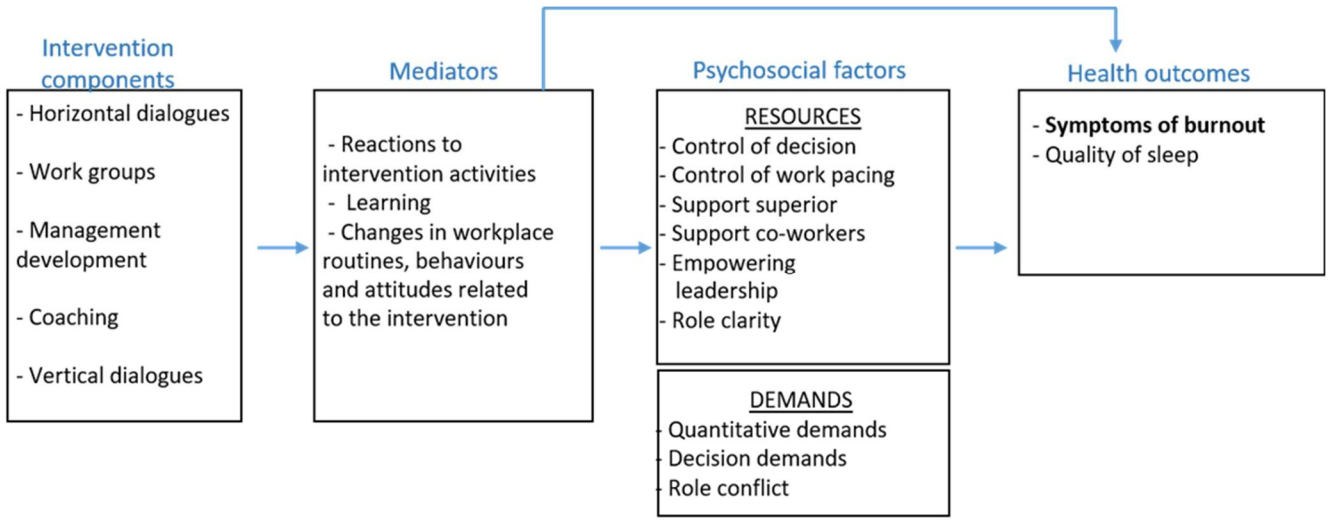

Figure 6. Logic model of the expected order of change. Originally published in Cedstrand, Nyberg (94).

HR representatives employed by the municipality and two external consultants coordinated and delivered the intervention activities. One HR representative was assigned project leader. All activities were held during working hours, and the frontline workers were replaced with substitutes when needed to enable participation. The intervention activities targeted different organisational levels and are described below.

Individual level – leaders. All team managers (n = 5), unit managers (n = 3), department managers (n = 2) and the two administrative managers were offered coaching. The theme was "leading for health"; however, each person coached formulated their own goal.

Group level – frontline workers. So-called horizontal dialogue workshops with all frontline employees and first-line managers aiming to make team-specific risk assessments and action plans took place. The teams got to discuss and highlight any unbalances according to the JDR theory (92) and the ERI model (93). The home care unit formed work groups to implement the needs raised in the horizontal workshops. The work groups involved a couple of frontline workers from different teams. One team leader and the external consultant or an HR representative led the meetings. Within the school, they wished for individual stress management, which led to a couple of sessions to address that. Hence, the workgroups and the individual stress management were not in the original plan. Instead, they were tailored from the discussions in the horizontal dialogue workshops.

Group level – leaders. All management teams (n = 3) within the two administrations and the top management team within the municipality were offered support by the external consultant

regarding the topic “leading for health”. A prioritised general focus for these meetings was clarifying goals and roles to create a clear mission for each team.

Group level - politicians. The political board and the committees representing the two administrations met within each group with the HR representative and the external consultant to discuss the progress of the project and occupational health-related issues.

Organisational level. Meetings known as vertical dialogues meant discussing prioritised questions among politicians, managers and employee representatives to resolve prioritised obstacles within the work environment.

4.1.1 Materials and methods – article I

4.1.1.1 Participants

The participating organisation chose the two intervention groups, while the research team picked the control groups. We matched the control groups using the criterion type of work, intending the control groups to resemble the intervention groups. Hence, the elementary school department generated intervention and control groups within the early childhood and childhood education administration, see Figure 5. All occupations within the schools were included (intervention: n= 60; control n=44). Accordingly, the elderly care department generated intervention and control groups within social services, see Figure 5. The home care unit was enrolled as the intervention group (n=82 at baseline), and two nursing home units were invited and accepted as the control group (n=121 at baseline). We were aware of the risk of contamination given that the control group’s managers participated in the intervention through their involvement in the management team development. We included managers at different levels representing the control groups in the process evaluation to keep track of potential change initiatives due to their involvement.

The intervention and the process evaluation (interviews) include all management levels within the two administrations. However, the effectiveness evaluation includes only frontline workers and first-line managers since the intervention aimed to improve the psychosocial work environment and quality of sleep and decrease symptoms of burnout in these groups. One should see the involvement of management groups and politicians as a means to achieve an improved work environment for frontline workers and first-line managers.

The selection of participants for the interviews, i.e., process evaluation, was purposefully stratified (95). The project manager invited the participants. We included both those actively engaged and those more hesitant to the intervention. A total of 49 interviews took place. Both principals within the school were asked to participate in the interviews, but one declined. The principals were asked to invite two frontline workers from each team and one from the administrative team. However, recruitment of teachers was difficult due to teachers’ lack of time, and only one participated. Within the home care department, we invited the unit manager and two (teams 1 and 2) out of four team leaders. Two frontline workers from the

same teams were also asked to participate in interviews. Everyone in the home care unit accepted, and all respondents gave oral consent.

4.1.1.2 Data collection and measures

To evaluate changes in outcomes over time, we collected data using questionnaires at baseline, 18 and 24 months. Pencil-and-paper surveys were administered in September 2016 (baseline), in February 2017 (follow-up 1) and again in September 2018 (follow-up 2). The project manager distributed the surveys in the municipality during work meetings, and it was voluntary to fill in the survey. Individuals who were absent during the given time for data collection were assigned approximately two weeks to fill out the questionnaire. Individual participants were not traceable; however, they were linked to their closest managers. Hence, we used aggregated data for all analyses.

The primary outcome was symptoms of burnout, for which we used the Shirom Melamed Burnout Measurement (SMBM) (96) to assess. For a detailed description of all outcome measures, see Table 2. The secondary health outcome quality of sleep was assessed using one sub-scale of the Karolinska Sleep Questionnaire (97). We also included questions on background variables: *Educational level* (Elementary school/9 years, Upper elementary school > 9 years, University/college). *Occupation within the school* (Teacher, Early childhood educator, Recreation leader, Other). *Occupation within social services* (Care assistant, Assistant nurse, Nurse, Cleaner). *Job tenure* (<1, 1 - 2, 3 - 5, >5). *Sex* (Female, Male). *Age* (<35, 36 - 45, >46). *Work-time* (Chosen part-time, Not chosen part-time, Full-time). At 24 months, we also asked whether they had responded to any earlier questionnaires (Yes, both, Answered one of them, No, none of them, Don’t remember).

Table 2. Description of outcome measures with the number of items per scale, example of scale items, response alternatives and Cronbach's alpha.

	Effectiveness evaluation			
	Number of items	Examples of items	Response alternatives	Cronbach's alpha
Health outcomes				
Symptoms of burnout	14	I am physically exhausted, My thinking process is slow, I feel like my emotional batteries are dead	Range: 1: almost never, to 7: almost always	0.95
Quality of sleep*	4	Have you perceived any of the following complaints during the last three months? Difficulties falling asleep	Range 1: never to 6: always	0.84
Psychosocial working conditions				
Role clarity	3	Do you know what your responsibilities are?	Range 1: very seldom or never, to 5: very often or always	0.80
Empowering leadership	3	Does your immediate superior help you develop your skills?	ibid	0.88
Social support from manager	3	Are your work achievements appreciated by your immediate superior?	ibid	0.87
Social support from colleagues	2	If needed, can you get support and help with your work from your co-workers?	ibid	0,77
Control of decisions	5	Can you influence the amount of work assigned to you?	ibid	0.63
Control of work pacing	4	Can you set your own work pace?	ibid	0.69
Quantitative job* demands	4	Do you have too much to do?	ibid	0.80
Decision* demands	3	Does your work require maximum attention	ibid	0.68
Role conflict*	3	Do you have to do things that you feel should be done differently?	ibid	0.76

Further, we evaluated whether the intervention activities were delivered according to plan, i.e., fidelity. Consequently, we studied the number of intervention activities delivered as planned (dose delivered) and the proportions attending these activities (dose received). We used documentation from the project manager to examine fidelity.

Finally, we conducted sequential semi-structured individual interviews to collect data for the qualitative process evaluation. We interviewed each participant up to three times throughout the study. The first round of the interviews (February 2017) was conducted face to face, while phases two (October/November 2017) and three (May 2018) were over the telephone. The open-ended interview guide covered the three main domains of the Nielsen and Randall framework: contextual factors, intervention and implementation design and mental models (14). We added questions on changes in routines or behaviours related to the intervention. One chartered psychologist with experience in interviewing conducted all the interviews. Each interview lasted between 10 and 47 minutes and was recorded by an MP3 recorder. The interviews were transcribed verbatim by a transcription service.

4.1.1.3 Analysis

We tested for differences in background variables, work environment factors and mental health at baseline between control and intervention groups using independent t-tests for continuous variables and Pearson's chi-square test for categorical variables.

Since the individuals were not traceable, we applied weights to adjust the analysis for background variables and baseline measures, respectively (cross-sectional analysis). For a detailed description of this procedure, see Supplementary material S3[1].

Differences in the work environment and mental health at 18 and 24 months between control and intervention groups were tested using independent t-tests for continuous variables. However, all outcome data is ordinal, which suggests that the median and interquartile range should be reported and non-parametric tests should be applied. Nevertheless, normative data (98, 99) and previous studies in the field (100, 101) report means and standard deviations for the same variables we used. Thus, we did the same to enable comparability between studies. We performed non-parametric tests (Mann-Whitney U-test) correspondingly with the t-tests to ensure the trustworthiness of our results. We performed Levene's test to test if homogeneity of variances existed between the intervention and control groups.

Further, to calculate changes in outcome variables over time, we used t-tests for partially overlapping samples. We chose this method to handle a somewhat different study population at each time point caused by employee turnover and drop-out (102-104). We also tested for mass significance (105). We used SPSS V26 to analyse quantitative data.

[1] https://www.mdpi.com/article/10.3390/ijerph18073546/s1.

Next is a description of the analysis procedure for the qualitative part. Before starting the analysis, we categorised the informants by the administration to identify different perspectives from the two occupational groups. The two administrations differ in several aspects, for example, regarding educational level, which could mean that the intervention was perceived differently within the two administrations. We also kept track of whether the informant was a manager or a frontline worker due to their different roles in the intervention project. Hence, we compared and contrasted findings from two administrations and stakeholder groups across time.

We organised the analysis in two stages, through which we were guided by Braun and Clarke's thematic analysis (106). The method aims to identify, analyse, and understand patterns (themes) within the data. Through the first stage, we applied the three broad pre-determined dimensions of the Nilsen and Randall framework (14) to categorise our data. Two co-authors initially coded the data independently, after which they met to discuss using NVivo version 11. To further understand and make sense of the first independent coding, the researchers examined the coding and revisited the literature in an iterative process. During this process, Kirkpatrick's learning evaluation model (107) was identified, and in the second stage, we reanalysed our data with this model in mind. The model includes four levels: 1) reactions to the intervention, 2) learning/knowledge, 3) behavioural changes and changes in work routines 4) organisational results. However, the fourth level reflects work and health effects, which we assessed by a questionnaire. Hence, the coding in stage two was guided by levels one to three of the Kirkpatrick model. We chose the model because it highlights the linkages between frontline workers' and managers' reactions to and learning from the intervention activities and the impact of those activities on the outcomes.

After categorising data into the three dimensions of the Kirkpatrick model (107), we searched for themes within these dimensions and reviewed them concerning the entire data set. In the next step, we named and defined the themes, relating them to each other to create an overall story of the data. Finally, the research group met to discuss this comprehensive map and final adjustments were made.

4.2 A CO-CREATED OCCUPATIONAL HEALTH INTERVENTION WITHIN THE CONSTRUCTION INDUSTRY

The second intervention targeted mainly white-collar workers in a large construction company in Sweden. The gender distribution in the regions was approximately 80% men and 20% women. Professionals accounted for around two-thirds of the study population, while trade workers accounted for one-third.

Our aims of the co-creation were to a) define goals for the intervention, design intervention activities and implementation strategies, b) enhance readiness for change and tailor the intervention into the context, c) knowledge exchange and d) improve the dissemination of findings.

During the preparation phase, we formed a steering group consisting of the Human Resource (HR) representative, the Health and Safety manager, the Development manager, the manager of Operations, the blue- and white-collar safety representatives and the research team's project leader. The blue-collar chief safety representative worked full-time within the region, coordinating the safety representatives in the building projects. The white-collar chief safety representative worked part-time, representing all white-collar workers. Later during the project, after the co-creation group was chosen, the steering group became the project management team [II]. The members were the ones described above without the chief safety representatives.

The regional manager was assigned the project owner with the highest management team. To reach a buy-in among the senior management, we presented all suggestions from the co-creation process to the highest management team, who agreed to include the prioritised outcomes and intervention activities in the business case for the coming two years.

In phase 2, i.e., the screening phase, we conducted a formative evaluation to assess the current working conditions. We carried out interviews (n= 25) and a survey to answer the questions: *What works well?* and *What needs to be improved*? regarding the organisational and social work environment. The needs assessment survey was conducted in the control group to give the intervention and control group similar conditions. However, we did not provide the control group feedback on the results.

4.2.1 The intervention activities

In the third phase (action planning), researchers and the Health and Safety advisory Board (HSB) co-created the outcomes, the intervention components, and the implementation strategies. Hence, we co-created the program logic, a recommended method (108). The two intervention components, structured roundmaking and duties clarification, were expected to improve role clarity, quantitative demands, staffing, and planning. Structured roundmaking was described in one of the organisation's manuals accordingly: "The aim of structured roundmaking is for the first-line manager to plan for the upcoming working procedures and remove obstacles to create trouble-free production. By continuously following up on site, the routine enhances control over the project's quality, safety, and time plan for the first-line manager". See Supplementary material for the company manual on structured roundmaking. The chosen intervention activities were thus not new in the organisation. Still, managers did not adhere to the routines, and their possible effect on role clarity and stress was never discussed. Duties clarification included having discussions in each construction project management team on role and goal clarity. An aim of duties clarification was also to visualise the goals and roles of everyone in the construction project. An example could be having pictures and lists on the walls to clarify who´s responsible for what.

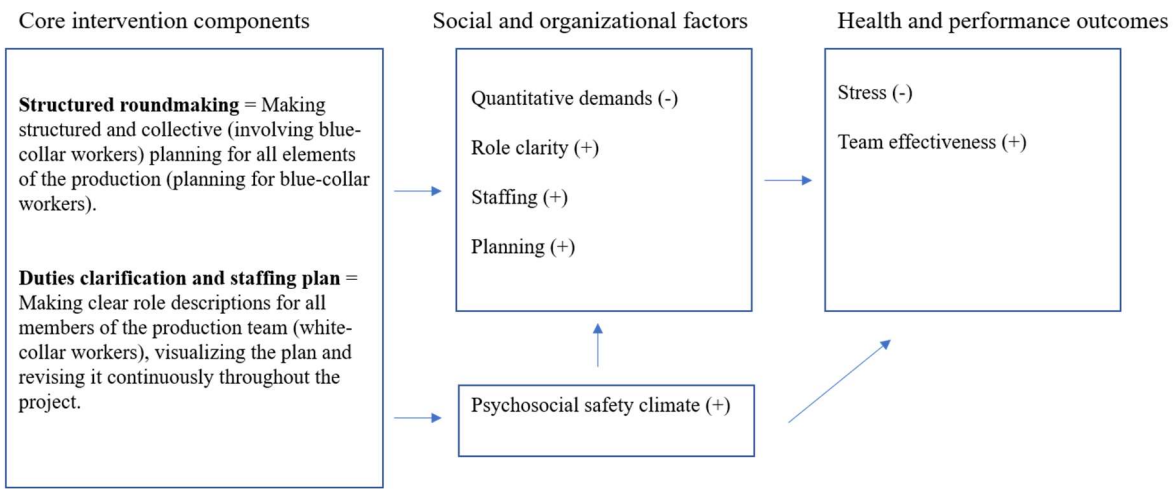

Figure 7. Program logic for the intervention. + = an increase in the outcome, – = a decrease in the outcome. Figure originally published in Cedstrand, Nyberg (109).

4.2.2 The implementation strategies

Moreover, in the HSB, we discussed and formulated suggestions for how to design the implementation process. We used appointed representatives, i.e., members of the HSB, an existing group with representatives from all levels and districts. Thus, it was well suited for co-creation. The members were highly involved in shaping the content as they decided which psychosocial working conditions to target and how to improve them, i.e., intervention components. All appointed representatives were also allowed to influence the implementation strategies. The thesis author led the iterative co-creation process, which lasted for four months. All workshops were held in regular meetings; thus, we inserted new content into existing structures.

Even though conducting an intervention study, it is crucial to include a clear description of implementation strategies. At a workshop with the HSB, the behaviour change wheel (BCW) (110) was introduced. The BCW is a framework to facilitate the design and description of behaviour change interventions to enhance the implementation. Our aim in introducing the BCW to the HSB was to increase the knowledge about possible aspects, i.e., capability, opportunity, and motivation, affecting behaviour change. The nine intervention functions, e.g. training, modelling, and enablement depicted in the BCW, were also described to display the options available to promote behaviour change. After explaining the two inner layers of the BCW to the HSB members, we analyzed hindering and facilitating factors taking the different parts of the COM-B model into account. Examples of restraining factors related to capability were lack of knowledge about structured roundmaking (intervention) and lack of understanding of how to practice it. Once they had identified the hindering factors, the group members were encouraged to develop strategies to meet the recognized needs. For example, Education and Modelling were seen as appropriate strategies. After the workshop with the HSB, the project management team had additional discussions to finalize the implementation strategy. Four strategies were chosen: (1) identifying early adopters of the intervention activities, (2) shadowing other experts, (3) visiting other sites, and (4) creating a learning

collaborative. Our strategies correspond with the ones described by Powell et al. (111) to enable comparison with other studies.

The Production Academy (i.e., the implementation support) was implemented to increase adherence to the intervention components and included four modules with various themes on project management. We intended to enrol all construction projects (i.e., groups) in the implementation support; however, since the pandemic hindered physical meetings, the management chose to start with the four largest groups. Yet, all projects were encouraged to perform the intervention components.

The BCW guided the theory behind the implementation support (23). The functions of education and modelling mainly directed the content. In addition to the educational elements, the intention was for the different projects to visit each other sites and learn through observing different project management routines, such as structured roundmaking. Module one focused on production management, how to work with a weekly structure and continuous improvement strategies for managers. Module two focused on leadership and structured roundmaking. The third module dealt with leadership and how to perform daily briefings. The final module focused on leadership and how to perform time plans.

Members of the organisation mainly delivered the modules; however, an external consultant was partly responsible for the first module. The four modules were delivered accordingly: (1) A full-day face-to-face workshop plus a 2-h follow-up on Teams, (2) A full day on Teams plus a 2-h follow-up on Teams, (3) 3 h on Teams, (4) 3 h on Teams. The participating projects were encouraged to discuss their status regarding structured roundmaking and set up goals. All managers from the projects were invited.

4.2.3 Materials and methods article II

4.2.3.1 Participants

We based the study's sampling method on the assumption that respondents' perceptions could differ depending on their role in the company, the co-creation process, and gender. Therefore, we applied the principles of maximum variation during the purposive sampling process to select participants from all levels within the company, from the different co-creation groups (HSB, project management team, highest management team, and district management team) and of a different gender. Once the participants were identified, the HR representative contacted them, asking for approval for the researchers to reach out. Thirteen persons accepted to be interviewed, and two declined, one due to time constraints and one because he felt he had not participated enough in the co-creation meetings. One person agreed to participate but later cancelled the meeting due to time constraints. In total, eight men and four women participated. All respondents were given written information and gave written consent to participate.

4.2.3.2 Measures and data collection

We conducted twelve semi-structured interviews in December 2020 and January 2021. They were held online due to COVID-19 and lasted, on average, 37 min (range 19–55 min). A researcher who had not been part of the project's setup, nor had she participated in the workshops with the HSB or in the feedback meetings with the district management teams conducted all interviews. The interview guide was informed by the Leask et al. framework (41). The guide covered the suggested three areas to evaluate within co-creation projects: (1) satisfaction with engaging in the process, (2) perceived knowledge and (3) skill development. We added questions on perceptions of the intervention activities and implementation support.

4.2.3.3 Analysis

We applied a thematic analysis guided by the stages recommended by Braun and Clarke (106). All interviews were recorded and transcribed verbatim by a professional transcription firm. In the first stage, the two researchers mainly involved in the analysis familiarized themselves with the data by reading the transcriptions and taking notes. In the second stage, one made an initial coding round in NVivo 12. The codes were organized according to the three areas in Leask et al. (41): satisfaction with engaging in the process, perceived knowledge, and skill development. In the next step, both researchers separately coded the data to obtain a comprehensive and nuanced coding of the data rather than seeking consensus (112). The codes were discussed with two senior researchers, after which changes were made. In the search for themes, i.e., the third stage described by Braun and Clarke (106), it became evident that the three areas in Leask did not correspond well with the participants' perceptions. Hence, the developed codes of these perceptions remained; however, we applied a data-driven approach in developing themes. Steps four and five, reviewing, defining, and naming themes, were combined and carried out in an iterative process with feedback from the two senior researchers. Lastly, all authors discussed the results, and we conducted the final changes.

4.2.4 Materials and methods article III

4.2.4.1 Participants

We recruited two branches within a large Swedish construction company. In collaboration with representatives from the company, we did a short listing of eligible business streams and branches. The building construction business stream was chosen as the context for the intervention. The national health and safety manager was responsible for informing the branches about the study and searching for potential participants. One branch with approximately 360 employees applied to participate in the study. We matched a control group, i.e., a branch from the same business stream and of similar size (N > 300). Randomisation was not viable because the intervention group wanted all construction projects, i.e., teams, to receive the intervention. Throughout the process, we excluded employees uninvolved in the production and the senior managers (branch manager and district managers) as the intervention did not target them.

4.2.4.2 Measures and data collection

Primary and secondary outcomes were assessed at baseline, at 12 and 24 months, using an online survey distributed during working hours. The primary outcome of stress was measured with the Copenhagen Psychosocial Questionnaire (COPSOQ) III (113, 114). The scale has three items: (1) How often have you had problems relaxing? (2) How often have you been irritable? (3) How often have you been tense? The items are preceded by "These questions are about how you have been during the last four weeks." The response categories range from (1) "all the time" to (5) "not at all". For the analyses, we converted the scale from 1 – 5 to 0 – 100 (113). Secondary outcomes assessed with the COPSOQ III were role clarity and quantitative demands. We used a scale for team effectiveness developed by Maynard, Mathieu (115). The psychosocial safety climate was assessed using the Swedish-validated scale version (101). Staffing was assessed with two self-constructed items, and to assess planning, we used a non-validated scale utilised in a Swedish report investigating a similar study population (7). For measurement details of all secondary outcomes, see Appendix A[2]

Fidelity can be measured in different ways (116). We measured adherence to the intervention (109) and the dose delivered. Hence, we assessed to what degree end-users performed structured roundmaking and duties clarification before and after the study and to what extent the implementation support was given. We planned to evaluate adherence with a questionnaire (109) completed by each construction project's management team and observations, but this procedure was not feasible due to the Covid-19 pandemic. However, the Operational manager continuously evaluated the intervention activities at the construction project level using pre-set criteria. Thus, we used these ratings to assess adherence at an aggregated level, i.e., for all construction projects. For details on the pre-set criteria used for the evaluation, see Appendix A[3]. Dose delivered of the Production Academy (i.e., implementation support) was assessed using workshop attendance lists.

4.2.4.3 Analysis

We measured fidelity using descriptive statistics for the two intervention activities before and after the study. Participants' outcomes and demographic characteristics at baseline are presented as frequencies with percentages and mean with SD. The scales role clarity and planning were not normally distributed; thus, we transformed them using the square root function. We applied likelihood-based, mixed-effects repeated measures analyses to account for the dropout during follow-up (117). However, the analyses are valid only when the dropout pattern is missing at random (MAR). Since MAR is an assumption that is impossible to verify statistically (118, 119) and it is recommended to perform sensitivity analysis using different missing not at random (MNAR) mechanisms (120, 121), we applied pattern mixture models (PMM) (120, 122). Hence, we identified missing data patterns (MDP) to model the

[2] https://www.frontiersin.org/articles/10.3389/fpubh.2022.973890/full#supplementary-material
[3] https://www.frontiersin.org/articles/10.3389/fpubh.2022.973890/full#supplementary-material

missing data distribution, and we created dummy variables named MDP1, MDP2, etc. Next, we applied Marginal Means Models (MMM) (i.e., Linear Mixed Model with fixed effects only) to evaluate if each missing data pattern predicted the outcome variable or interacted with time to predict changes in the outcome variable over time. The missing data patterns or the interaction between MDP and time that predicted the outcome were kept in the final model (122).

Marginal Means Models were applied to examine outcome changes from baseline to 12 and 24 months in the intervention group compared to the control group. Group and time variables were treated as fixed factors. We used the interaction of group and time as an indicator of the intervention effect at the different, discrete time points. We tested for the potential confounding variables age, gender, role seniority, job seniority, and education in two steps. First, the variables were tested univariate with the outcome. We continued the procedure only if the beta estimate for the potential confounder was statistically significant. Next, if the regression coefficient of group (intervention vs. control) or the interaction term between group and time changed by more than 20 %, the confounder was kept in the model.

Further, as the intervention component duties clarification targeted only the professionals, and structured roundmaking primarily targeted first-line managers, we performed sensitivity analyses. However, team effectiveness was not applicable, as only professionals were asked about these scale items. We aimed to examine statistically significant and clinically meaningful (i.e., noticeable differences for the individual) effects when interpreting the results (123). For COPSOQ, a change of +/- 5 is considered a noticeable difference (113, 123). P-values <0.05 were considered statistically significant. We used IBM SPSS Statistics 28 to conduct the analyses for this study.

4.3 ETHICAL CONSIDERATIONS

The two intervention projects constitute partially mutual ethical challenges. Thus, when necessary, I will organise my reflections by the project. We have applied for and obtained ethical approval for both projects. Paper I: number 2018/303-31/5, and papers II and III: number 2019-02662. Both intervention projects concern two major ethical principles: 1) research on human subjects and 2) handling research material sensitive to confidentiality (124). In the municipality project, we applied for ethical approval after initiating the data collection. We did so as we were invited late in the process, and there was no time to apply for ethical approval before the baseline measurement (questionnaire). We, therefore, collected anonymous data to protect the informants and not violate any ethical guidelines. Hence there are different levels to protect the individual's integrity (86). As a researcher, one can anonymise or de-identify the informants, i.e., no one can connect a particular piece of information with a specific person's identity, not even the research group. One can do this by destroying the code list or, as we did, collecting data without noting the identity of specific individuals. However, even if anonymisation is a reliable way to protect the informant's integrity, it comes with a tradeoff where the analysis and results might be influenced negatively. Without the possibility to identify individuals, one loses the opportunity to track them over time. Hence, we could not

account for within-individual differences in our analysis. In line with ethical guidelines, all informants received written information about the project's aim, that participation was voluntary, that no individuals could be identified, and their right to quit their involvement at any time. We provided the information before they answered the questionnaires and participated in the interviews, respectively. In concordance with this, we also obtained informed consent.

Regarding the construction project, we applied for and obtained ethical approval before collecting data. This time we could only promise the informants confidentiality, meaning that we collected data noting the identity of individuals to be able to track them over time. This information was exclusive to the research team, which we made clear in the project's written and oral presentations, not the least in the information letter preceding the questionnaire. However, collaborative research like co-creation can jeopardize participants' trust as the employer and researchers collaborate. This fact might lead to employees worrying that what they say in interviews and questionnaires does not stay with the researchers but spreads to the employer. Hence, some people could consider the information collected a breach of integrity, leading them to not participate or answer truthfully.

Further ethical challenges associated with co-creation is the fact that the relationship between researchers and the employer must build on cooperation and interdependence, and at the same time, there must be room for reflection and independence for the research group to make scientifically sound and ethical decisions. If not, the researcher's independent position might be threatened, which is one example of the internal requirements of science (Helgesson). To secure the scientific needs, it is essential to, in advance, discuss and decide on the issues that the researchers and the employer have (86). Also, it is crucial to formulate a contract concerning ownership of the collected data and the right of the researchers to decide how the data should be analysed and presented. It is of great importance that results that may be detrimental to the employer may also be published. To mitigate the risk of losing objectivity and control over the data, we agreed on the researchers' right to analyse and present data regardless of the tenor of the results.

Yet another ethical aspect to consider when conducting collaborative research is the researcher's involvement in the planning and delivery of the intervention and the possible effects of that. My role in the two projects differed. In the first project, the research group and I were not involved in the intervention's planning, design, or implementation. We were observers and evaluated the intervention solely. On the other hand, the research group set up the project with the construction company, and I guided all meetings with the management and the HSB, i.e., the co-creation team. However, we did not deliver the implementation support. Thus, we planned the project and led the organisation through the needs assessment, analysis and identifying the intervention components. We also guided the implementation support, i.e., Production Academy; however, we deliberately stayed out of the delivery to enhance sustainability after the project ended. There are pros to researchers staying on the side, only observing and evaluating the intervention in terms of objectivity. Once you involve

yourself and have a vested interest, it can be challenging to analyse the data dispassionately (39). A solution to this problem might be separate teams for the outcome and process evaluation (39) or having independent researchers involved in the co-creation, data collection and analysis. However, it's a matter of recourses being able to implement such an approach. We used the least involved researcher to collect data for the qualitative evaluation in study II to mitigate the risk of biased results.

On the other hand, standing on the side of the municipality project, observing a negative trend in outcomes and participant reactions raised an ethical challenge regarding whether or not to give feedback during the trial. von Thiele Schwarz, Lundmark (125) stress the importance of considering the dual outcomes of organisational interventions, i.e., adding knowledge to the scientific community and creating practical value for the organisation. Thus, it requires a new evaluation framework where the evaluation is seen as an integrated part of the intervention. Also, every intervention stage is evaluated continuously, and the results are applied to inform the way forward. This approach guided the second project within the construction industry.

5 RESULTS

5.1 KEY FINDINGS ARTICLE 1

5.1.1 Effectiveness evaluation

Table 3 outlines the number of participants included in the statistical analysis and the response rates at each time point. Details on the participant characteristics can be found in the original paper I.

	Elderly care		School	
	Intervention	Control	Intervention	Control
Baseline N (%)	74 (89)	81 (67)	52 (87)	32 (73)
18 months N (%)	50 (71)	92 (75)	44 (66)	32 (76)
24 months N (%)	57 (78)	74 (63)	48 (72)	34 (87)

Table 3. The number of respondents and response rates in the three waves of questionnaires for intervention and control groups within each administration.

The statistical analysis showed no improvements in any outcome for the two intervention groups compared to their control groups. On the contrary, the school and home care intervention groups deteriorated in most outcomes. This deterioration was not observed in the control groups. Comparing mean values between the intervention and control group within each administration at 18 and 24 months, controlling for background variables and the baseline measure, showed four statistically significant differences within elderly care. These results reflected a negative change for the intervention group compared to the control group at 24 months, weighted for background variables for social support from the manager (Mean difference (MD) = -0.78, $p<0,01$), empowering leadership (MD = -1,08, $p<0,01$), control of work pacing (MD = -0,79, $p<0,01$) and role clarity (MD = -0,45, $p<0,01$).

5.1.2 Process evaluation

5.1.2.1 Implementation fidelity

The activities targeting the frontline workers, i.e., horizontal dialogues, were delivered according to the plan with high attendance since they were held during working hours with substitutes. However, only approximately half of the planned feedback and discussion meetings targeting the municipality management team and the political board were delivered. The first-line managers, especially within the homecare, participated in all scheduled activities with a higher dose delivered than planned for management support and coaching. Hence, overall implementation fidelity was high except for the senior management and politicians.

5.1.2.2 Mental models and context evaluated using interviews

Figure 8 outlines the thematic analysis's emerging themes in relation to the Kirkpatrick model (107). Hence, we tried to convey the participants' perceptions of the different

intervention activities to the model's three stages: reactions, learning and changes in routines, attitudes, and behaviours. We applied this approach to disentangle the possible effects of the different intervention activities on the outcomes as we used the process evaluation data to guide the interpretations of the outcome results. Through this approach, we could tell that the intervention component utilising full participation, i.e., horizontal dialogues seemed to have caused the most frustration and disappointment and was seen as a burden because of the large amount of time consumed. Instead, using representatives (work groups and vertical dialogues) and targeting specific groups (coaching and management support) seemed more promising in bringing about positive reactions, increased learning and possible changes in routines and behaviours. Additional information from the interviews, however not included in the themes, reflects contextual factors affecting the outcomes. One explanation for the deterioration in perceived leadership quality, i.e., empowering leadership and support from the manager, was turnover among the principles for the two involved schools. However, the managers remained within the home care, yet the ratings decreased. One explanation was that the frontline workers perceived the managers as more absent due to their involvement in the intervention activities. The results are presented in detail in manuscript 1, which can be found at the end of the thesis.

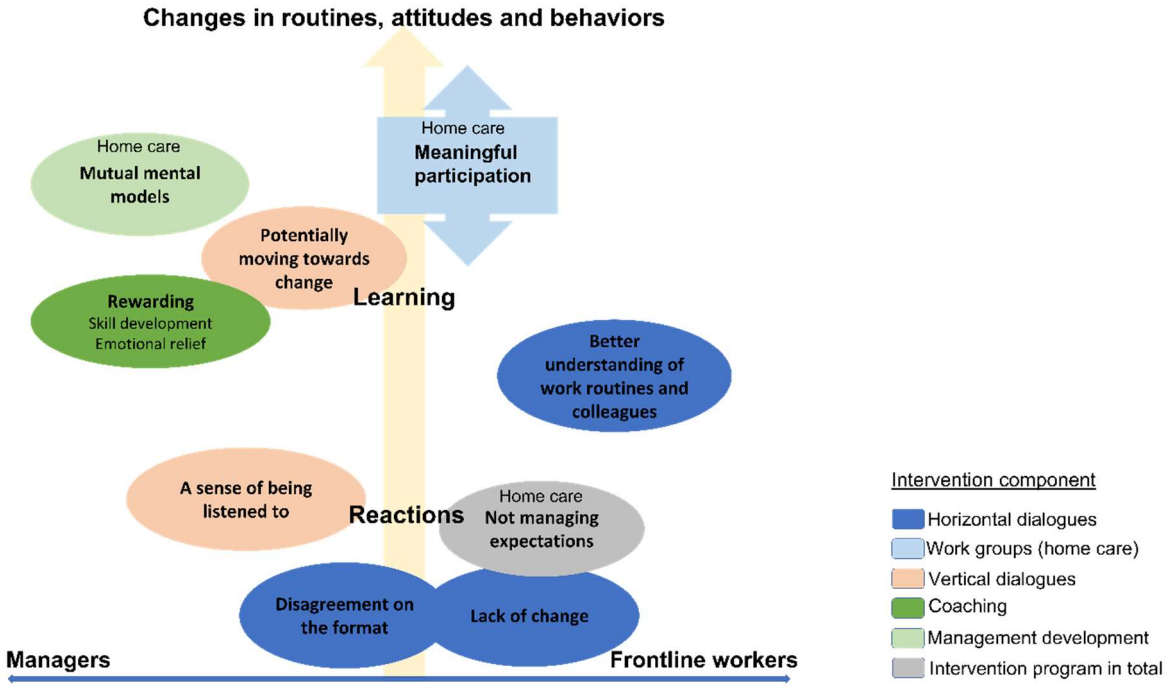

Figure 8. The thematic analysis's emerging themes in relation to the Kirkpatrick model (107).

5.2 KEY FINDINGS ARTICLE 2

We constructed three overarching themes from the data: (1) Building awareness about the organisation, (2) Enabling a satisfying co-creation process and (3) Tailoring intervention components and implementation strategies into the context.

The results showed that the respondents valued the co-creation process because they felt it increased their learning about the psychosocial work environment and mental health in

general and related to employee status at all levels. We identified a good partner fit as one prerequisite for the reported positive experiences of the co-creation process. The researchers and the organisation stakeholders shared the vision of a collaborative approach with equal power and ownership. Through the interviews, we learnt that the respondents were satisfied with the power and ownership balance throughout the process. They understood themselves as active agents with authority to decide on several questions, while the researchers contributed to the framework and as sources of expertise. An additional precondition to enhancing the co-creation process was that it was easy to fit into existing structures, mainly due to the already existing HSB. Hence, the organisation had an existing structure for worker involvement in health and safety matters. Finally, the respondents were satisfied with the overall structure and the implementation design. They perceived the project objectives as straightforward and recognised the logic model as a helpful tool for identifying outcomes and essential intervention activities. Some respondents identified the strategy of co-creating (workers and managers) a logic model and embedding the goals and activities in the business case as promising in bringing about change. Some respondents even mentioned wanting to try the same setup again, addressing safety concerns.

The third theme reflects the possible effects of the co-creation process on the implementation. Hence, involving different stakeholders and allowing the organisation to decide the intervention activities and the implementation strategies seem to have enabled a good contextual fit. In synthesis, we summarised our results in four key points: (1) Forming a genuine partnership with mutual expectations regarding responsibility and ownership, stressing senior management engagement over time. (2) Presenting a distinct structure for the co-creation to make the process understandable. (3) If possible, integrate the co-creation in already existing structures. (4) Work with representatives to avoid making the co-creation a burden.

5.3 KEY FINDINGS ARTICLE 3

5.3.1 Implementation fidelity

We assessed whether the implementation support, i.e., Production academy, was delivered according to the plan and adherence to the intervention components. Only four of approximately 20 building teams participated in the Production Academy. The goal was to enrol all projects. However, the organisation postponed the delivery due to the restrictions on in-person meetings because of Covid-19. The teams receiving the support attended all sessions.

We could not track changes in adherence to the intervention activities per building project. Instead, we used a mean value for all projects before and after the trial. However, for structured roundmaking, we could differentiate between the teams involved in the implementation support and the remaining teams. The comparison revealed a more notable improvement for the enrolled teams. On a scale of 1-5, they changed from 2,6 to 4, contrasting 1,75 to 1,82 for the projects not participating in the Production Academy. Duties

clarification changed from 3,55 to 4, counting all teams together. Beyond the Production Academy and the co-creation, we included further activities to enhance the implementation. See Table 4 for implementation strategies and how they were implemented. An additional strategy we used to ensure commitment from the senior management was the inclusion of the intervention activities in their business plan.

Table 4. Description of the implementation strategies, the barriers they targeted, theoretical foundation and how we implemented them, i.e., what did we do?

Activity	**Implementation strategies included**	**Barriers to target**	**What did we do?** April 2019 – Dec 2021	**Theory**
Co-creation	Use advisory boards and workgroups Conduct local consensus discussions	Lack of fit into the context Lack of support from managers Lack of integration in existing structures	8 meetings with the Health and Safety advisory board 10 meetings with the highest management team 25 meetings with the project management team	Literature: Lack of support from managers Lack of fit into the context Lack of integration in existing structures
Formative evaluation	Conduct local needs assessment	Lack of fit into the context Lack of readiness for change among end-users	25 interviews and a survey in May 2019	Lack of readiness for change
Feedback of results and rational to interventions	Conduct educational meetings	Lack of understanding	15 meetings, mostly for the district management teams but also for project teams	Lack of motivation COM-B model
Develop educational materials	Develop educational materials	Lack of competence	The company had a guide on Structured roundmaking. Changes were discussed but not implemented. There were guidelines for Duties clarification.	Capability and opportunity COM-B model
Learning collaborative	Identify early adopters Shadow other experts Visit other sites Create a learning collaborative	Lack of motivation Lack of competence Lack of understanding	The Production Academy was the learning collaborative Due to Covid they could not visit each other sites, or shadow experts	Lack of motivation COM-B model

5.3.2 Effectiveness evaluation

The analysis included 359 and 275 workers from the intervention and control groups, respectively. The response rate for the control group was low, thus rendering 41 complete cases, i.e., answering at all three time points. The corresponding number for the intervention group was 101. The details of participant characteristics can be found in the original paper [III].

We found no statistically significant results comparing the groups over time. All outcomes except role clarity deteriorated for both groups during the trial. It appears to be a clinically meaningful change regarding stress and quantitative demands, given that the intervention and control groups increased by five or more scale points from baseline to 24 months. However, we found a clinically meaningful improvement, i.e., a noticeable difference for the individual for the intervention group for role clarity when looking at white-collar workers. The professionals in the intervention group improved by 5,7 points (control +1,9) and the first-line managers by 6,2 points (control +0,2).

6 DISCUSSION

The overall aim of this thesis is to contribute to knowledge on how stress-related ill health can be prevented in the workplace and develop our understanding of how to design and implement occupational health interventions. The effectiveness and implementation of two occupational health interventions on the psychosocial work environment and stress [I, III] and the design process of one of the interventions were evaluated [II].

The interventions and settings differed. We evaluated one multi-component participatory occupational health intervention targeting teachers and home care workers within a municipality. The other intervention was co-created and focused on enhancing goal and role clarity for construction workers in a large Swedish construction company.

The results showed that neither of the interventions improved the long-term outcomes of burnout and stress, respectively. Also, the municipality intervention did not improve the psychosocial work environment outcomes. Instead, our results indicate a significant adverse effect on four psychosocial work environment factors for home care employees.

The construction industry intervention seems to have positively impacted one aspect of the psychosocial work environment, i.e., role clarity for white-collar workers. However, we also observed a noticeable increase in quantitative demands and stress for both the intervention and control groups. In summary, the municipality intervention showed null or detrimental effects on the outcomes, while the construction industry intervention showed null or positive effects. How can we understand these results, and what can we learn for future studies?

6.1 INTERPRETING THE EFFECTS OF THE INTERVENTIONS

There are several potential explanations for the effects of the two interventions on the outcomes. I will use process evaluation data and the results from paper two's thematic analysis to interpret and explain the effectiveness evaluations' results. I will examine three themes to understand and interpret our results: (1) organisational prerequisites, (2) the design strategies and (3) the implementation. Finally, several methodological aspects can also explain the effects of the intervention. I will discuss them in chapter 7.

6.1.1 Organisational prerequisites

One explanation for the results of the two interventions might be the different organisational prerequisites between the teachers and home care workers and, on the other hand, the construction workers. Organisational prerequisites can comprise at least two components: organisational capability and incentive structures to promote health.

6.1.1.1 Organisational capability

Organisational capability reflects the level of available human and technical resources and expertise (126). I believe organisational capability is an overlooked yet important factor that

can help explain the effects of an intervention on the outcomes by affecting the implementation (126).

The studied municipality faced problems with high rates of sickness absence and staff turnover when the intervention was initiated (120). Also, more specifically, the teachers highlighted a lack of staffing and the need for improved technical resources and premises as threats to good mental health (94). These factors suggest a low organisational capability, and most likely, these conditions hampered the implementation of the action plans in the municipality project. Our results align with other research, e.g., Mellor, Mackay (126) report that good organisational capability in terms of resources and expertise was an enabler for implementing the Management Standards for preventing and reducing work-related stress in Great Britain. Moreover, they found that a lack of organisational capability hampered the implementation.

Further, a similar concept to organisational capability is organisational readiness for change (69, 127). One of the four areas in the organisational readiness for change scale by Lehman, Greener (69), i.e., Institutional resources (offices, staffing, and training), resembles organisational capability. In a Swedish study evaluating the implementation of guidelines for the care and treatment of substance users, the researchers found that higher institutional resources were associated with higher adherence to the guidelines. Even though the setting of the latter study was not occupational health, the results strengthen the assumption that we need good prerequisites, i.e., organisational capability to make behavioural changes. This reasoning is also in line with psychological theory of behaviour change. For example, the O in the COM-B model stands for Opportunity, reflecting the impact of external factors such as time, resources and cultural norms to change behaviours (70).

Moreover, our results from the municipality indicate that implementing a participatory intervention may harm frontline workers in an organisation with low organisational capability. The harm was most likely related to the intervention being perceived as a burden and the fact that the above-mentioned structural level risks (offices, staffing and technical resources) were never solved during the two years of the intervention. Hope for improvements was evoked; however, the hope was never fulfilled. Hence, the participatory intervention might have profited from initially targeting only the politicians and the highest management to increase organisational capability and readiness for change.

Finally, in discussing goals and activities, within the construction company the participants did not address needs related to human and technical resources. Thus, we perceived the construction company as an example of an organisation with high organisational capability. The construction company's presumed high organisational capability is seen as a facilitating factor for the implementation.

6.1.1.2 Incentive structures to promote health

Another organisational prerequisite potentially impacting the implementation is incentive systems to promote health. According to learning psychology, antecedents (activators) and

consequences direct our behaviours (128). Imagine you are at a dinner with colleagues (activator), you tell a joke (behaviour), and your colleagues laugh (consequence). Suppose the person perceived the colleagues laughing as positive, i.e., reinforcement. In that case, the behaviour will likely happen again in a similar situation (activator). Examples of activators within the organisational setting include values, marketing plans, steering documents, job descriptions, instructions from a manager or colleague, etc. All these examples can help to activate desired behaviours within an organisation. Examples of consequences are follow-up, feedback, reward, punishment and reminders. Thus, organisations need to include goals for employee health in the steering documents and follow up on the progress of those goals to promote health. This suggestion is in line with the swedish provisions on organisational and social work environment. (129).

One of the goals of the municipality intervention was to educate and support leaders in "leading for health". I think this goal was supposed to work as an incentive system to promote employee health by, e.g., raising awareness of risk and protective factors in the psychosocial work environment among managers and politicians. Increased knowledge about what affects mental health in the workplace might enable a change in organisational values and instructions for the employees, i.e., potential activators for behaviours. However, our process evaluation [I] did not support this change in organisational values and employee instructions.

Within the construction industry, the company had incentive systems to promote employee health. Examples are the mandatory health and safety goals in the business plan and the matrix organisation with a Health and Safety manager and the HSB within each region. These incentive systems enabled the integration of the intervention project's goals into these systems, i.e., the business plan, which enhanced senior management support and sustainability. Also, the organisational health and safety structure provided a forum (HSB) for the co-creation process, improving the integration of the intervention into existing structures.

6.1.2 The intervention designs

A second explanation for the different intervention effects may be the different intervention design strategies. I will use the Sigtuna design principles (15) to compare the design process of the two interventions. I should, though, state that I was not involved in the design of the municipality intervention. However, we learnt about it through the process evaluation interviews and continuous communication with the project manager and the consultant.

6.1.2.1 Ensuring involvement and participation among stakeholders

End-user participation was the core of the participatory intervention in the municipality. The horizontal and vertical dialogues were structures for involvement, and the goal was to perpetuate these structures in some form after the intervention ended. Nevertheless, the participation of end-users and managers in the design phase may have been overlooked. The intervention project had a steering committee with stakeholders representing the senior management (HR manager, municipality director, administrative managers and the project

leader). Still, the results from the interviews suggest that the intervention could have been better tailored to the specific department conditions and the end-users' needs. For example, the elderly care department found the name of the intervention troublesome. It was called "Me, the team and the mission", implying that the mission, i.e., the assignment, should be discussed and clarified to enhance role and goal clarity. However, the assignment could not be negotiated as a case manager at a different unit decided on it. It seems the lack of end-user involvement in the intervention design contributed to a lack of tailoring.

Within the construction industry, we strived to include a variety of stakeholders in the initial planning phase to ensure that we considered various perspectives. The initial discussions included the highest manager, the HR generalist, the Health and Safety manager, the development manager, and the chief safety representatives for white and blue-collar workers. Paper II's results indicate that the stakeholders were satisfied with the degree of involvement, and the fact that they found the intervention activities relevant and feasible to implement suggests adequate involvement. Our results align with Tafvelin, Thiele Schwarz (17), implying that stakeholder involvement is crucial in the early phases, i.e., during the intervention planning and design.

6.1.2.2 Understand the situation

Understanding the situation is about considering the context, and one part is ensuring the intervention is responsive to the end-users needs. A common and recommended strategy is to start with a needs assessment (33, 34). Within the municipality project, they planned for a needs assessment; however, it was never conducted. Possible consequences of missing out on this might be the reported reluctance towards the intervention activities among the municipality participants. A needs assessment could have been used to inform the horizontal dialogues, which probably would have saved time in identifying risks and prioritising actions. Each team spent approximately 20 hours on this activity (121). Also, the needs assessment results could have guided the choice of intervention activities at an early stage, tailoring them to the two administrations' different needs. Instead, the school and the home care initially received the same intervention components.

The performed needs assessment in the construction company was crucial to identify the target group, i.e., white-collar workers. Also, the thematic analysis of stakeholders' perceptions of the co-creation showed that the discussions about the needs assessment results contributed to a mutual understanding of the psychosocial work environment and enabled increased learning about the topic (122).

6.1.2.3 Align the intervention with existing organisational objectives

When we designed the intervention with the construction company, aligning the intervention with organisational objectives was a guiding principle. Incorporating the intervention activities in the business plan exemplifies how this principle can be applied. Further, choosing structured roundmaking and duties clarification, i.e., traditional routines for production management as the intervention components, is an example of addressing the dual

outcomes of performance and health in tandem (66). As researchers, it is unlikely that we would have devised those intervention activities without the dialogue with the employees. Hence, applying co-creation enhances the alignment of the intervention activities with existing organisational objectives.

We lack detailed information on this principle for the municipality project. However, as the intervention activities were designed by researchers who took health theories as a starting point, it is unlikely that the intervention was aligned with existing organisational objectives.

6.1.2.4 Explicate the program logic

We co-created the program logic together with various stakeholders within the construction company. Thus, we outlined the goals and intervention activities in a logic model, i.e., the expected order of change. However, it is recommended that all possible mediating factors should be illustrated in the logic model (15). Thus, we could have expanded the logic model, e.g., including the implementation strategies.

There was no outlined program logic when we entered the municipality project. Instead, the intervention activities were predefined by researchers. Therefore, we created a logic model after participating in several meetings with the project manager and the consultants and reviewing the project documentation. Hence, the aim of creating a program logic was to guide the evaluation rather than the choice of interventions.

6.1.2.5 Prioritise activities based on effort-gain

The effort-gain principle should be used when prioritising between different intervention activities (15). The possible impact of an intervention activity should be put in relation to the potential cost, e.g., money, time, and effort. I believe we safeguarded the effort-gain principle within the construction industry project by using co-creation, i.e., continuously discussing the intervention and implementation with various stakeholders. To the best of my knowledge, the effort-gain principle was not addressed concerning the intervention activities within the municipality. Instead, there was an emphasis on health theories and ensuring the intervention incorporated and utilised them. Another related aspect is the cost-effectiveness of the trials. We didn't conduct such evaluations. However, apart from time, the municipality invested a large amount of money to pay for substitutes and consultants. On the other hand, the construction company invested no money but their time in the project.

6.1.2.6 Work with existing practices

The municipality and construction industry projects differ in how the integration of the intervention content into existing structures and practices was carried out. The municipality intervention was not integrated into existing structures. As mentioned in the introduction, the organisation already had existing structures for addressing work environment issues and involving workers. They had an annual employee survey with feedback sessions. Further, in line with Swedish legislation and the routine practice of public organisations, they utilized monthly workplace meetings (referred to as APT in Swedish). Instead of introducing

additional meetings, i.e., horizontal dialogues, they could have integrated the new content within the existing structures. By doing so, the intervention might have been perceived as less burdensome.

Within the construction company working with existing structures was an outspoken goal and requirement from the researchers. As mentioned, the company had systems for employee involvement, i.e., the HSB. Our results from the evaluation of the co-creation process showed that the stakeholders were satisfied with the co-creation structure, and no one reported the co-creation as burdensome.

6.1.2.7 Iteratively observe, reflect, and adapt

It is suggested to monitor the intervention and implementation progress, continuously provide feedback on the results and apply the findings to finetune the chosen strategies in line with existing goals (15). We stayed out of the intervention process in the municipality project to safeguard the study's internal validity. Thus, we did not provide feedback on the outcomes' findings or process evaluation during the intervention. In hindsight, we regret not doing so, considering the adverse development of the intervention effects. Hence, from the municipality project, we learnt that we didn't want to track the outcome development without feeding back the results to the organisation. Thus, for the construction industry project, we incorporated feedback meetings to report the results of the outcome evaluations as part of the implementation. During the feedback meetings with the district management teams, we also discussed the relevance of the program logic and the potential need for changing it. An outspoken wish was for additional implementation support, i.e., attending the Production Academy. However, as explained earlier, due to the pandemic, it was not feasible to enrol additional projects.

Still, even though we did not give feedback on the results from the outcome evaluations to the municipality, they employed an iterative process. There was an ongoing discussion about the intervention activities, project communication and delivery, i.e., implementation between the project manager, the consultant, and the managers within the intervention groups. The discussions rendered several adjustments to the original plan, one being the use of work groups within the home care.

6.1.2.8 Develop organisational learning capabilities

Developing learning capabilities is critical to an organisation's capacity to address future challenges and continually learn from change processes (63). We did not explicitly consider how the project could increase the organisation´s learning capability within the construction company. Also, we could not foresee the project's impacts on the larger national company. For example, at a national level, they inserted new items into the company employee survey and changed how they reported the results to the employees. Several stakeholders recognised the value of cutting the results for different occupational groups/roles, blue-collar workers vs white-collar workers etc. Also, the results from the co-creation process evaluation [paper II]

reveal that increased learning was a significant benefit of the project. Still, the increased learning can only be attributed to the participants in the co-creation process.

Sustainability is also crucial to developing organisational learning capabilities (15). Aligning the intervention with existing structures and corporate objectives and promoting internal resources to deliver the intervention or implementation activities can enhance sustainability. We know from continued discussions with the construction company that the Production Academy, i.e., implementation support is ongoing, and more projects are being enrolled. Thus, there is a sustained focus on the intervention activities.

Discussing learning capabilities evokes the question of who decides when an intervention is successful. If we ask the participating stakeholders, it might not always be the change in long-term outcomes that reflect a successful intervention. The aforementioned findings within the construction company support that notion. Moreover, several managers within the municipality said they learned a lot from the intervention process, mainly from the coaching and the management development. Yet, it seems frontline workers did not benefit from being involved. Future studies should explain how the intervention project might develop learning capabilities, outline outcomes for these learning capabilities and evaluate possible improvements.

6.1.3 The implementation of the two interventions

A third possible explanation for the intervention effects is intervention adherence and implementation fidelity.

6.1.3.1 Implementation fidelity and adherence

The implementation fidelity among frontline workers and first and middle managers within the municipality was high. We can therefore assume that the significant adverse changes for the homecare personnel were related to the intervention. At least, we can conclude that the intervention failed to bring about an expected positive change. We found these results, even though the intervention was theoretically well-underpinned, building on explanatory, i.e., health theories. Also, the program theory was built on a participatory approach, a highly recommended strategy (13).

As the action planning within the municipality was an intervention component, we didn't know beforehand which behaviours or routines could mediate the short and distal outcomes. Thus, we could not conduct baseline and follow-up measures to track behaviour changes over time, i.e., measuring adherence to the intervention components. Instead, we investigated possible behaviour, attitude, and routine changes through interviews. One identified theme in our analysis was "lack of change", causing frustration among frontline employees. However, could this frustration alone cause a deterioration in the leadership, role clarity and control of work pacing outcomes within home care? The Kirkpatrick model (107) postulates a change in behaviours, attitudes, learning and/or routines to expect changes in, e.g. business, work

environment or health outcomes. Thus, we should not expect behaviour change solely due to adverse reactions.

Consequently, one possible explanation for the adverse development of the leadership outcomes in the municipality may be that the intervention took up much of the managers' time, making them more absent than before the intervention, which is an example of a negative behaviour change. It is, however, more challenging to elaborate on the significant differences between the intervention and control groups in role clarity and control of work pacing due to the lack of information on this in the process evaluation. However, these adverse changes might be related to the participants' perceptions of the intervention as a burden. Also, during the horizontal dialogues, assignments and roles were discussed and questioned, which might have led to more confusion than before the intervention, thus lowering role clarity.

In summary, the municipality intervention did not bring about any positive changes. The adverse shift in support from manager and empowering leadership seems directly related to the intervention activities via the managers' behaviour change. On the other hand, for role clarity and control of work pacing, it is harder to explain the difference between the intervention and control groups. Still, these results indicate that the program theory did not work as intended.

Our results from the co-created intervention within the construction company support the program theory. In line with the logic model, increased adherence to the intervention activities seems to have impacted perceived role clarity positively for white-collar workers. Still, the improvement did not decrease self-reported stress, which we expected. According to health theory, low role clarity is associated with burnout in construction workers (20). Also, according to the JDR model, role clarity is a recourse that can buffer the adverse effects of high job demands. However, we also observed a noticeable increase in quantitative demands and self-reported stress during the trial in both the intervention and control groups. Even though the rise in role clarity could not buffer the adverse trend in symptoms of stress, we should not rule out role clarity as a possible buffer for stress. Instead, possibly quantitative demands, i.e., high workload surpass role clarity in their effect on symptoms of stress.

Another explanation for the lack of a reduction in self-reported stress is the timing of the measurements. We simultaneously measured the expected mediating factor role clarity and the long-term outcome stress. Yet, there might be a time lag between improved role clarity and decreased stress.

6.1.3.2 The implementation strategies´ impact on adherence to the intervention components

We measured adherence to the intervention activities quantitatively in the construction company. Measuring adherence to the intervention is highly recommended and necessary to attribute any outcome changes to the intervention (116, 130). We observed an increase in role clarity and duties clarification; thus, we believe the improvement in role clarity is associated

with increased adherence to the intervention components. However, we know less about which implementation strategies led to the behaviour change.

The Production Academy was one implementation strategy within the construction industry project. The four enrolled projects rated a more considerable improvement in structured roundmaking than those not, indicating a positive effect of that support. However, four projects are a small amount, and their ratings could have been biased in that the participants knew it was expected of them to transfer training, i.e., practice structured roundmaking to a higher degree (131). Our original plan of doing observations would have been a helpful complement to validate the self-ratings. Though, as mentioned, it was not feasible due to the pandemic.

Further, other implementation strategies, such as feedback meetings with the district and project management teams and the fact that the intervention activities were included in the business plan, could have contributed to the implementation of structured roundmaking and duties clarification. Also, the feedback meetings could have directly impacted role clarity via the raised awareness of the focus on role clarity and the managers taking the initiative to clarify their project members' goals and roles. Future studies could benefit from applying a hybrid design, evaluating both the effectiveness of the intervention activities and the implementation strategies (132).

6.1.3.3 Contextual factors

The high turnover of senior managers within the municipality at the start of the intervention was a hindering factor in successfully implementing the activities targeting the highest management teams and the politicians. Also, the fact that the two principals quit during the trial most likely explains the negative change in the leadership outcomes, i.e., empowering leadership and support from the manager within the intervention school. Yet, these adverse changes were not significantly different to the control group.

One obvious external factor most likely affecting the results of the co-created intervention was the pandemic. Having the baseline measurement in December 2019 and the follow-ups 12- and 24 months later complicates the interpretation of our results. Nevertheless, the Swedish work environment authority (133) reported increased work-related disorders between 2018 – 2020, mainly due to high workload. This increase was valid regardless of gender, age, or occupation. In addition, the construction company's employee surveys and health assessments confirm an adverse trend in the psychosocial work environment and stress for professionals and trade workers between 2020 and 2021. Accordingly, the unfavourable development of stress and quantitative demands in the intervention and control groups appears to be related to factors outside the organisation. The company stakeholders confirmed the notion of increased worked load during the pandemic. The explanation was mainly associated with the increased levels of short-term sick leave due to Covid-19 regulations. It should be noted that all building projects were run according to plan during the pandemic.

6.2 METHODOLOGICAL CONSIDERATIONS

Conducting research implies one must make a range of decisions, which all affect a study's internal and external validity. To ensure relevance, occupational health interventions require real-world settings. Thus, we need a pragmatic attitude to design (134), i.e., trade-offs at the expense of either external or internal validity. Therefore, even though we aimed to make decisions based on methodological gold standards, some decisions have been based on feasibility. In the following section, I will discuss some general methodological considerations. Detailed methodological considerations can be found in the published papers at the end of this thesis.

6.2.1 The choice of designs

In the effectiveness evaluations (papers I and III), we employed a controlled trial design, i.e., comparing an intervention group with a matched control group using before and after measurements. Using a longitudinal design is favourable when studying changes. However, the gold standard is to cluster-randomise the groups, which was not feasible for practical reasons. This choice possibly rendered selection bias, i.e., bias in allocating participants to the intervention group or control group, jeopardising the trial's internal validity by failing to distribute potential confounders evenly. We tried to handle this by matching the control groups and controlling for potential confounders. Also, to analyse the results in study III (construction industry), we applied LMM based on maximum likelihood estimations.

In papers I and II, we applied a qualitative design using interviews to investigate the participants' perceptions of the intervention and implementation [I] and the co-creation process [II], respectively. I believe the qualitative design was appropriate for our given research questions; however, for the process evaluation [I], we could have supplemented the interviews with a questionnaire. The advantages of using a questionnaire in process evaluations are that we capture the reactions of all participants, and it allows statistical linking between process and outcome (135). On the other hand, adding questions about the process to the questionnaire risks burdening the participants even more.

Further threats to the internal validity in pre-post designs with control groups are risk of contamination, history, maturation, instrumentation decay, testing, statistical regression, and mortality (136). The most relevant threats to the trials of this thesis will be discussed below

6.2.1.1 Risk of contamination

The risk of contamination refers to intervention activities "spilling over" to the control group(s). Suppose that happens and pretend the intervention is effective. In that case, our results will show outcome improvements for both the intervention and the control group, leading to a false negative finding, i.e., we falsely confirm the null hypothesis. We identified a risk for contamination in both intervention projects. Within the municipality, the intervention targeted all management teams within each administration. Thus, the administrative (same person for both intervention and control group) and the control groups'

department managers were exposed to the intervention. The administrative manager received coaching and management team support, while the department managers only received management team support. Due to this, we discussed choosing control groups outside the administration; however, for comparability, we judged it was more important that the groups had similar work tasks and organisational capability.

Within the construction company, the control group was familiar with structured roundmaking and duties clarification, as these routines were part of the production management. However, they did not know they were the chosen intervention components. Also, in discussions with the control region, we learnt they did not focus on increasing the use of structured roundmaking and duties clarification. Hence, we thought it was acceptable to keep the control group.

In both intervention projects, we handled the risk of contamination by conducting interviews with control group participants to keep track of any considerable change initiatives. We did not find any information suggesting threats to the internal validity related to the observed contamination.

6.2.1.2 History

History reflects parallel events affecting both the intervention and the control group, or only the control group and has effects on the outcomes. The Covid-19 pandemic is an example of such an event. Yet, I have elaborated on the consequences of that in the discussion chapter.

6.2.2 Statistical power

In both intervention projects, we performed power calculations for the effectiveness evaluations given the number of participants in the intervention and matched control groups. For the construction industry project, our analysis showed that given a mean value change of 5 (SD = <15), we would have statistical power (1-β) of 0.9. Our calculations were based on a level of significance (α) of 0.05. However, our power calculations were based on the number of participants, including white and blue-collar workers (109). Thus, in our sensitivity analysis (only white-collar workers), we could not demonstrate a statistically significant difference even if our results showed a mean value change of five or more, i.e., a noticeable difference. Also, we had high dropout rates because employees did not respond to the survey to the extent that we expected, especially not in the control group. The high dropout rates also contributed to reduced statistical power. Looking at the study retrospectively, we could have included an additional control group when we realised that the co-created intervention mainly targeted white-collar workers. However, this was not obvious until after a year. Hence, the other control group would have entered the study after the baseline measure was conducted, and the value of a second control group would therefore have been limited.

6.2.3 Generalisability – external validity

Bonell, Oakley (137) argue that many intervention studies fail to address the generalisability of their results. Therefore they propose that trials should include process evaluations to, e.g.

evaluate context and whether the intervention meets the end-users´ needs, as the latter is vital for an intervention to be effective. Consequently, recipients of a future intervention should have similar needs to those of the original study participants. Further, they argue that intervention studies must report the extent to which their participants represent the targeted population. In the construction industry project, we assessed the end-users´ needs, and we believe the study participants represent the target population, i.e., construction workers in large Swedish organisations, to a great extent. Thus, I suggest our findings indicating that structured roundmaking and duties clarification can improve role clarity is transferable to other large construction companies where the need to enhance role clarity has been identified.

For the participatory intervention, it is more difficult to say whether or not our findings are transferable as no needs assessment was conducted. Thus, we would not know which type of needs the intervention would suit. Also, considering the high economic cost, the intervention is unlikely to be feasible in other similar settings (137).

Finally, given the existing research emphasising the need to tailor interventions to specific contexts, thus suggesting co-created interventions, one may query whether the co-creation process is generalisable across settings. That was not a scope for the studies included in this thesis, and to the best of my knowledge, no other studies have targeted that research question.

7 CONCLUSIONS

The findings showed that the participatory intervention targeting teachers and home care workers in a middle size municipality did not improve mental health (burnout and quality of sleep) or the psychosocial work environment. Instead, the results imply a deterioration of two leadership dimensions, role clarity and control of work pacing for home care workers. Moreover, the findings showed that the co-created intervention did not improve stress for construction workers in a large Swedish construction company. Still, we found a noticeable improvement in role clarity for white-collar construction workers.

The settings and the prerequisites of the two interventions studied in this thesis differ. One setting was female-dominated and suffered low organisational prerequisites, while the other was male-dominated with adequate organisational prerequisites. The content of the interventions conducted was also different. However, interesting comparisons can be made between these interventions' design and implementation processes. Although no conclusions regarding what parts of the intervention processes can explain the somewhat different outcomes of the interventions, certain factors appear to have made a difference. First, prerequisites such as organisational capability and incentive systems to promote health affected the implementation of both intervention projects [I and III]. The organisational capability was a facilitating factor within the construction industry, whereas it was a barrier in the municipality.

Second, aligning the intervention activities with existing organisational objectives and practices facilitated the implementation within the construction company. Our findings [papers II and III] indicate that applying co-creation can enhance this integration of the intervention into the context. Also, the lack of fit of the intervention activities into existing organisational objectives and practices within the municipality hindered the implementation and likely contributed to frustration among frontline workers.

Last, the lack of a needs assessment within the municipality most likely contributed to the mismatch between participants' need for change and the intervention's target. Consequently, the intervention activities did not correspond to the end-users needs, which was a barrier to a successful implementation. Similarly, the needs assessment within the construction industry was critical in identifying the target group. Thus, our findings confirm the need for understanding the situation, i.e., context, and the benefit of conducting a needs assessment to address the end-users needs (15, 34, 36).

Our results further suggest that full participation, i.e., involving all employees in identifying challenges and making action plans, is a less successful strategy. The use of work groups with representatives was perceived more positively and seemed to promote changes in work routines within the home care unit. Also, the use of co-creation is an example of representative participation, which the stakeholders reported as adequate involvement [II].

Finally, our findings show that co-creating the intervention allows disentangling the intervention process (action planning/program logic) from the intervention content (activities)

and the implementation strategy. When designing, implementing, and evaluating occupational health interventions, distinguishing between these elements enables a more explicit description of each, whether that element builds on a participatory approach or is influenced by other relevant theories. Keeping the elements separated enhances the evaluation, e.g. assessing adherence and comparison between studies and replicability. This reasoning is in line with Abildgaard, Hasson (47), who highlights the need to explain how occupational health interventions are participatory. Whether the process, content, goal or all parts build upon a participatory approach.

8 POINTS OF PERSPECTIVE

8.1 FUTURE RESEARCH AND PRACTICAL IMPLICATIONS

Based on our findings, we recommend future occupational health intervention projects to co-create the goals, the intervention activities and the implementation strategies with various stakeholders, including end-users. If doing so, the possible effects of the co-creation on the implementation and organisational learning capabilities should be evaluated. Also, we need to learn more about what characterises a successful co-creation process across settings. For co-creation to be a valid method, it needs to be transferable and scalable, which future studies should investigate.

Moreover, organisational capability and incentive systems to promote health appear as critical contextual factors when testing an occupational health intervention, i.e., behaviour change intervention. The intervention must target the proper level(s), and we should not have overconfidence in participation as a means of change. If an organisation lacks incentive systems and processes that promote and reward sustainable, healthy work, I suggest it is inappropriate to target frontline workers. The structures must be in place first or at least acknowledged and dealt with simultaneously. Hence, when the organisational capability is low, we should primarily recommend interventions targeting the highest management and organisational structures.

In line with this, a more rigorous approach to identifying target behaviours and applying theories of behaviour change, such as the COM-B model, to analyse and determine which barriers and enablers are present in the specific context of change might increase the chances of successfully implemented interventions.

We suggest that structured roundmaking and duties clarification potentially improve role clarity within the construction industry. Thus, since role clarity predicts burnout among construction workers (20), we suggest testing structured roundmaking and duties clarification in similar settings where the need to enhance role clarity has been identified to examine if equivalent or better effects can be reached.

Finally, a decade ago, the debate about the need for process evaluations began (19), and today they are more commonly applied (77). However, measuring fidelity, specifically adherence (if a change occurred), is still rare (138). Future intervention studies should aim to illustrate all possible mediating factors (including intervention activities) and describe how a change in these factors can be monitored and assessed.

The setting of the included studies in this thesis is the real world. Thus, most results have practical implications for employers wishing to improve the psychosocial work environment and prevent poor mental health. For example, our results suggest that senior managers and HR representatives should consider how to safeguard end-users involvement when initiating work environment change projects. Also, considering behaviour change theory and the importance of considering external factors such as time and resources (O) to facilitate motivation,

employers are encouraged to explore the employees' perceptions of hindering and facilitating factors related to these external factors. Adhering to these recommendations before initiating work environment change projects can improve the chances of succeeding with the implementation.

9 ACKNOWLEDGEMENTS

I want to thank everyone who has contributed to and supported me during my PhD journey.

First, **Gun**, thank you for always taking the time to listen to my ideas, reflections and worries. You have proven to be an inexhaustible listener. You have put complete trust in my ability throughout these years, letting me try my wings and always backing me up if needed. You have allowed me to grow and challenge my comfort zones, guiding me to becoming an independent researcher. I'm forever grateful for your support, and words cannot explain how happy I am to have had you as my main supervisor.

Theo, thank you for showing me that the sky is the limit through your fearless leadership. You lead by openness— to share with, to collaborate, to distribute power to many. You are a true source of inspiration. I'm thankful you have been so inclusive, opening the doors to your networks and encouraging me to explore what the research world has to offer. Thank you for believing in me when I did not, opening the door to becoming a visiting scholar at Harvard.

Anna, you have always been there when needed, supporting and engaging in planning the two intervention projects. I greatly appreciate our visit to Lisbon and attending the EAHOP conference in the early years of my PhD. Your proofreading has been invaluable in helping me to improve my writing. Also, your challenging yet sharp questions have forced me to think twice about my reasoning, enhancing my analyses. I have also cherished our discussions about everyday matters.

Hanna, you have been like a supervisor to me. I remember the first online meeting with you during your post-doc in Sydney. I had found your thesis and felt you had done what I was about to start. You were open and generous with your time, willing to discuss all aspects of intervention and implementation research. I'm so grateful for having you as a co-author on this journey. **Helle** Mölsted-Alvesson, you have also been a dear co-author, teaching me everything I know about qualitative analysis. Thank you for engaging in our projects and guiding me in conducting thematic analyses. **Magnus** and **Néstor** my partners in crime when it comes to statistical analysis. I appreciate your willingness to discuss and explain statistical matters. I have learnt a lot from you.

Finally, among co-authors: **Sara** and **Erika**, I worked closely with you on the municipality and construction company projects, respectively. You both came into the projects on short notice and quickly oriented yourselves, becoming a valuable support to me. I cherish you both as colleagues and friends. **Hanne Berthelsen**, thank you for your generosity in sharing and replying to my endless emails about the COPSOQ and the PSC. **Andre,** thank you for managing the construction company project's survey system and helping me with all sorts of technical issues.

Sara, thank you for accepting to be my mentor. I genuinely appreciate our discussions about working life's challenges and possible solutions. Thank you for openly sharing your experiences and pearls of wisdom as an organisational psychologist.

I would also like to thank everyone from the municipality and construction company projects. **Linda** and **Sara**, thank you for taking the time to answer my questions during and after the municipality project. **Anna, Peter F, Peter S, Pelle, Karin**, and everyone else in the region. I'm so grateful for your openness to engage and invest in research. It's been a pure pleasure collaborating with you. Also, thank you **Pernilla T** and **Helena P** for opening the door to collaboration in the first place.

To all my dear old and new colleagues: Johanna, Kathy, Katrina, Bertina, Xuelong, Karin G, Nuria, Claudia, Liyun, Melody, Emma, Emilie, Cecilia V, Filip, Cecilia O, Åsa, Karin N, Signild, Carin H, Julio, Filip C, Shanli, Elinor, and many more. You have all been excellent peer support. Thank you for contributing to an enjoyable social work environment. **Johanna**, I have truly appreciated sharing life as PhD-student and becoming a mother of two with you. **Kathy, Karin G, Bertina**, and **Xuelong,** we have shared most of the PhD-journey. Thank you for being so supportive and always willing to help. **Katrina**, you contribute with new perspectives and sharp analysis. It´s been a pleasure having you as a colleague. **Jenny Selander, and Maria Albin**, it has been fantastic to have you as role models. Excellent researchers and humble leaders. Thank you for all your support.

To all my dear friends, ingen nämnd, ingen glömd. Thank you for being you. I'm thankful for the joy and love you bring.

Last but not least, I want to thank my family. My wonderful parents, **Inga-Lill** and **Michael**, most of all, thank you for your unconditional love. Also, I'm thankful for all the time and energy you invest in my family and me. How would we get by without you? **Sofie**, my dearest sister. You paved the way for me by becoming a doctor more than ten years ago. Thank you for being one of my best friends and someone I can always turn to, no matter what.

Finally, **Mattias**, I can't thank you enough for your support throughout this journey, not the least during this fall. Moving to Boston, running the family with all it takes, enabling my carrier. You personify equality. Thank you for caring about the details when I'm busy searching for direction. I love you. To our amazing daughters, thank you **Hilda** and **Signe** for existing and reminding me what matters in life.

10 REFERENCES

1. Nielsen K. Review Article: How can we make organizational interventions work? Employees and line managers as actively crafting interventions. Human relations (New York). 2013;66(8):1029-50.

2. Duijts SFA, Kant I, Swaen GMH, van den Brandt PA, Zeegers MPA. A meta-analysis of observational studies identifies predictors of sickness absence. J Clin Epidemiol. 2007;60(11):1105-15.

3. Duchaine CS, Aubé K, Gilbert-Ouimet M, Vézina M, Ndjaboué R, Massamba V, et al. Psychosocial Stressors at Work and the Risk of Sickness Absence Due to a Diagnosed Mental Disorder: A Systematic Review and Meta-analysis. JAMA psychiatry (Chicago, Ill). 2020;77(8):842-51.

4. Lidwall U, Olsson-Bohlin C. Sjukskrivning för reaktioner på svår stress ökar mest. Stockholm: Försäkringskassan 2016. Report No.: 9175003945.

5. Harvey SB, Modini M, Joyce S, Milligan-Saville JS, Tan L, Mykletun A, et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. Occup Environ Med. 2017;74(4):301-10.

6. Steptoe A, Kivimäki M. Stress and cardiovascular disease: an update on current knowledge. Annu Rev Public Health. 2013;34:337-54.

7. Stenberg M. Bortom noll: En hälsofrämjande byggbransch [Beyond zero: A health promoting construction industry]. Luleå: Luleå tekniska universitet [Luleå University of Technology]; 2016.

8. Hassard J, Teoh KRH, Visockaite G, Dewe P, Cox T. The Cost of Work-Related Stress to Society: A Systematic Review. J Occup Health Psychol. 2018;23(1):1-17.

9. Hassard J, Teoh K, Cox T, Cosmar M, Gründler R, Flemming D, et al. Calculating the cost of work-related stress and psychosocial risks. Luxembourg: European Agency for Safety and Health at Work; 2014.

10. Aronsson G, Theorell T, Grape T, Hammarström A, Hogstedt C, Marteinsdottir I, et al. A systematic review including meta-analysis of work environment and burnout symptoms. BMC Public Health. 2017;17(1):264-.

11. Nieuwenhuijsen K, Bruinvels D, Frings-Dresen M. Psychosocial work environment and stress-related disorders, a systematic review. Occupational medicine (Oxford). 2010;60(4):277-86.

12. Seidler A, Thinschmidt M, Deckert S, Then F, Hegewald J, Nieuwenhuijsen K, et al. The role of psychosocial working conditions on burnout and its core component emotional exhaustion - a systematic review. Journal of occupational medicine and toxicology (London, England). 2014;9(1):10-.

13. World Health Organization. WHO guidelines on mental health at work. Geneva; 2022.

14. Nielsen K, Randall R. Opening the black box: Presenting a model for evaluating organizational-level interventions. Eur J Work Org Psychol. 2013;22(5):601-17.

15. von Thiele Schwarz U, Nielsen K, Edwards K, Hasson H, Ipsen C, Savage C, et al. How to design, implement and evaluate organizational interventions for maximum impact: the Sigtuna Principles. Eur J Work Org Psychol. 2021;30(3):415-27.

16. Kristensen TS. Intervention studies in occupational epidemiology. Occup Environ Med. 2005;62(3):205-10.

17. Tafvelin S, Thiele Schwarz U, Nielsen K, Hasson H. Employees' and line managers' active involvement in participatory organizational interventions: Examining direct, reversed, and reciprocal effects on well-being. Stress Health. 2019;35(1):69-80.

18. Egan M, Bambra C, Petticrew M, Whitehead M. Reviewing evidence on complex social interventions: appraising implementation in systematic reviews of the health effects of organisational-level workplace interventions. Journal of epidemiology and community health (1979). 2009;63(1):4-90.

19. Murta SG, Sanderson K, Oldenburg B. Process evaluation in occupational stress management programs: a systematic review. Am J Health Promot. 2007;21(4):248-54.

20. Sun C, Hon CKH, Way KA, Jimmieson NL, Xia B. The relationship between psychosocial hazards and mental health in the construction industry: A meta-analysis. Saf Sci. 2022;145:105485.

21. Stansfeld S, Candy B. Psychosocial work environment and mental health--a meta-analytic review. Scand J Work Environ Health. 2006;32(6):443-62.

22. Kjellström J, Almquist B, Modin B. Lärares arbetsvillkor och hälsa efter 1990-talets skolreformer. Arbetsmarknad & Arbetsliv. 2016;22(1):52-69.

23. Szebehely M, Stranz A, Strandell R. Vem ska arbeta i framtidens äldreomsorg? Stockholm Sweden: Stockholm University; 2017.

24. Cerdas S, Härenstam A, Johansson G, Nyberg A. Development of job demands, decision authority and social support in industries with different gender composition – Sweden, 1991–2013. BMC Public Health. 2019;19(1):758.

25. Försäkringskassan [Swedish Social Insurance Agency]. Sjukfrånvaro i psykiska diagnoser: en registerstudie av Sveriges arbetande befolkning i åldern 20–69 år. Socialförsäkringsrapport 2020:8 [Sick leave due to mental disorders: a register based study of the working population 20-69 years in Sweden. Social Insurance Report 2020:8]. Stockholm: Försäkringskassan [Swedish Social Insurance Agency]; 2020.

26. Gray C, Wilcox G, Nordstokke D. Teacher Mental Health, School Climate, Inclusive Education and Student Learning: A Review. Canadian psychology = Psychologie canadienne. 2017;58(3):203-10.

27. Arvidsson I, Håkansson C, Karlson B, Björk J, Persson R. Burnout among Swedish school teachers - a cross-sectional analysis. BMC Public Health. 2016;16(1):823-.

28. Svenska Byggbranschens Utvecklingsfond [The Development Fond of the Swedish Construction Industry]. Kartläggning av psykisk ohälsa bland yrkesarbetare. Malmö: Svenska Byggbranschens Utvecklingsfond [The Development Fond of the Swedish Construction Industry]; 2020.

29. Burki T. Mental health in the construction industry. The Lancet Psychiatry. 2018;5(4):303.

30. Windsor-Shellard B. Suicide by occupation, England: 2011 to 2015. Analysis of deaths from suicide in different occupational groups for people aged 20 to 64 years, based on deaths registered in England between 2011 and 2015. Office for National Statistics; 2017.

31. Leung MY, Liang Q, Olomolaiye P. Impact of Job Stressors and Stress on the Safety Behavior and Accidents of Construction Workers. J Manage Eng. 2016;32(1).

32. Greiner BA, Leduc C, O'Brien C, Cresswell-Smith J, Rugulies R, Wahlbeck K, et al. The effectiveness of organisational-level workplace mental health interventions on mental health and wellbeing in construction workers: A systematic review and recommended research agenda. PLoS One. 2022;17(11):e0277114.

33. AFS 2001:1 [Systematic Work Environment Management. Provisions of the Swedish Work Environment Authority on Systematic Work Environment Management, together with General Recommendations on the implementation of the Provisions].

34. Nielsen K, Randall R, Holten A-L, González ER. Conducting organizational-level occupational health interventions: What works? Work Stress. 2010;24(3):234-59.

35. Nielsen K, Abildgaard JS. Organizational interventions: A research-based framework for the evaluation of both process and effects. Work & Stress. 2013;27(3):278-97.

36. Skivington K, Matthews L, Simpson SA, Craig P, Baird J, Blazeby JM, et al. A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. BMJ (Online). 2021;374:n2061-n.

37. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. BMJ. 2008;337(7676):979-83.

38. Hasson H, Villaume K, von Thiele Schwarz U, Palm K. Managing Implementation: Roles of Line Managers, Senior Managers, and Human Resource Professionals in an Occupational Health Intervention. J Occup Environ Med. 2014;56(1):58-65.

39. Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. BMJ. 2015;350:h1258.

40. Greenhalgh T, Jackson C, Shaw S, Janamian T. Achieving Research Impact Through Co-creation in Community-Based Health Services: Literature Review and Case Study. The Milbank quarterly. 2016;94(2):392-429.

41. Leask CF, Sandlund M, Skelton DA, Altenburg TM, Cardon G, Chinapaw MJM, et al. Framework, principles and recommendations for utilising participatory methodologies in the co-creation and evaluation of public health interventions. Res Involv Engagem. 2019;5:2.

42. Jull J, Giles A, Graham ID. Community-based participatory research and integrated knowledge translation: advancing the co-creation of knowledge. Implementation science : IS. 2017;12(1):150-.

43. Oliver K, Kothari A, Mays N. The dark side of coproduction: do the costs outweigh the benefits for health research? Health Res Policy Syst. 2019;17(1):33.

44. Jackson CL, Greenhalgh T. Co-creation: a new approach to optimising research impact? Med J Aust. 2015;203(7):283-+.

45. Holmström I, Stier J, Tillgren P, Östlund G. Samproduktionens retorik och praktik: inom området hälsa och välfärd [The rhetoric and practice of co-production: within the field of health and welfare]. Lund: Studentlitteratur AB; 2016.

46. Wallerstein N, Duran B, Oetzel JG, Minkler M. Community-based participatory research for health : advancing social and health equity. Third edition. ed. San Francisco, CA: Jossey-Bass, a Wiley Brand; 2018.

47. Abildgaard JS, Hasson H, von Thiele Schwarz U, Løvseth LT, Ala-Laurinaho A, Nielsen K. Forms of participation: The development and application of a conceptual model of participation in work environment interventions. Economic and industrial democracy. 2020;41(3):746-69.

48. Robroek SJW, Coenen P, Oude Hengel KM. Decades of workplace health promotion research: Marginal gains or a bright future ahead? Scand J Work Environ Health. 2021;47(8):561-4.

49. Peñalvo JL, Sagastume D, Mertens E, Uzhova I, Smith J, Wu JHY, et al. Effectiveness of workplace wellness programmes for dietary habits, overweight, and cardiometabolic health: a systematic review and meta-analysis. The Lancet Public health. 2021;6(9):e648-e60.

50. Moore GF, Evans RE. What theory, for whom and in which context? Reflections on the application of theory in the development and evaluation of complex population health interventions. SSM Popul Health. 2017;3:132-5.

51. Funnell SC, Rogers PJ. The essence of program theory. In: Funnell SC, Rogers PJ, editors. Purposeful program theory: Effective use of theories of change and logic models. 31. San Fransisco: John Wiley & Sons; 2011.

52. Montano D, Hoven H, Siegrist J. Effects of organisational-level interventions at work on employees' health: a systematic review. BMC Public Health. 2014;14(1):135-.

53. Gray P, Senabe S, Naicker N, Kgalamono S, Yassi A, Spiegel JM. Workplace-Based Organizational Interventions Promoting Mental Health and Happiness among Healthcare Workers: A Realist Review. International journal of environmental research and public health. 2019;16(22):4396.

54. Lamontagne AD, Keegel T, Louie AM, Ostry A, Landsbergis PA. A systematic review of the job-stress intervention evaluation literature, 1990-2005. Int J Occup Environ Health. 2007;13(3):268-80.

55. Ipsen C, Gish L, Poulsen S. Organizational-level interventions in small and medium-sized enterprises: Enabling and inhibiting factors in the PoWRS program. Saf Sci. 2015;71:264-74.

56. Mellor N, Smith P, Mackay C, Palferman D. The "Management Standards" for stress in large organizations. International journal of workplace health management. 2013;6(1):4-17.

57. Christensen M, Innstrand ST, Saksvik PØ, Nielsen K. The Line Manager’s Role in Implementing Successful Organizational Interventions. The Spanish Journal of Psychology. 2019;22:E5.

58. Helland E, Christensen M, Nielsen K, Helland E, Christensen M, Innstrand ST, et al. Line managers' middle-levelness and driving proactive behaviors in organizational interventions. International Journal of Workplace Health Management. 2021;14 (6):577-92.

59. Randall R, Nielsen K, Tvedt SD. The development of five scales to measure employees' appraisals of organizational-level stress management interventions. Work Stress. 2009;23(1):1-23.

60. Billsten J, Fridell M, Holmberg R, Ivarsson A. Organizational Readiness for Change (ORC) test used in the implementation of assessment instruments and treatment methods in a Swedish National study. J Subst Abuse Treat. 2018;84:9-16.

61. Kelloway EK, Nielsen K, Dimoff JK. Leading to occupational health and safety: How leadership behaviours impact organizational safety and well-being. Chichester, UK:: John Wiley & Sons; 2017.

62. Lundmark R, Hasson H, von Thiele Schwarz U, Hasson D, Tafvelin S. Leading for change: line managers' influence on the outcomes of an occupational health intervention. Work Stress. 2017;31(3):276-96.

63. Nielsen K, Abildgaard JS. Organizational interventions: A research-based framework for the evaluation of both process and effects. Work Stress. 2013;27(3):278-97.

64. Augustsson H, von Thiele Schwarz U, Stenfors-Hayes T, Hasson H. Investigating variations in implementation fidelity of an organizational-level occupational health intervention. Int J Behav Med. 2015;22(3):345-55.

65. Bamberger M, Tarsilla M, Hesse-Biber S. Why so many "rigorous" evaluations fail to identify unintended consequences of development programs: How mixed methods can contribute. Eval Program Plann. 2016;55:155-62.

66. Ipsen C, Karanika-Murray M, Nardelli G. Addressing mental health and organisational performance in tandem: A challenge and an opportunity for bringing together what belongs together. Work Stress. 2020;34(1):1-4.

67. Weiner BJ, Amick H, Lee S-YD. Review: Conceptualization and Measurement of Organizational Readiness for Change: A Review of the Literature in Health Services Research and Other Fields. Med Care Res Rev. 2008;65(4):379-436.

68. Shea CM, Jacobs SR, Esserman DA, Bruce K, Weiner BJ. Organizational readiness for implementing change: a psychometric assessment of a new measure. Implementation science : IS. 2014;9(1):7-.

69. Lehman WEK, Greener JM, Simpson DD. Assessing organizational readiness for change. J Subst Abuse Treat. 2002;22(4):197-209.

70. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation science : IS. 2011;6(1):42-.

71. Gould GS, Bar-Zeev Y, Bovill M, Atkins L, Gruppetta M, Clarke MJ, et al. Designing an implementation intervention with the Behaviour Change Wheel for health provider smoking cessation care for Australian Indigenous pregnant women. Implementation science : IS. 2017;12(1):114-.

72. Michie S, Whittington C, Hamoudi Z, Zarnani F, Tober G, West R. Identification of behaviour change techniques to reduce excessive alcohol consumption. Addiction (Abingdon, England). 2012;107(8):1431-40.

73. Ruotsalainen JH, Verbeek JH, Mariné A, Serra C. Preventing occupational stress in healthcare workers. Cochrane Database Syst Rev. 2014(11).

74. Steckler AB, Linnan L, Israel B. Process evaluation for public health interventions and research. San Fransisco: Jossey-Bass San Francisco, CA; 2002.

75. Pawson R, Tilley N. Realistic evaluation. London: Sage; 1997.

76. Lengnick-Hall R, Gerke DR, Proctor EK, Bunger AC, Phillips RJ, Martin JK, et al. Six practical recommendations for improved implementation outcomes reporting. Implementation science : IS. 2022;17(1):16-.

77. Havermans BM, Schlevis RM, Boot CR, Brouwers EPM, Anema JR, van der Beek AJ. Process variables in organizational stress management intervention evaluation research: a systematic review. Scand J Work Environ Health. 2016;42(5):371-81.

78. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for Implementation Research: Conceptual Distinctions, Measurement Challenges, and Research Agenda. Administration and policy in mental health and mental health services research. 2011;38(2):65-76.

79. Durlak JA, DuPre EP. Implementation Matters: A Review of Research on the Influence of Implementation on Program Outcomes and the Factors Affecting Implementation. Am J Community Psychol. 2008;41(3-4):327-50.

80. Fox KE, Johnson ST, Berkman LF, Sianoja M, Soh Y, Kubzansky LD, et al. Organisational- and group-level workplace interventions and their effect on multiple domains of worker well-being: A systematic review. Work Stress. 2022;36(1):30-59.

81. Pieper C, Schröer S, Eilerts A-L. Evidence of Workplace Interventions-A Systematic Review of Systematic Reviews. Int J Environ Res Public Health. 2019;16(19):3553.

82. Joyce S, Modini M, Christensen H, Mykletun A, Bryant R, Mitchell PB, et al. Workplace interventions for common mental disorders: a systematic meta-review. Psychol Med. 2016;46(4):683-97.

83. Richardson KM, Rothstein HR. Effects of Occupational Stress Management Intervention Programs: A Meta-Analysis. J Occup Health Psychol. 2008;13(1):69-93.

84. Lytsy P, Friberg E. Psykosocial arbetsmiljö – hälsa och välbefinnande [Psychosocial Work Environment: Health and Well-being]. Gävle: Swedish Agency for Work Environment Expertise; 2020.

85. Rydenfält C, Holgersson C, Östlund B, Arvidsson I, Johansson G, Persson R. Picking low hanging fruit - A scoping review of work environment related interventions in the home care sector. Home Health Care Serv Q. 2020;39(4):223-37.

86. Nabe-Nielsen K, Garde AH, Diderichsen F. The effect of work-time influence on health and well-being: a quasi-experimental intervention study among eldercare workers. Int Arch Occup Environ Health. 2011;84(6):683-95.

87. Nilsson A, Engström M. E-assessment and an e-training program among elderly care staff lacking formal competence: results of a mixed-methods intervention study. BMC Health Serv Res. 2015;15(1):189-.

88. Olson R, Thompson SV, Elliot DL, Hess JA, Rhoten KL, Parker KN, et al. Safety and Health Support for Home Care Workers: The COMPASS Randomized Controlled Trial. American journal of public health (1971). 2016;106(10):1823-32.

89. Naghieh A, Montgomery P, Bonell CP, Thompson M, Aber JL, Naghieh A. Organisational interventions for improving wellbeing and reducing work-related stress in teachers. Cochrane Database Syst Rev. 2015;2015(4):CD010306-CD.

90. Framke E, Sørensen OH, Pedersen J, Rugulies R. Effect of a participatory organizational-level occupational health intervention on short-term sickness absence: a cluster randomized controlled trial. Scand J Work Environ Health. 2016;42(3):192-200.

91. Schelvis RMC, Wiezer NM, Van der Beek AJ, Twisk JWR, Bohlmeijer ET, Oude Hengel KM. The effect of an organizational level participatory intervention in

secondary vocational education on work-related health outcomes: results of a controlled trial. BMC Public Health. 2017;17(1):1-14.

92. Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The Job Demands-Resources Model of Burnout. J Appl Psychol. 2001;86(3):499-512.

93. Siegrist J. Adverse health effects of high-effort/low-reward conditions. J Occup Health Psychol. 1996;1(1):27-41.

94. Cedstrand E, Nyberg A, Sanchez-Bengtsson S, Alderling M, Augustsson H, Bodin T, et al. A Participatory Intervention to Improve the Psychosocial Work Environment and Mental Health in Human Service Organisations. A Mixed Methods Evaluation Study. Int J Environ Res Public Health. 2021;18(7).

95. Onwuegbuzie AJ, Collins KMT. A typology of mixed methods sampling designs in social science research. Qualitative report. 2007;12(2):281-316.

96. Shirom A, Melamed S. A Comparison of the Construct Validity of Two Burnout Measures in Two Groups of Professionals. Int J Stress Manage. 2006;13(2):176-200.

97. Nordin M, Åkerstedt T, Nordin S. Psychometric evaluation and normative data for the Karolinska Sleep Questionnaire. Sleep Biol Rhythms. 2016;11(4):216-26.

98. Dallner M, Elo A-L, Gamberale F, Gamberale F, Hottinen V, Knardahl S, et al. Validation of the General Nordic Questionnaire (QPS Nordic) for psychological and social factors at work. Copenhagen: Nordic Council of Ministers [Nordiska ministerrådet]; 2000.

99. Lundgren-Nilsson Å, Jonsdottir IH, Pallant J, Ahlborg G, Jr. Internal construct validity of the Shirom-Melamed Burnout Questionnaire (SMBQ). BMC Public Health. 2012;12:1.

100. Arapovic-Johansson B, Wåhlin C, Hagberg J, Kwak L, Björklund C, Jensen I. Participatory work place intervention for stress prevention in primary health care. A randomized controlled trial. Eur J Work Org Psychol. 2018;27(2):219-34.

101. Björklund C, Grahn A, Jensen I, Bergström G. Does survey feedback enhance the psychosocial work environment and decrease sick leave? Eur J Work Organ Psychol. 2007;16(1):76-93.

102. Derrick B, Toher D, White P. How to compare the means of two samples that include paired observations and independent observations: A companion to Derrick, Russ, Toher and White (2017). The Quantitative Methods in Psychology. 2017;13(2).

103. Costantini G, Saraulli D, Perugini M. Uncovering the Motivational Core of Traits: The Case of Conscientiousness. European journal of personality. 2020;34(6):1073-94.

104. Derrick B, Russ B, Toher D, White P. Test statistics for the comparison of means for two samples that include both paired and independent observations. Journal of Modern Applied Statistical Methods. 2017;16(1):9.

105. Shaffer JP. Multiple Hypothesis Testing. Annu Rev Psychol. 1995;46(1):561-84.

106. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative research in psychology. 2006;3(2):77-101.

107. Kirkpatrick D. Great ideas revisited. Training & Development. 1996;50(1):54-60.

108. von Thiele Schwarz U, Richter A, Hasson H. Getting everyone on the same page: Cocreated program logic (COP). In: Nielsen K, Noble tA, editors. Organizational Interventions for Health and Well-being: Routledge; 2018. p. 58-83.

109. Cedstrand E, Nyberg A, Bodin T, Augustsson H, Johansson G. Study protocol of a co-created primary organizational-level intervention with the aim to improve organizational and social working conditions and decrease stress within the construction industry - a controlled trial. BMC Public Health. 2020;20(1):424.

110. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation Science. 2011;6(1):42.

111. Powell BJ, Waltz TJ, Chinman MJ, Damschroder LJ, Smith JL, Matthieu MM, et al. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. Implementation Science. 2015;10(1):21.

112. Braun V, Clarke V. Reflecting on reflexive thematic analysis. Qualitative research in sport, exercise and health. 2019;11(4):589-97.

113. Berthelsen H, Westerlund H, Bergstrom G, Burr H. Validation of the Copenhagen Psychosocial Questionnaire Version III and Establishment of Benchmarks for Psychosocial Risk Management in Sweden. Int J Environ Res Public Health. 2020;17(9):3179.

114. Burr H, Berthelsen H, Moncada S, Nübling M, Dupret E, Demiral Y, et al. The Third Version of the Copenhagen Psychosocial Questionnaire. Safety and health at work. 2019;10(4):482-503.

115. Maynard MT, Mathieu JE, Rapp TL, Gilson LL. Something(s) old and something(s) new: Modeling drivers of global virtual team effectiveness. Journal of organizational behavior. 2012;33(3):342-65.

116. Dusenbury L, Brannigan R, Falco M, Hansen WB. A review of research on fidelity of implementation: implications for drug abuse prevention in school settings. Health Educ Res. 2003;18(2):237-56.

117. Mallinckrodt CH, Clark WS, David SR. ACCOUNTING FOR DROPOUT BIAS USING MIXED-EFFECTS MODELS. J Biopharm Stat. 2001;11(1-2):9-21.

118. Little RJA. Modeling the Drop-Out Mechanism in Repeated-Measures Studies. Journal of the American Statistical Association. 1995;90(431):1112-21.

119. Molenberghs G, Beunckens C, Sotto C, Kenward MG. Every missingness not at random model has a missingness at random counterpart with equal fit. Journal of the Royal Statistical Society Series B, Statistical methodology. 2008;70(2):371-88.

120. Schafer JL, Graham JW. Missing Data: Our View of the State of the Art. Psychol Methods. 2002;7(2):147-77.

121. Son H, Friedmann E, Thomas SA. Application of Pattern Mixture Models to Address Missing Data in Longitudinal Data Analysis Using SPSS. Nurs Res. 2012;61(3).

122. Amrhein V, Greenland S, McShane B. Scientists rise up against statistical significance. Nature (London). 2019;567(7748):305-7.

123. Pejtersen JH, Bjorner JB, Hasle P. Determining minimally important score differences in scales of the Copenhagen Psychosocial Questionnaire. Scand J Public Health. 2010;38(3_suppl):33-41.

124. Stafström S. God forskningssed [Good research practice],. Stockholm: Vetenskapsrådet; 2017.

125. von Thiele Schwarz U, Lundmark R, Hasson H. The Dynamic Integrated Evaluation Model (DIEM): Achieving Sustainability in Organizational Intervention through a Participatory Evaluation Approach. Stress Health. 2016;32(4):285-93.

126. Mellor N, Mackay C, Packham C, Jones R, Palferman D, Webster S, et al. 'Management Standards' and work-related stress in Great Britain: Progress on their implementation. Saf Sci. 2011;49(7):1040-6.

127. Weiner BJ. A theory of organizational readiness for change. Implement Sci. 2009;4:67.

128. Ramnerö J, Törneke N. Beteendets ABC. En introduktion till behavioristisk psykoterapi. Sweden: Studentlitteratur; 2006.

129. Arbetsmiljöverket [Swedish Work Environment Authority]. Organisatorisk och social arbetsmiljö. Stockholm; 2015.

130. Carroll C, Patterson M, Wood S, Booth A, Rick J, Balain S. A conceptual framework for implementation fidelity. Implement Sci. 2007;2:40.

131. Miller-Day M, Pettigrew J, Hecht ML, Shin Y, Graham J, Krieger J. How prevention curricula are taught under real-world conditions: Types of and reasons for teacher curriculum adaptations. Health education (Bradford, West Yorkshire, England). 2013;113(4):324-44.

132. Curran GM, Bauer M, Mittman B, Pyne JM, Stetler C. Effectiveness-implementation Hybrid Designs: Combining Elements of Clinical Effectiveness and Implementation Research to Enhance Public Health Impact. Med Care. 2012;50(3):217-26.

133. Arbetsmiljöverket [Swedish Work Environment Authority]. Arbetsorsakade besvär 2020 [Work-related Disorders 2020]. Stockholm; 2021.

134. Barratt H, Campbell M, Moore L, Zwarenstein M, P. B. Randomised controlled trials of complex interventions and large-scale transformation of services. Health Serv Deliv Res; 2016.

135. Abildgaard JS, Saksvik PØ, Nielsen K. How to Measure the Intervention Process? An Assessment of Qualitative and Quantitative Approaches to Data Collection in the Process Evaluation of Organizational Interventions. Front Psychol. 2016;7:1380-.

136. Flannelly KJ, Flannelly LT, Jankowski KRB. Threats to the Internal Validity of Experimental and Quasi-Experimental Research in Healthcare. J Health Care Chaplain. 2018;24(3):107-30.

137. Bonell C, Oakley A, Hargreaves J, Strange V, Rees R. Assessment of generalisability in trials of health interventions: suggested framework and systematic review. BMJ. 2006;333(7563):346-9.

138. Fikretoglu D, Easterbrook B, Nazarov A. Fidelity in workplace mental health intervention research: A narrative review. Work Stress. 2022;36(1):6-29.

11 SUPPLEMENTARY MATERIAL