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STRESS PREVENTION AT WORK: INTERVENTION EFFECTIVENESS AND IMPLEMENTATION PROCESS EVALUATION

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Stress prevention at work: Intervention effectiveness and implementation process evaluation

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To Thomas, for all the years of love and sharing.

To mom, for all the care and ground service.

But foremost, to my beloved Nikolina, the most important and the finest person in my universe: You are a beautiful soul.

FOREWORD

As I am finishing my work on this dissertation in March 2020, the coronavirus is raging around the world. It is rather difficult to concentrate, because my thoughts are wandering to those who are affected, as well as to the healthcare staff who are at the forefront of this "war" against an invisible enemy.

Job demands and workload, which I write about at length in this dissertation, will probably become extremely high for Swedish healthcare workers in the immediate future. Nonetheless, I believe they will cope with all the hardship with great commitment. Because it is an exceptional situation.

However, when the situation is not exceptional, they should not have to deal with unreasonable working conditions such as excessive workload and job demands. Future research will show whether such working conditions are due to structural imbalance, use of management systems not appropriate for health care sector, rationalizations in the wake of neoliberal ideologies, or other factors. For the time being: thank you for the work you do.

ABSTRACT

Background: Work-related stress is a prevalent condition, which is costly for individuals, organizations and society. It is a complex phenomenon that involves and is influenced by factors at many levels. It is consequently only by means of intervening on several levels that preventive work can have a broad impact. There is mixed evidence about the efficacy of organizational-level interventions for stress prevention and more research is needed. Furthermore, process evaluations of trials in this field of research are still scars.

Aims: The overall aim of this thesis was to contribute to the evaluation of organizational level interventions for the primary prevention of stress and its consequences for workers mental health. More specifically, the aim of Study I was to explore whether a participatory, organizational intervention that has the theoretical potential to reduce work-related risk factors for mental ill-health can be effective in preventing stress. Study II was a process evaluation of the intervention implementation in Study I. It aimed to describe the implementation process, examine the influence of contextual factors and explore the participants' experience of working with the method. Study III examined the psychometric properties of the single-item stress question (SISQ) used in Study IV. The aims of Study IV were to describe the trajectories of stress experience in the study population, to examine the association between the subjective stress experience and the objective organizational measures of workload, and to examine the intra-individual variability in stress experience.

Methods: Several designs and methods were used: cross-sectional and longitudinal designs; quantitative and qualitative methods, and multiple data collection methods. Study I was a randomized controlled trial including 57 employees in the intervention group and 61 employees in the comparison group at the baseline. Questionnaire data was collected at the baseline and at 6- and 12- month follow ups. This was the main data collection. Study II had a mixed method design and used cross sectional data from the intervention group: checklists, administrative data, one focus group, three purposefully sampled semi-structured interviews and a process evaluation questionnaire (N=49, 73 %). In Study III, cross-sectional data was used to examine the convergent validity of the SISQ (N=118). To examine the SISQ' s predictive validity, the stress experience of employees with no sick-leave and no signs of depression or exhaustion at the baseline was examined. Eighty-three employees were included in this analysis. The reliability of the SISQ was analyzed by the test–retest procedure using a separate convenience sample including 108 individuals. Study IV had a longitudinal design. The association between the stress experience and the objective, quantitative workload was examined using administrative data gathered monthly and the data from two time series of weekly administered SISQ. Intra-individual variability was examined by means of standard deviation of a time series and by analyzing the speed of change in stress experience.

Results: No statistically significant differences between the intervention and the control group regarding the primary outcome (job strain), or the secondary outcomes (effort-reward imbalance, exhaustion, sleep and recovery) was found. However, at the 12-month follow up, the perception of effort decreased, and work was experienced as more rewarding in the

intervention group by those employees who showed no signs of exhaustion at the baseline. Employees with signs of exhaustion at baseline continued to deteriorate with time regardless off group. The objective data showed that the intervention group had significantly less time per task, more administration per hour worked and more telephone calls answered per hours worked during the entire trial. The reach was satisfying, with high proportion of employees participating in the intervention. Employees had a positive experience of the intervention regarding several of its aspects. However, not all the components of the intervention were introduced in all occupational subgroups. This was mostly due to difficulties obtaining productivity data needed for work with the intervention, and because of staff shortage. The validity of the (SISQ) was supported by its convergence with relevant scales measuring work-related stress and mental ill-health. Furthermore, the SISQ could predict sick leave, exhaustion and depression at 12-month follow up. The stress experience in this sample of primary health care employees was highest in mid-October, mid-November and before Christmas. There was a significant association on a group level, between the quantitative monthly objective measures of workload and the experience of stress. In addition, the fewer the measured tasks were accomplished per hour worked, the higher the experience of stress. The association between the administrative tasks and stress was stronger than between stress and number of patient visits. The analysis of the intra-individual variability showed that the employees scoring high on exhaustion scale have higher rate of change (changing faster) in their stress experience then other employees

Conclusions: This thesis evaluated an organizational intervention in a primary health care context. Statistically significant support for its effects on job strain, effort-reward imbalance, exhaustion, sleep or recovery could not be found. The process evaluation showed that the intervention was not fully implemented, due to several contextual barriers such as staff shortage. No definitive conclusions can therefore be drawn about its effects. However, during the project, several lessons were learned. One of them was that employees already showing signs of exhaustion need special consideration when designing an intervention. Furthermore, these employees showed more rapid changes in their experience of stress from week to week, possibly demonstrating reduced resilience to additional stress. Another lesson learned was that the employees' experience of stress was associated with objectively measured quantitative workload. Administrative tasks seemed to be more strongly associated with stress than patient related tasks. Managing to complete fewer tasks per hour worked was associated with increased stress. Finally, the single-item stress measure (SISQ), administered by weekly SMS messages, is a valid and reliable measure of experienced stress, in a Swedish population of predominantly female primary health care employees. It can be administered by SMS messages in a work context and be useful in predicting sick-leave and exhaustion one year later.

LIST OF SCIENTIFIC PAPERS

I. Arapovic-Johansson B, Wåhlin C, Hagberg J, Kwak L, Björklund C & Jensen I. (2018). Participatory work place intervention for stress prevention in primary health care. A randomized controlled trial. European Journal of Work and Organizational Psychology, 27(2), 219–234.

II. Arapovic-Johansson B, Wåhlin C, Jensen I, Björklund C & Kwak L. (2020). Process Evaluation of Productivity Measurement and Enhancement System (ProMES) as a Stress Preventive Intervention at the Workplace. Manuscript.

III. Arapovic-Johansson B, Wåhlin C, Kwak L, Björklund C & Jensen I. (2017). Work-related stress assessed by a text message single-item stress question. Occupational Medicine, 67(8), 601–608.

IV. Arapovic-Johansson B, Wåhlin C, Hagberg J, Kwak L, Axén I, Björklund C & Jensen I. (2020). Experience of stress assessed by text messages and its association with objective workload – a longitudinal Study. International Journal of Environmental Research and Public Health, Vol 17, Issue 3, 680.

CONTENTS

LIST OF ABBREVIATIONS

CFIR	Consolidated Framework for Implementation Research
EU-OSHA	European Agency for Safety and Health at Work
ERI	Effort Reward Imbalance
HAD	Hospital Anxiety and Depression Scale
JDC-S	Job Demand Control -Support
JD-R	Job Demand-Resources
MRC	Medical Research Council
OLBI	Oldenburg Burnout Inventory
PSC	Psychosocial Safety Climate
RCT	Randomized Controled Trial
SISQ	Single-Item Stress Question
SMS	Short Message Service
QPS Nordic	General Nordic Questionnaire for Psychological and Social Factors at Work

1 INTRODUCTION

Work is not only a source of income but can also bring rhythm and structure to our lives. In the best of all worlds, it can give a beneficial social context and a sense of meaning, achievement and pride. However, this is not the best of all worlds. According to research from the Harvard Business School and the Stanford Graduate School of Business, more than 120 000 deaths per year in USA can be linked to harmful work management and to exposure to ten risk factors for work-related stress. These include high job demands, low job control, and long working hours (Goh, Pfeffer, & Zenios, 2015). If this is true, the global statistics are breathtaking.

Workplace stressors can lead to work-related stress. Levels of perceived work-related stress seem to have increased over time globally, due to changes such as globalization, communication technology, employment insecurity and financial constraints (Siegrist & Li, 2016). Stress and sick leave due to work-related ill-health have also increased in European countries. According to the European Agency for Safety and Health at Work, a quarter of workers experience work-related stress most of the time, and report that stress has negative effects on their health (Eurofond & EU-OSHA, 2014). In Sweden, work-related ill-health due to stress and other psychological ill-health have overtaken disorders caused by the physical workload for women (Arbetsmiljöverket, 2016). Furthermore, in 2017, and according to the Swedish Work Environment Authority, 65 % of the employees with work-related ill-health reported that too high workload was the cause of their ill-health (Arbetsmiljöverket, 2018a). Finally, a systematic review of evidence regarding the social costs of work-related stress gives a striking picture of the vast economic impact of work-related stress on society in terms of productivity-related loss, medical costs and costs for health care (Hassard, Teoh, Visockaite, Dewe, & Cox, 2018).

Professor Sir Cary Cooper, cited in a Newsletter from the European Academy of Occupational Health, stated that we by now know enough about what "causes people to get ill in the workplace" and that what we have to do is start finding the solutions ("Work & Stress special issue on organizational interventions," 2010). As the problem is complex, the solutions must also be complex and implemented on many societal levels and by many stakeholders, from governments to individuals. However, as processes at societal and organizational levels are often complex, complicated and slow, there is a tendency to end up working with the "easiest" option. Solutions are often directed at individuals and their coping abilities, as this is seen as "easier" than implementing changes at societal or organizational level. Individual interventions are therefore far more common than interventions at organizational level (Hurrell, 2005; Montano, Hoven, & Siegrist, 2014). Striving to intervene on a social and organizational level is one way of refusing to place the blame on the "victim" (Karasek & Theorell, 1990). People differ in their individual abilities. However, as Professor Schonfeld neatly puts it: it is better to organize comprehensive, population-based sanitary measures then to individually identify and decontaminate polluted water (Schonfeld & Chang, 2017a). When

fairly large groups of employees consider themselves to be affected by stress it is a sign of a system malfunction.

Legislation for employee health protection differs widely from one country to another. In Sweden, an important step was taken with the introduction of provisions about organizational and social work environment, AFS 2015:4 (Arbetsmiljöverket, 2015). These provisions require that the employer should "regularly investigate and assess what risks may arise at work…" and "…take corrective measures to manage the risks" (Arbetsmiljöverket, 2015). These "corrective measures to manage the risks" may require employers to adopt interventions at either individual, group or organizational level and to choose a resource with which to implement the "corrective measure".

Occupational health services in Sweden are a strategic resource for companies and organizations. They play an important role in both preventing ill-health and developing healthy work environments (Schmidt, Sjöström, & Antonsson, 2012). Moreover, about 58 % of all employees in Sweden have access to occupational health services, which makes them important for the implementation of preventive interventions (Axén, Björk Brämberg, Vaez, Lundin, & Bergström, 2020). However, the use of evidence-based methods has not historically been as widespread in the occupational health services as in other areas of health care (Carter, 2000). This means that occupational health services may be using a variety of methods with unclear effects and potentially harmful side effects.

The group- and organizational interventions used by occupational health services to target identified work-related risks should be evidence based, wich makes further research in this area vital. Unfortunately, the evidence for these kinds of primary preventive interventions for stress and stress-related mental ill-health is far less conclusive than it is for interventions directed at those who have already developed symptoms of ill-health (i.e. secondary prevention), which will be discussed in the background section.

This thesis is an evaluation of one such group- or organizational-level intervention targeting work-stress related risk factors for mental ill-health. The intervention is intended to be primary preventive. This work will hopefully contribute to a growing body of research evaluating organizational interventions.

2 AIM

2.1 OVERALL AIM

The overall aim of the thesis was to contribute to the development and evaluation of organizational-level interventions for the primary prevention of stress and its consequences for employees' mental health. More specifically, the aim was to examine whether a workplace intervention which aims to change the employees' work environment by increasing their sense of control and active participation in the definition of job demands, can reduce work-related stress and prevent stress-related ill-health.

2.2 SPECIFIC STUDY AIMS

The aim of Study I, which was a randomized controlled trial (RCT), was to evaluate whether a participatory, organizational intervention (the "Productivity Measurement and Enhancement System" or ProMES) can reduce work-related risk factors for stress and thereby prevent stress-related ill health. More specifically, the aim was to examine if working with ProMES can reduce perceived levels of job demands and effort or increase perceived levels of job control and reward, and thereby reduce perceived job strain and effort-reward imbalance. A further aim was to examine if levels of sleeping difficulties, recovery and exhaustion would be affected.

Study II was a process evaluation of the implementation process of ProMES and was conducted parallel to the RCT in Study I. It had several aims: to explore the intervention implementation process in terms of recruitment, reach and dose; to assess fidelity to the intervention guidelines; to examine hindrances and facilitators during the implementation process; and to examine participants' satisfaction and how they experienced working with the intervention.

The aim of Study III was to examine the psychometric properties (reliability, convergent and predictive validity) of a single-item stress question (SISQ) distributed by short message service (SMS) and used in Study IV.

The overall aim of Study IV was to follow and examine stress experience over time in the sample of Swedish primary health care employees who participated in the randomized controlled trial (Study I). The specific aims of Study IV were to describe the trajectories of stress experience in two time series; to examine the association between the subjective stress experience and the objective organizational measures of workload; and to examine the intra-individual variability in stress experience.

3 BACKGROUND

This section briefly describes the population studied in this thesis in relation to stress and then gives a brief overview of stress research in general. It then addresses occupational stress research and its theoretical models.

After that, it describes organizational and individual factors related to occupational stress, the consequences of prolonged work-related stress and different types of stress measures. The final part of this section looks at occupational stress interventions in general and at process evaluation of intervention implementation, as well as the specific intervention evaluated in this thesis.

The terms "occupational stress", "work stress" and "work-related stress" are used interchangeably. This is also the case for "work stress-related mental ill-health", "mental ill-health" and "stress-related ill-health".

3.1 SWEDISH HEALTH CARE SECTOR AND STRESS

Working in health care can be rewarding but also demanding. According to the Swedish Work Environment Authority roughly 30 % of employees working in the welfare sector (including health and social care, social services or education) had mentally strenuous jobs in 2017 (Arbetsmiljöverket, 2018b). For example, more than four out of ten assistant nurses and nurses had work-related health problems (Arbetsmiljöverket, 2018a). Some of the factors related to work stress in health care are work overload, role conflict, time pressure and patient-related stress (Giga, Fletcher, Sgourakis, Mulvaney, & Vrkljan, 2018).

Working conditions in Swedish primary health care have been described as poor, especially for female general practitioners and district nurses, who have reported high workload and low job control (Wilhelmsson, Foldevi, Åkerlind, & Faresjö, 2002). Primary health care employees in Sweden have a complex work situation and a high administrative workload (Anskär, Lindberg, Falk, & Andersson, 2019). They see many organization-related work tasks as unnecessary and illegitimate, which is associated with role conflict (Anskär et al., 2019). A comparative survey of primary care in ten countries (Osborn et al., 2015) found that 58 % of physicians in Swedish primary care are somewhat or very dissatisfied with time spent per patient. As a comparison, the proportion in Norway and Switzerland was 33 and 32 % and in Netherlands 55. Moreover, 56 % of primary care doctors in Sweden experience that their job is very or extremely stressful, while the proportion for example in Norway, Netherlands and Switzerland is 24, 18, ad 31 respectively.

3.2 STRESS RESEARCH

Stress is a natural evolutionary aspect of being human, in the same way as emotions are. Some researchers see it as a part of a stress/anxiety continuum, a variation of the same phenomenon (Bystritsky & Kronemyer, 2014). Despite stress being a natural part of being human this common human experience is difficult to define with scientific rigor.

Stress is sometimes described as a process (Lazarus, 2006). However, when the word "stress" is used it is not always clear if the user means the stress stimuli part of the process (also called stressors or risk factors), the physiological response to stress stimuli (often meaning non-specific, general, physiological reaction) or the individual's experience of the stress response and its accompanying cognitive, emotional and behavioral components (Ursin & Eriksen, 2010). There are two aspects to stress as a response to stress stimuli. Firstly, if it is moderate it can be positive, and lead to alertness and motivation. This is known as eustress (Hargrove, Quick, Nelson, & Quick, 2011). In eustress, both response and recovery are rapid. Secondly, it is known as distress if the stress is more than moderate, repeated and the individual cannot cope with it (Goyal, Singh, Vir, & Pershad, 2016; Wheaton & Montazer, 2009). Prolonged distress can lead to chronic stress.

Initially, the term "stress" came from physics and engineering. "Load" referred to the weight put on a structure; the "strain" was a deformation of structure, while "stress" was the area under the load. Moving into the biological, medical, and psychological sciences, stress became a question of environmental input (external load) and output (for example organism breakdown) (Lazarus, 1993). Since definitions are usually products of the theories behind them, definitions of stress have changed with time, research area and context (Dewe, O`Driscoll, & Cooper, 2012). Each theory has a different focus even though the basic elements are usually the same (ibid).

Researchers can, for example, focus on exposure to adverse conditions as in an environmental (engineering) approach, where stressors are stimuli which are causally linked to an individual's stress reactions. Holmes-Rahe's work in the 1960s into the correlation between life events and illness is an example of an environmental theory of stress (Holmes & Rahe, 1967). This early research into acute changes in an individual's life, was later broadened to look at recurrent and/or persistent demands, with more comprehensive measurement of cumulative stress (Thoits, 2010). Alternatively, the focus of stress research can be on physiological or biological responses to adverse conditions in the environment, as in a physiological approach. An example is Selye's definition of stress as a body's non-specific physiological response (Selye, 1955). The cognitive activation theory of stress (CATS) is one development of Selye' s theory (Ursin & Eriksen, 2010). Despite the incorporation of cognitive evaluation, CATS still focus on a "psychobiological sensitization within neural loops, meaning that synapses are changed because of repeated use, and become more sensitive, similar as in the development of chronical pain process".

Psychological approaches have a focus on interactional or transactional process between the environment and the individual (Mark & Smith, 2008). In the "cognitive revolution" in the field of psychology in the 1950s, individual differences as described by cognitive processes were introduced into the models of stress. One of the most influential psychological theories of stress is Lazarus' transactional theory (Lazarus, 2001). Stress is seen as a complex process involving an individual and his/her environment, in which cognitive processes play a crucial role. Appraisal and emotion are of central importance. Through appraisal, the focus moves towards what people think, and appraisal functions as an explanatory link between environment, and human behavior (Lazarus, 1993, 2001). As appraisal is connected to the emotion, Lazarus suggests that stress and emotion should be "a single topic". However, psychological theories are sometimes criticized because the emphasis on individual differences (in appraisal) can lead us to see stress as an individual flaw, rather than as a result of the influences of the environment on the individual, which in the context of work calls for the restructuring of the work itself, i.e. work processes, organizations and social structures (Dollard, Dormann, & Idris, 2019).

Cohen and colleagues (Cohen, Kessler, & Gordon, 1997) integrate environmental, physiological and psychological approaches in a heuristic model, which has led to one of the more influential definitions of stress as "a process in which environmental demands tax or exceed the adaptive capacity of an organism, resulting in psychological and biological changes that may place persons at risk for disease". Environmental demands can be placed in different contexts, such as the family context, or the work-related context. By replacing "environmental demands" with "work-related demands" in the above definition we get a definition of work-related (occupational) stress. Another example of a definition of work-related stress is: "The response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities, and which challenge their ability to cope" (S. Joyce et al., 2016). In this thesis we use the definition put by Levi (2000): "The emotional, cognitive, behavioral and physiological reaction to aversive and noxious aspects of work, work environments and work organizations. It is a state characterized by high levels of arousal and distress and often by feelings of not coping"(European Commission, 2000).

3.3 THEORIES AND MODELS OF OCCUPATIONAL STRESS

In the field of public health research, theories are defined as "a systematic way of understanding events or situations. It is a set of concepts, definitions, and propositions that explains or predicts these events or situations by illustrating the relationships between variables" (Rimer & Glantz, 2005). When theories are not highly developed and tested, they are called theoretical frameworks. Models, on the other hand, are said to "draw on a number of theories to help understand particular problem in a certain setting or context"(Rimer & Glantz, 2005).

In work psychology, occupational health psychology and the field of work-related stress research, the terms “theory” and “model” seem often to be used interchangeably. It is also easy to be overwhelmed by the proliferation of research, and by the sheer number of theories and models. Some overviews of the various theories and models that can be related to the occupational stress (Dewe et al., 2012; Mark & Smith, 2008) mention the following: Person-Environment Fit; the Job Characteristics Model; the Vitamin Model, the Michigan Model; the Job Demand Control Support Model (JDC-S); the Effort Reward Model (ERI); the Cognitive Theory of psychosocial stress; Cox’s Transactional Model of occupational stress; the Demand Skill Support Model; the Demand Induced Strain Compensation model; the Job Demands-Resources (JD-R) model; and this is just a selection compiled some years ago. Some of these theories are job design theories for example the JDC-S model, while others have their roots in sociology (ERI) or psychology (the Cognitive Theory of Psychosocial Stress).

The large number of theories and viewpoints makes it difficult to decide which theory to use and leads to a certain level of “cherry picking” regarding how to approach an intervention study. However, many theories and models build upon each other and can be combined in more comprehensive models.

Below follows a short description of four of the more well researched and influential models which describe the connection between work and work stress-related mental ill-health which is the focus of this thesis. Two of these models underpin the logic model that was used in the main Study in this thesis: JDC-S and ERI. The third, JD-R model is often seen as a broader, “heuristic” framework (Schaufelli & Taris, 2014) which has been widely used for the past two decades. The fourth one, the Psychosocial safety climate model, is a relatively new work-stress theory and even broader than the JD-R model and will be used to discuss the findings of the studies described in this thesis.

3.3.1 Job Demand Control Support Model (JDC-S)

According to some researchers (Barling & Griffits, 2003), one of the major developments in research into psychosocial aspects of the work environment and their consequences for physical and psychological health was made by Karasek and Theorell through their work on job strain (Karasek & Theorell, 1990). This work was done in a context of changing working and economic conditions in western countries, with declining manufacturing jobs, growing service and knowledge jobs, new technology, globalization, restructuring, downsizing, lean production technologies, etc. (Kompier, 2006).

The Job Demand Control Support Model (JDC-S) focused originally on two aspects of work. The first is job demands (sometimes called workload and defined in terms of, for example, time pressure). The second is job control, sometimes called decision latitude (Karasek & Theorell, 1990). Decision latitude has two elements: decision authority and skill discretion. Decision authority refers to having control over the job, while skill discretion refers to the

scope for exercising one's competence. The model postulates that high job demand and low job control are negatively associated with employee health. The combination of high job-demands and low job control is termed "job strain", which is a strong risk factor for mental and physical ill-health. Accordingly, reducing demands and/or having more job control will reduce strain. Jobs with high demands and high control are, according to this model, associated with motivation and learning, and thereby, hypothetically, lower levels of strain.

At the end of the 80s, the concept of social support at work was added to the JDC-model as another important factor, the lack of which can lead to negative consequences for health (Johnson & Hall, 1988). Social support and control are thought to act as buffers against the effects of high demands. However, the results of empirical tests of interactive effects remain mixed (Egan et al., 2007; Van Der Doef & Maes, 1999). This means, for example, that the buffering effect of control on exhaustion is weak. The three-way interaction of the JDC-S model (with support as mediator) was also found to have weak effects on exhaustion (Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010). However, there is evidence of the additive effects of job demand, job control and social support on health and well-being. In other words, there is evidence that both high job demand, low job control and low social support each have negative effect on employee health and psychological well-being. With research support being stronger for the JDC model than for the JDC-S model, we chose the former for our logic model.

This model has initiated a vast amount of research since its conception and the evidence for the negative impact of high job demands and low job control on employee health is strong. There is also some evidence that organizational-level participative interventions aimed at increasing job control have positive effects on employee health (Egan et al., 2007; Holman & Axtell, 2016). This was a reason for the choice of this model as one of the theoretical points of departure in the thesis, i.e. used in the logic model of the intervention study.

3.3.2 Effort-Reward Imbalance Model

This model has social-anthropologic roots, with emphasis on the human need for relations, the importance of social exchange between the individual and the environment, and the importance of positive feedback for self-esteem (Siegrist, 1996). The work has an important role in the context of social exchange, in which the employee invests his effort at work and the organization distributes rewards (money, career, esteem). Effort-reward imbalance in the ERI model is a ratio of effort and reward subscales (Siegrist, 2013), i.e. between the employees' perceptions of the "cost" and the "gain" in the work context. According to this theory, high effort and low reward lead to negative emotions and stress response and in the long run to negative effects on health, including mental health (Siegrist & Li, 2016).

The concept of effort in the ERI model overlaps to some degree with the concept of demand in the JDC-S model, described above. However, the concept of reward has different implications, both theoretically and for designing interventions, than the concept of control

of the JDC-S model. The concept of reward has three subdomains: promotion reward, esteem reward and job security. In a study of global and specific factors of reward, researchers showed (van Vegchel, De Jonge, Bakker, & Schaufeli, 2002) that the effort-reward imbalance had the strongest negative effect on employee health when esteem was used as an indicator of reward. The over-commitment scale of the ERI model was developed to capture individual differences in experiencing work-related stress. The motivational patterns of excessive work-related commitment and a high need for approval have been shown to be an important psychological risk-factor for the experience of stress/strain. Earlier research has shown that over-commitment seems to moderate the relationship between the effort-reward imbalance and health (J. de Jonge, Bosma, Peter, & Siegrist, 2000; Siegrist et al., 2004). However, a systematic review (Siegrist & Li, 2016) found that over-commitment is associated with a number of ill-health indicators (e.g. psychological distress, anxiety, exhaustion, sleep, etc.) but that the evidence for the moderation hypothesis remains limited. Either way, this model complements the JDC-S model as it examines a job resource other than job control, namely reward. Moreover, it includes an intrinsic component in studying the association between working conditions, the experience of stress and health. It is therefore, together with the JDC-S model, used as the theoretical background of this thesis.

3.3.3 Job Demand Resources Theory (JD-R)

The Job Demand Resources Model has been studied extensively over the last two decades (Demerouti, Bakker, De Jonge, Janssen, & Schaufeli, 2001). Some researchers have regarded this model as more heuristic (Schaufelli & Taris, 2014) and as a broad framework within which specific sub-models can be placed. According to its developers, the model has now evolved into a theory (Bakker & Demerouti, 2017). There are many different job demands, and job resources that can act as a buffer for demands. Job control and social support from JDC-S, and reward from ERI are three examples of the 'job resources' category in JD-R model (Schaufelli & Taris, 2014). While high job demands can lead to stress and stress-related ill-health, high resources can lead to increased motivation and productivity. According to some researchers, interventions should target specific stressors (Ruotsalainen, Verbeek, Mariné, & Serra, 2014) in order to achieve an understanding of the mechanism of change. We chose to regard JD-R model as a broad framework behind our logic model and reasoning, while we chose more specific theories (JDC-S and ERI) for the explicit logic model used to understand the mechanisms of change of the intervention evaluated in the thesis.

3.3.4 Psychosocial Safety Climate Work Stress Theory

Over the last decade a new work stress theory that attempts to synthesize several other theories has been developed by the Australian researcher Maureen F. Dollard and her colleagues (Dollard et al., 2019). It is called the Psychosocial Safety Climate (PSC) theory of work stress.

In this thesis the PSC is used as a background theory. It was not measured but will be used to discuss the findings of the studies in this thesis. According to the developers of PSC, it refers to how much the higher management values the psychological health of its workers rather than merely the performance and the productivity of the organization or company (Dollard et al., 2019). It is about the basic values of an organization and is therefore dependent on the senior management and prevailing policies and practices (which are ultimately governed by the politics and ideologies of the society and the country). The psychosocial safety climate is called the ultimate determinant of both job design and social relations, and therefore the "theoretical precursor" of other work stress theories (Dollard et al., 2019). It is operationalized as employee perceptions about how the upper management deals with employees' psychosocial health and wellbeing and it has been shown to accurately predict job demands, job resources, effort-reward imbalance, social relations and psychological health (McCusker & Dollard, 2019). According to this theory the primary prevention of stress should target the organizational PSC, even though the model acknowledges the important role of national political power relations, the economy, culture and corruption. An important assumption is that PSC can be changed by the management, if the stress prevention is taken seriously and if communication about psychosocial risks and mental health is on the agenda and followed up by organizational interventions with concrete strategies to tackle excessive workload, fragmented work tasks, personnel shortfall etc.

PSC is said to be situated between the theories of economic systems and theories of job design (Dollard et al., 2019). It influences job design in organizations, e.g. how job demands, job control, resources and rewards are organized. In turn, this will influence perceived stress and the employee health.

3.4 ORGANIZATIONAL AND INDIVIDUAL FACTORS RELATED TO OCCUPATIONAL STRESS AND STRESS RELATED ILL-HEALTH

As described above, different theories and models have described different risk factors (stressors, sources of stress) associated with stress-related physical and mental ill-health. The causal relationships between risk factors and ill-health are complex. Risk factors are physical and/or psychological demands that can initiate the stress response (Hargrove et al., 2011). They can be extrinsic (environmental, in this case work or organization-related), or intrinsic (individual, such as genetic predisposition or over-commitment).

Some of the known extrinsic risk factors for work-related stress and stress-related ill-health are organizational and technological changes, ambiguous or unclear roles, high workload, interpersonal conflicts, emotionally demanding work, leadership style, social isolation, harassment (Hargrove et al., 2011). The scientific support is stronger for some factors than for others. According to some researchers there is strong evidence that the following are risk factors for work-stress related ill-health (such as adjustment disorders and exhaustion): a) high job demand, b) low job control, c) low co-worker and supervisor support (only for men),

d) low relational and procedural justice, and e) high effort-reward imbalance (Nieuwenhuijsen, Bruinvels, & Frings-Dresen, 2010). For other risk factors the evidence is less strong. Other researchers, looking at the association between work-related risk factors and common mental ill-health such as anxiety, depression and work-related stress conclude that there is moderate evidence for the role of job demands, job control, effort–reward imbalance, relational justice, procedural justice, role stress, bullying and social support (Harvey et al., 2017).

A systematic review based on 59 studies concludes that low job control in terms of low decision latitude, job strain (high demands and low control) and bullying are predictive of development of depression in the near future for both men and women (Theorell et al., 2015). The evidence is still limited for other factors such as poor social climate, conflicts and job insecurity. Another more recent systematic review of the association between work-related factors and burnout (Aronsson et al., 2017) showed that there is evidence that high demands, low job control, high workload and low reward are some of the risk factors for exhaustion, which is the core construct in burnout.

Among health care employees, work overload, time pressure, patient-related stressors, role ambiguity, role conflict and shift patterns are some of the more prominent risk factors for work-related stress (Giga et al., 2018). Statistics from the Swedish Work Environment Authority (Sverke, Falkenberg, Kecklund, Magnusson Hansson, & Lindfors, 2017) show that some psychosocial risk factors such as job strain, unclear goals, psychological demands and emotional demands are more prevalent for female employees. The Swedish health care sector is dominated by women.

The relationship between risk factors, stress reactions (physiological, cognitive and emotional) and ill-health is thought to be moderated by buffering factors. For example, control and support are theorized to buffer job demands. However, as discussed earlier, the evidence for the buffering hypothesis is still inconclusive. Furthermore, Siegrist (1996) describes three sorts of control: control of objective work characteristics, subjective judgment of work characteristics, and individuals' generalized experience of the possibility to control the environment. Employees` personal modes of coping, for example reducing effort if the workload is unreasonable, or distancing on an emotional level, are individual factors which must be taken into consideration.

Individual risk factors can be genetic in terms of neural processes and anatomical and functional connectivity of the brain (Franklin, Saab, & Mansuy, 2012). But they can also be personality-like traits, i.e. cognitive and behavioral patterns associated with the ability to resist stress. These include self-efficacy (Bandura, 1982), hardiness (Kobasa, 1979), sense of coherence (Antonovsky, 1987), over-commitment (Siegrist, 1996), coping style (Lazarus, 1993) and resilience (McEwen, Gray, & Nasca, 2015). These individual factors are interrelated and interdependent. Moreover, neuronal networks and behavioral responses are most often rooted in genetics and early life experiences (Agorastos, Pervanidou, Chrousos,

& Kolaitis, 2018) which makes it difficult for the individual to change. The situational and environmental factors have an important role in either amplifying or extinguishing them.

There are, in addition, factors that are neither organizational nor purely individual and are easily "forgotten". Sociological studies have shown that social inequalities are important. For example, groups of individuals with lower education and income show higher rates of mortality and psychological distress than those from higher socioeconomic positions (Thoits, 2010). Other examples of ongoing difficulties are work-family conflict, caring for frail parents, insufficient incomes (for example single mothers). These can be elements of cumulative stress burden, and therefore the stress exposure of an individual should be assessed comprehensively. Even if they do not originate in a work context, they will add to the total amount of stress a person experiences and will most likely have an effect on his or her work.

Moreover, neither organizations or individuals operate in a vacuum and social inequalities and stress burden are also dependent on ideology and politics. Because we are immersed in our time, we can easily forget that "Under capitalism a clear tension exists between the need for continuous growth and productivity and the mental health of workers" (Dollard et al., 2019).

3.5 CONSEQUENCES OF PROLONGED STRESS

Stress can have behavioral, psychological and medical consequences (Hargrove et al., 2011). For example, coping with stress with the help of alcohol, overeating or tobacco, are sometimes mediators of medical consequences (Azagba & Sharaf, 2011; Frone, 1999).

Work-related stress is associated with some of the leading physical causes of death, such as heart disease, cancer and injuries (Quick, Henderson, & Cooper, 2016). Prolonged/chronic stress is also associated with types of mental ill-health such as depression, anxiety, and exhaustion (Nieuwenhuijsen et al., 2010; Stansfeld & Candy, 2006). It is suggested that once exhausted, the individuals can become even more sensitive to additional stress and develop reduced tolerance of even minor episodes of stress (Besèr et al., 2014) .

Prolonged stress is also known to affect sleep and recovery even before it has got to the stage of causing serious illness (Sonnentag, 2018; Åkerstedt, 2006). In addition to affecting physical and psychological health, occupational stress may also reduce creativity and personal development (Schabracq, Cooper, & Winnubst, 2003), employee performance (Hargrove et al., 2011) and productivity (Jensen, Björklund, Hagberg, Aboagye, & Bodin, 2020; Lohela-Karlsson, Nybergh, & Jensen, 2018; Martinsson, 2017). Furthermore, as mental ill-health is one of the major causes of sick leave in many western countries (Mather, Bergstrom, Blom, & Svedberg, 2015; Strömberg, Aboagye, Hagberg, Bergström, & Lohela-Karlsson, 2017), it will affect individual, organizational and societal economical resources.

Therefore, there are both strong socio-economic incentives and ethical imperatives to prevent work-related stress.

3.6 A MODEL OF CAUSES AND CONSEQUENCES OF WORK-RELATED STRESS

Even though brief and incomplete, the above description of some of the models of work-related stress and organizational and individual risk factors related to occupational stress gives a picture of the complexity of the problem. Figure 1. displays a model adapted from the Eurofond (Eurofound, 2010) and Psychosocial Safety Climate theory of work stress (Dollard et al., 2019), describing the understanding of work-related stress in this thesis. It is often not possible to address all the factors in one single intervention study. However, "addressing an issue may require more than one theory" (Rimer & Glantz, 2005). We therefore chose two well-researched theories/models: JDC-S and ERI. They are complementary in that they look at both organizational (job demands, effort, job control, rewards) and individual factors (overcommitment). They are compatible with both the JD-R and the PSC models and emphasize two different resources (control and reward). Moreover, the theoretical background of the intervention evaluated in this thesis fits well with these theories, as will be described in more detail in section 3.8.4.

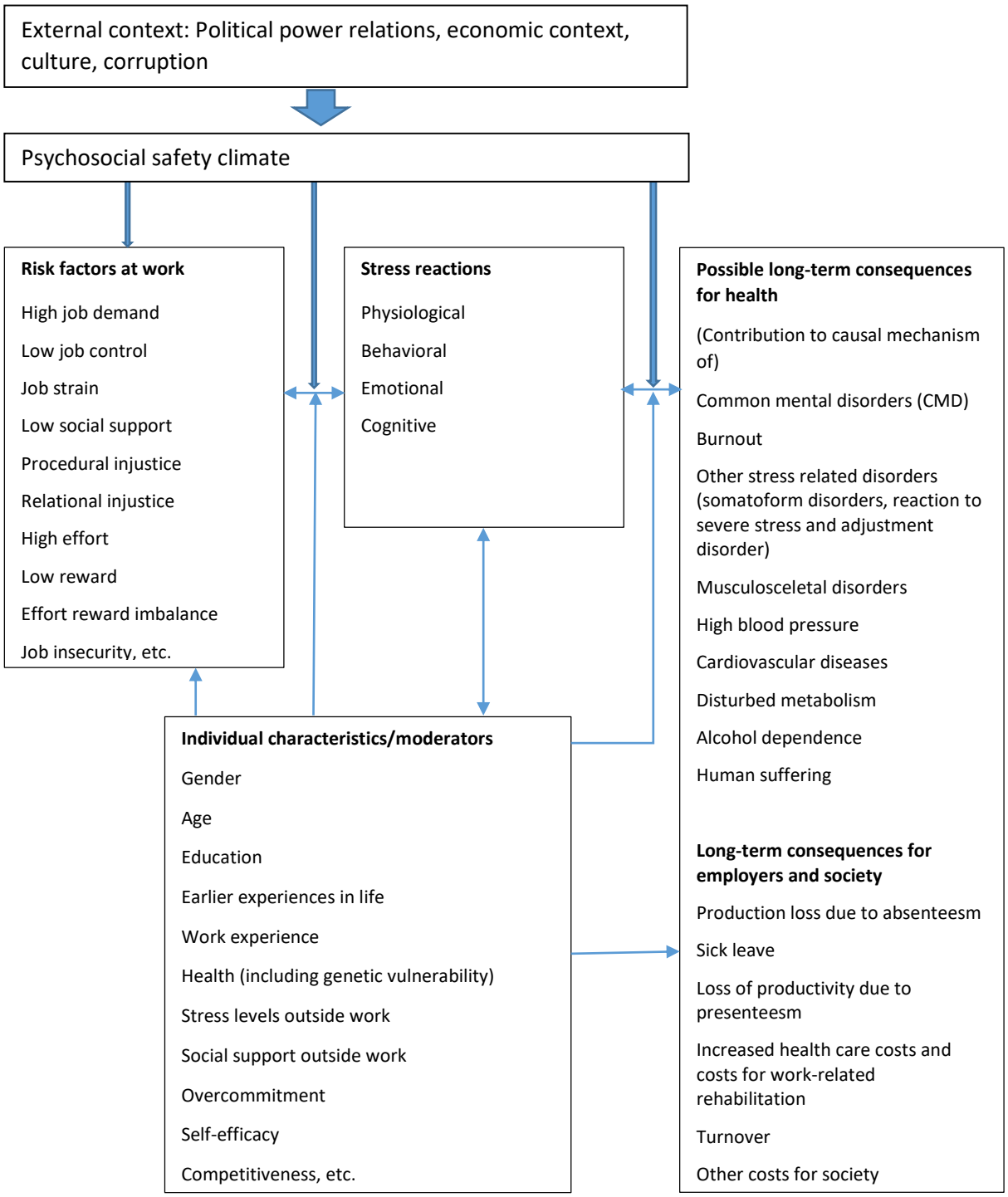


Figure 1: Model of causes and consequences of work-related stress. (Adapted after the model from the European Foundation for Improvement of Living and working Conditions (*Work-related stress*, 2010) and Dollard et al. (2019).

3.7 MEASUREMENT OF STRESSORS AND STRESS

3.7.1 Types of measures

How we choose to measure stressors and stress experience is dependent on the questions we want to answer. It also depends on what part of the stress process we want to examine: external or internal stimuli, perception and appraisal of stimuli, or reactions to stimuli. However, measures can also be categorized according to their level of objectivity.

3.7.1.1 Objective measures

Objective measures of stressors or stress are based on observational approaches and can be archival or biological (Leka & Aditya, 2010). Some researchers see observational approaches such as the assessment of supervisors or observers' ratings as a kind of objective measures (Bowling & Kirkendall, 2012). However, in this thesis they are regarded as semi-objective measures and not discussed further.

Biomarkers are an example of biological, objective data for measuring stress responses. When stimuli are interpreted as threatening, various kinds of biological change occur in the body (possibly the signs of destructive processes), which result from the activation of the hypothalamic-pituitary-adrenocortical axis (HPA) and sympathetic-adrenal-medullary activation (SAM) (Figueroa-Fankhanel, 2014). One limitation when using biomarkers to measure stress is that changes can occur in biomarkers for reasons which are unrelated to stress (Leka & Aditya, 2010). Furthermore, measuring biomarkers is often costly and invasive, and usually requires trained health care professionals. For this reason, we decided not to measure stress by means of biomarkers in the studies in this thesis.

Examples of archival objective measures of stressors and stress reactions are company records about sickness absence and performance data. Sickness data is a measure of reactions to stress, while performance data would be a measure of external stimuli, i.e. stressors. In other words, performance data such as working hours, number of tasks, production data, and so on can be a measure of workload, i.e. objective data about external stimuli that might give rise to perceived stress and stress reactions. There are many shortcomings associated with this data. They cannot, for example, give a picture of the actual, perceived stress. However, a consequence of focusing too much on measuring "perceived" stress can be that we choose interventions that address individual factors and make less effort to try to change the environmental risk factors for perceived stress. In this thesis we are examining the archival objective measures of stressors, namely organizational performance measures at group level. These are measures of objective workload at group level that can be associated with subjective measures such employees' perceived stress (see Study IV). If more than six out of 10 employees in Sweden had far too much to do in 2017 (Arbetsmiljöverket, 2018 a), then maybe interventions targeting workload are needed. Furthermore, tracking the objective workload by common archival measures and associating it with subjective measures of

employee stress can give more precise knowledge about the trajectories of workload and stress in specific organizations and companies, units, occupational groups or even individuals. This can, in turn, provide the basis for discussions about changes in work organization, requirement levels, priorities, resource allocation, etc.

3.7.1.2 Subjective measures

The most common assessments of stress rely on subjective measures. These are an individual's judgment of either stress stimuli (in work-related stress research usually psychosocial risk factors for ill-health), ways of coping, or the impact of stimuli on well-being and health (cognitive, emotional, physiological, or behavioral reactions). Assessment is usually carried out by means of questionnaires or interviews. One of the more well-known and researched general questionnaires is Cohen's Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983). It consists of 14 items which measure people's appraisals of events in the past month and whether they are perceived as uncontrollable and unpredictable.

In work-related stress research some questionnaires measure exposure to occupational psychosocial risk factors, for example the Job Content Questionnaire (Karasek et al., 1998), or the Job Diagnostic Survey (Hackman & Oldham, 1975). Other questionnaires measure the outcome of the stress process (i.e. its impact on health). These include the Maslach Burnout Inventory (Maslach & Jackson, 1981) and the Oldenburg Burnout Inventory (Halbesleben & Demerouti, 2005). Some questionnaires are comprehensive and measure both psychosocial risk factors and mental/physical health: the Copenhagen Psychosocial Questionnaire (Kristensen, Hannerz, Høgh, & Borg, 2005) or the General Nordic Questionnaire (Dallner et al., 2000). Others measure both mental and physical risk factors and individual factors, for example the Effort Reward Imbalance Questionnaire (Siegrist, 1996, 2013).

Compared to objective measures, it is relatively inexpensive to collect data by questionnaires. These also have face validity because the information comes directly from the individuals rather than from observers. Some researchers argue that correlations between answers to questions about risk factors and about health outcomes could be due to processes of negative affectivity, social desirability, or consistency motive, which are all sources of common method bias (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). However, research has shown that the criticism of self-report data (i.e. subjective measures) is not justified. If certain criteria such as neutral wording are met, they are a "useful and a valid source of information" (Kompier, 2005; Rehkopf, Kuper, & Marmot, 2010) even when individuals are under psychological distress (Waldenstrom, Lundberg, Waldenstrom, & Harenstam, 2003).

The optimal measurement of stress is probably a combination of objective measures of workload (stimuli); information from employees (subjective experience) about both risk factors and health outcomes; external observational data; and information gathered via biomarkers. Unfortunately, due to cost and time constraints this is often not feasible.

Furthermore, some problems would remain even with such extensive data collection, because different measures can sometimes represent different aspects of the stress process or different time dynamics (Kompier, 2005; Rehkopf et al., 2010). On the whole, however, more than one source of data collection is preferable from the methodological point of view (Kompier, 2005), since converging measures can validate each other. Moreover, multiple sources of data can give a more detailed picture of the question under study.

Even though questionnaires, in comparison with single-item measures, are preferable from the psychometric point of view (e.g. the possibility of factorial analysis), it is often difficult to get employees to answer lengthy questionnaires (Elo, Leppänen, & Jahkola, 2003). Less comprehensive methods to assess stress in the workplace might be more acceptable to employees, which in turn would increase response rates. Moreover, questionnaires are not practical for frequent, repeated measurements. Many researchers are developing short versions of their questionnaires and even single-item measures have gained ground since the 1990s and the research of Wanous and colleagues (Wanous & Reichers, 1996). Single-item measures are suitable for frequent administration, i.e. for daily, weekly or monthly measurements over lengthy periods.

In a recent article which examined 37 single-item questions, Fisher and colleagues showed that some single-item measures have achieved considerable empirical evidence and respectability (Fisher, Matthews, & Gibbons, 2016). Three main reasons are given for using single-item questions: to reduce criterion contamination, to minimize the burden on respondents, and to increase face validity. They examined psychometric properties of 37 single-items (18 newly developed) in occupational-health research and included single-items measuring burn-out and perceived depression. Their results confirm the reliability, content and construct validity of many of the single-items measures. However, no single-item measure for perceived stress was described in the paper.

This thesis, on the other hand, includes a study of a single-item stress measure administered by text messages, i.e. short message service (SMS). Using SMS for distribution of a question is a real time assessment, that reduces risk of memory bias as well as data handling errors as the responses are registered in the data file directly. Frequent measurements, for example by SMS, can give valuable information that can be missed if only two or three wave measurements are collected.

A less frequent measurement can indicate that a phenomenon is stable just by a chance (choice of measurement timepoint), when it is a question of a constant process and fluctuation (Axén et al., 2012). In some areas of research, such as low back pain, there is some understanding of trajectories of pain (Axen et al., 2011; Axén et al., 2012). However, less is known about trajectories of work-related stress over long periods for different occupations, workplaces, sub-groups of employees, etc. Even less is known about the associations between the trajectories of perceived work-related stress and objective organizational measures of workload. Only two peer-reviewed studies of stress assessment, assisted by smartphone in the context of the workplace, were included in a recent systematic review of phone assisted assessment of stress

(Þórarinsdóttir, Kessing, & Faurholt-Jepsen, 2017). Their aims were to automatically detect stress with the help of accelerometers, to find an appropriate feature set for smartphones and to identify stress levels rather than to examine the trajectories of stress per se, or to examine the association between the subjective stress experience and objective measures of workload, as has been done in this thesis.

3.8 WORKPLACE INTERVENTIONS AND PREVENTION OF STRESS

3.8.1 Levels and types of interventions

In occupational health research, terminology from public health research is sometimes used when classifying preventive interventions, i.e. primary, secondary and tertiary level interventions (Hurrell & Murphy, 1996). In addition, researchers have categorized interventions into organizational- and individual-level interventions. Organizational-level interventions for stress prevention are interventions that target the sources of work-related stress and "circumstances under which work is performed" (Montano et al., 2014).

Primary preventive interventions are those which aim to reduce "the onset of a condition" (S. Joyce et al., 2016). In other words, primary preventive interventions reduce known risk factors for work-related stress, thereby preventing its harmful effect in terms of stress related ill-health. Even though primary preventive interventions are often focused on organization, they can also have an individual-level focus. An example is pre-employment medical examination and assessment (Holman, Johnson, & O`Connor, 2018). Furthermore, health promotion interventions (physical or relaxation training for example) can be thought of as primary preventive interventions on an individual level, implemented before the onset of a disease.

The aim of secondary preventive interventions is to change individual's stress responses before they lead to ill-health. They are therefore most often individual-level interventions, even though they can be, and often are distributed in an organizational context. These are called stress management programs or interventions (SMI) (Hurrell, 2005). Examples of such interventions are mindfulness training, cognitive behavioral therapy, interpersonal skills training etc. However, some researchers regard improving communication and peer support groups as secondary preventive organizational interventions (Holman et al., 2018). Tertiary-level interventions are directed at symptom alleviation, when the stress process has gone "out of control". These interventions are individual-level therapeutic interventions, and their aim is to minimize suffering, and/or prevent condition becoming chronic, but they can also be disability management or outplacement.

As stress is a complex phenomenon, complex solutions/interventions of many types and on many levels are needed. However, primary prevention is important both from an ethical point of view (prevention of suffering) and from a societal (economic) point of view, since the same risk factors in the psychosocial work environment that are associated with stress and

stress-related ill-health; can cause production loss (Lohela-Karlsson, Hagberg, & Bergström, 2015).

In addition to the above classification (primary, secondary or tertiary), organizational-level interventions for stress prevention can be classified according to the area of work practices they are trying to improve. They can, for example, target work-life balance (e.g. flexible scheduling); employee development (e.g. leadership development, problem-solving); health and safety (e.g. wellness screening, safety training); recognition (e.g. bonuses, acknowledgments); or employee involvement (e.g. participation in decision making) (Grawitch, Gottschalk, & Munz, 2006; Schonfeld & Chang, 2017b). The intervention in this thesis is a primary preventive intervention on organizational level which aims to improve employee involvement in decision making, but also targets recognition and employee development.

Organizational-level interventions are furthermore divided into psychosocial interventions (participatory actions research, job redesign interventions, interventions focused on managers), and socio-technical interventions, i.e. workload interventions, work schedule interventions and work procedure interventions (Hurrell, 2005). Finally, they can be categorized depending on if they affect perceived job demands, job control, workplace social support, clarity in work tasks/roles, work processes or organizational communication (Giga et al., 2018). The intervention explored in this thesis is a psychosocial intervention that has theoretical potential to affect most of the factors described by Giga et al. (2018), as will be outlined in the section 3.7.4.

3.8.2 The evidence for the effectiveness of organizational level interventions for stress prevention

Most work-stress related intervention studies are individual-level interventions at secondary or tertiary level. Furthermore, research regarding the effects of primary preventive organizational level interventions is inconclusive. For example, in a systematic review of occupational stress management interventions, the interventions were categorized as cognitive-behavioral, relaxation, organizational, multimodal and alternative (Richardson & Rothstein, 2008). The review concluded that cognitive-behavioral programs aimed at the individual level had larger effects on psychological outcome variables than other types of interventions. There were few organizational-level interventions, and in the review, they demonstrated no effect compared to the control conditions (no-treatment or waiting list control). Some of the reasons for the lack of an effect may have been the quality of reporting and the research design.

Lamontagne and colleagues on the other hand (Lamontagne, Keegel, Louie, Ostry, & Landsbergis, 2007) reviewed 90 studies of work stress related interventions that reported some sort of evaluation. They categorized them according to whether they were both organizationally and individually focused (high systems approach), organizationally focused

(moderate systems approach), or individually focused (low systems approach). They concluded that high and moderate systems approach studies are effective at both individual and organizational level, while individually focused approaches are effective at only individual level.

Since the reviews by Richardson & Rothstein (2008) and Lamontagne et al. (2007), many further studies and reviews have been published that have a bearing on the topic of the primary prevention of work-related stress and its consequences. However, as research comes from many scientific fields and traditions, stress intervention studies "go under different names" (Sonnentag & Frese, 2012). Furthermore, the findings are still mixed. For example, a synthesis of reviews reporting on anxiety, depression and absenteeism (Bhui, Dinos, Stansfeld, & White, 2012) concluded that there was mixed evidence about organizational-level interventions (e.g. management skill training and support for staff). Another example is a systematic meta-review that examined any interventions that "prevent, treat or rehabilitate a worker with a diagnosis of depression, anxiety or both" (S. Joyce et al., 2016). Researchers found moderate evidence that enhancing employee control has a primary preventive effect on depression and anxiety.

Another systematic review of effects of organizational-level interventions on employee health (Montano et al., 2014) concluded that the probability of reporting effects was marginally but significantly higher if interventions had several targets. The 39 studies included in their review had heterogeneous intervention targets: material conditions (e.g. vibrations, ergonomics), organizational conditions (e.g. team organization, job demands, job control, reward) and work-time related conditions (e.g. intensity of work, deadlines, shifts), or combinations of these. Finally, a systematic review of interventions studies in job design and employment practices (Daniels, Gedikli, Watson, Semkina, & Vaughn, 2017) recommended a system-wide approach that enhances both job design and other employment practices such as performance management systems, resource planning systems, etc.

In summary, there are some encouraging signs. However, most researchers agree that more longitudinal research on organizational interventions is needed. It is difficult to draw conclusions about their effectiveness, with the exception of work schedules (Beckers, Kompier, Kecklund, & Härmä, 2012; Hurrell, 2005; K. Joyce, Pabayo, Critchley, & Bambra, 2010). There is also some evidence of the positive effects of increasing job control (Egan et al., 2007; S. Joyce et al., 2016). Many workplaces are investing in supporting employees' resilience more than working on organizational risk factors, i.e. the psychosocial work environment (S. Joyce et al., 2016). In this thesis, we followed the line of research that considers primary prevention on an organizational level (and by extension also on a community level) to be the most important and ethical way to combat work-related stress and its consequences (Bal & Dóci, 2018; Dollard et al., 2019; Schonfeld & Chang, 2017b), even if research has yet not shown exactly how.

Research has revealed which organizational and psychosocial risk factors (for example job control and unclear goals) are associated with both work-related and health-related outcomes,

(Sverke et al., 2017). Many interventions are trying to improve these factors. However, if work places and their occupational health services are to use certain interventions, they need to know not only that these interventions are built on theoretically valid components (for example trying to improve job control), but also that each specific compilation of components in different interventions has been evaluated and found to be effective.

3.8.3 Organizational level interventions for stress prevention in a health care context

In health care context, organizational interventions for prevention of work-related stress are even more scarce. A review of stress preventive interventions among health care workers (Ruotsalainen, Verbeek, Mariné, & Serra, 2014), the population of interest in this thesis, found that two-thirds of studies examined individual-level interventions such as cognitive behavioral training, mental- and physical relaxation, or a combination of the two. Training communication, organizing collegial support, work schedules and changing working conditions are examples of organizational interventions. Of these, only changing work schedules demonstrated significant effect on stress, which is also supported by other research (Ali et al., 2011; Lucas et al., 2012).

Another, more recent systematic review of RCTs with work-related stress management interventions for nurses in focus (Aqeel Alkhawaldeh, Soh, Mukhtar, & Ooi, 2019), showed that none of ten RCTs between 2011-2019 were on organizational level. Instead they were mindfulness-based intervention, cognitive behavior therapy, yoga, relaxation, etc. Regarding the employees in primary care, the population of interest in this thesis, a systematic review of interventions to promote mental health and well-being in nurses was conducted couple of years ago (Duhoux, Menear, Charron, Lavoie-Tremblay, & Alderson, 2017). Three of eight studies included were interventions aimed at stress prevention (strengthening professional identity and training on restorative supervision). However, two of them were judged to have low methodological quality. Another study included in this review, conducted in 81 Dutch organizations in home care sector (Taris et al., 2003), was a “combined intervention”, i.e. using a smorgasbord of individual, worker-environment, organizational and “other” interventions. Job demand decreased and social support and decision latitude increased. In this study, the outcome was more positive the higher the number of organizational interventions adopted and combined.

In primary care, physicians and especially women physicians have been shown to have high prevalence of stress and burnout (Linzer et al., 2015). In this cluster randomized trial, three types of interventions for this occupational group were assessed. These were communication improvement, workflow changes and quality improvement projects. A variety of specific interventions were used, such as call schedules changes, utilizations of medical assistants to enter certain data (workflow), clinicians meetings individually with leadership (communication), establishing quality metrics (quality improvement) (Linzer et al., 2015).

The conclusion was that there was no post intervention group effect on group averages of clinician outcomes. However, a second, person centered analysis of improvements from intervention baseline, in comparison with control clinicians, showed the effects of specific intervention types on individual physicians. The researchers concluded therefore that clinicians' work stress and burnout can be alleviated by using different programs. The strength of this study was its multicenter randomized design. However, limitations were that there was no overall group effect, that many different interventions were used and uncertainty about the implementation process and "reproducibility". Future studies of the specific intervention types are recommended.

In summary, organizational level interventions for work-related stress prevention in primary care are scarce, the effects are mixed, and the effects of specific interventions need to be further researched regarding both specific occupational groups and for primary care units as a whole.

3.8.4 The intervention evaluated in this thesis

The intervention in this thesis is a primary preventive organizational intervention, compatible with both JD-C and ERI models of work-related stress. It can be classified as targeting employee involvement in decision making, recognition and employee development. It is a psychosocial intervention affecting perceived job demands, job control, workplace social support, clarity of work task and work processes. Moreover, it can be classified as a job design intervention (Daniels et al., 2017) targeting work-place resources, defined as anything that can help employees to attain their work-related goals (Nielsen et al., 2017).

The "Productivity Measurement and Enhancement System" or ProMES is a participatory, organizational intervention. Its primary aim is to enhance productivity. Productivity is measured and the information is fed back to the employees. Productivity is defined as "how effectively an organization uses its resources to achieve its goals" (Pritchard, Harrell, DiazGranados, & Guzman, 2008). Increasing productivity means more outputs for the same inputs, and is seen as a necessary tool for building a "society of plenty while using fewer of our societal resources" (Pritchard, Weaver, & Ashwood, 2012).

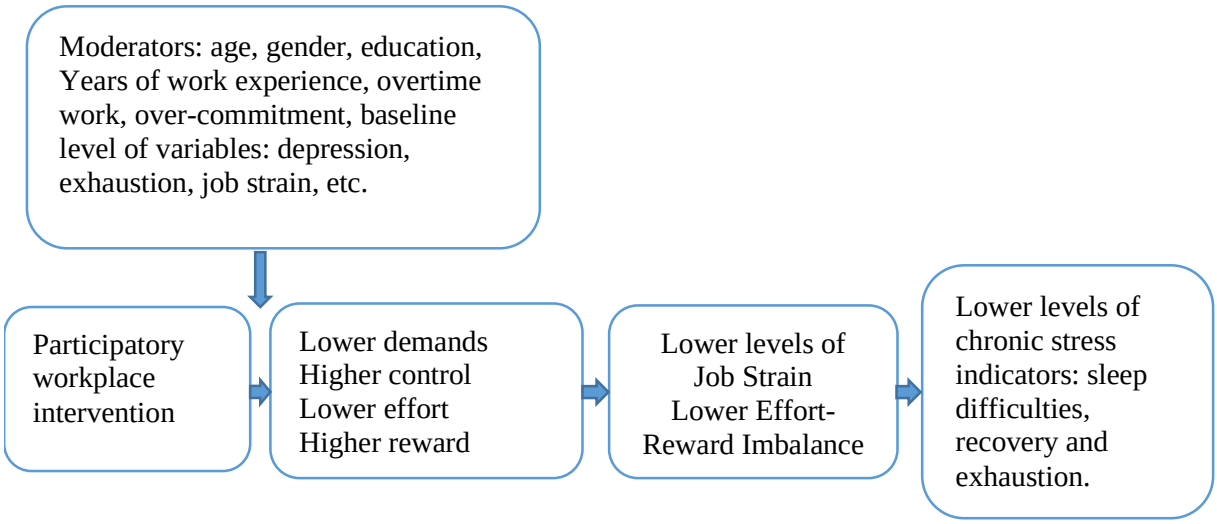
However, the ProMES has its roots in psychology, i.e. it is primarily built on the expectancy theory of motivation (Pritchard et al., 2008). Its aim is to improve organizational performance and productivity by improving employee motivation. The main assumption is that if people in a certain situation believe and expect that their efforts (in Pritchard's terms resource allocation) will satisfy their needs, they will be motivated to use their energy and resources to complete certain actions or tasks. Efforts lead to actions that lead to results, which when evaluated lead to outcomes such as feelings of accomplishment, payment and recognition. In this regard, the theory that the ProMES is based on is compatible with the effort-reward theory of work-related stress.

The connections between actions-results-evaluations-outcomes-needs satisfaction are crucial in ProMES (Pritchard et al., 2008). If any of these connections is broken the motivation process will be damaged. For example, if results are not followed up by evaluations, or if a positive evaluation is not followed up by a positive outcome.

ProMES is furthermore built on the literature about goal setting, feedback, participation, team building etc. Productivity measurement is seen as a tool for clarifying roles and setting priorities, as well as a source of employee feedback and a way to enhance employee involvement. There is a line of research which demonstrates the importance of these processes for performance (Cawley, Keeping, & Levy, 1998; Kluger & Denisi, 1996; Pritchard et al., 2012). Moreover, another line of research shows that unclear goals and role conflicts can have negative effects on both attitudes and mental health (Sverke et al., 2017). It was therefore hypothesized that ProMES by clarifying goals and enhancing feedback could have beneficial effect on mental health. Additionally, participation can according to some research increase the interaction with supervisors, sense of control, support, esteem and reward (Nielsen, Randall, Holten, & González, 2010), and participation is at the core of ProMES.

In the ProMES work process indications are obtained about which work results need to be improved and how they are to be measured. ProMES offers also a possibility for the employees to be involved in decisions about the evaluation system. In that regard it gives employees more control over their working situation, which is compatible with the Demand-Control theory of work stress. Furthermore, it gives feedback about the results of one's efforts, the opportunity to share the information with colleagues and to solve problems before they get too serious (Pritchard et al., 2008; Pritchard et al., 2012). In this thesis it is hypothesized that participative decision making, involvement in the development of the evaluation system, feedback about the results of employees' efforts, information sharing and problem-solving during meetings will lead to feelings of self-efficacy, of having control, of work being more rewarding, and of having better social support. This will, it is hypothesized, lead to lower job strain and lower effort-reward imbalance, as well as to better sleep and recovery. Through these mechanisms lower scores on scales that measure depression and exhaustion are expected. Figure 2, used in Study I, displays the logic model of the intervention used in this thesis. More detailed descriptions of the intervention can be found in Paper I and in the Table 1 in Paper II.

Figure 2. The logic model of the SPA study



Interventions are "distal causes of organizational change" (Montano et al., 2014), and should therefore be evaluated in randomized controlled trials (RCT). Despite all the difficulties, RCT makes it possible to control at least some of the confounding variables. However, as employees are nested in their work units it is not always possible to randomize individuals when working with primary preventive organizational interventions. As a result, the randomization of units is often used instead. So was done in this thesis.

3.8.5 Process evaluation or what's in the "black box"

Even though often seen as a "gold standard", RCT has its own limitations. Qualitative analysis of intervention implementation was recommended already 20 years ago to strengthen the validity of the results of RCT studies (Campbell et al., 2000). Since then the areas of process evaluation and implementation science have continued to develop. In other words: when interpreting the results of an intervention it is as important to pay attention to the context and process issues, as to statistical significance. In this thesis the term implementation means "putting to use or integrating evidence-based intervention within a setting" (Borsika & Brownson, 2012).

The context and the process information give a more comprehensive understanding of the variance in the outcomes (Biron & Karanika-Murray, 2014). In a process evaluation the aim is to answer questions about why and how an intervention succeeded or failed. Process evaluation can for example give information about participant's views on and satisfaction with the intervention, information on dose or reach, fidelity to intervention components, and variations in subgroups (Munro & Bloor, 2010). Information is usually collected by survey questions, semi-structured interviews, focus groups, and documents. A mixed method approach is sometimes used as a research design, i.e. a design combining both qualitative and quantitative methods (Creswell, 2009).

One of the more influential models for process evaluation comes from public health research and was developed by Linnan and Steckler (Linnan & Steckler, 2002). They present seven key process evaluation components: a) Context (environmental aspects that possibly influence intervention implementation); b) Reach (the proportion of the target population that participates in the intervention); c) Dose delivered (number of components delivered by intervention providers); d) Dose received (active engagement of target population); e) Fidelity (has the intervention been implemented as planned); f) Recruitment (procedures to approach participants in the intervention); and g) Implementation (a composite score including reach, dose delivered, dose received and fidelity). Additional process evaluation variables may be pretesting procedures, participant satisfaction, quality measures, etc.

A few years ago, some researchers characterized our understanding of process and context variables in organizational stress intervention research being in its embryonic phase (Biron & Karanika-Murray, 2014). Researchers did not pay enough attention to how, when, and why interventions are effective or not effective in reducing or preventing stress. Building on previous work by Cox and Nielsen (Cox, Karanika, Griffiths, & Houdmont, 2007; Nielsen & Abildgaard, 2013), Biron and Karinka-Murray (2014) suggested that a comprehensive table of research questions should be used in documenting and evaluating the context and the process at every phase of an intervention implementation. Research questions follow the problem-solving cycle: initiation and preparation, designing intervention plans, implementation, and evaluation. Some examples of questions in different phases are a) motives, readiness to change, and level of commitment (initiation and preparation); b) feasibility, participation of stakeholders, and commitment of senior management (designing intervention plans); c) managers' workload, dose received, and quality of delivery; d) hindering and facilitating factors, linking process and outcome evaluation, subgroup analysis (evaluation). Furthermore, Biron and Karinka-Murray (2014) state clearly that the process evaluation had to be connected to the outcomes of the intervention, if it was to be more than "anecdotal".

Another significant and broad framework, and the one used in this thesis, is the guidance for the development of process evaluation of complex interventions, developed by the United Kingdom Medical Research Council (MRC) (Moore et al., 2015). The process evaluation connects the intervention and its causal assumptions with the outcomes, by describing the context, the implementation of the intervention and the mechanisms of impact. The context is about the external factors which influence the implementation process, i.e. anything that can hinder or facilitate the working of the intervention in a specific context. The implementation is about the delivery itself, for example resources needed and used. It is also about what is delivered, for example dose, reach and fidelity to the intervention manual. Fidelity can be defined as "the extent to which the implementation of an intervention adheres to the protocol or program model originally developed" (Kwak, Wåhlin, Stigmar, & Jensen, 2017). Without knowing what was implemented and how it was implemented, it is difficult to judge if an outcome really can be the result of the intervention as described in the logic

model of a study. The mechanisms of impact describe participants' responses and interactions with the intervention but can also describe other mediators, hypothesized by the theory. Use of the MRC framework allows us to incorporate other frameworks to describe key functions of process evaluation. In this thesis we used the Consolidated Framework for Implementation Research (CFIR) for description of Context (Damschroder et al., 2009), while for the description of the Implementation process and mechanism of impact we used other frameworks (Linnan & Steckler, 2002; Proctor, Silmere, & Raghavan, 2011).

3.8.6 Summary

In summary, work stress is a widespread phenomenon, not least in the health care sector. The consequences are tangible for the individual, for organizations and for society. Many different work-related theories regarding sources of stress exist, with JDC-S and ERI receiving most support in the research. The literature about the risk factors for work-related stress is enormous, especially regarding high job demands, low job control, high effort and low reward. However, less is known about efficient interventions. This indicates that more research is needed, preferably in the form of controlled trials supplemented by process evaluation. The productivity measurement and enhancement system (ProMES) is a well-researched intervention regarding its efficacy for productivity enhancement, and it has the theoretical potential to influence work-related risk factors. Moreover, stress is a complex phenomenon and therefore, in terms of methodology, the use of several data collection methods is desirable. For the longitudinal examination of the trajectories of stress new technology and single-item measures could be an alternative procedure.

4 METHODS

4.1 THE CONTEXT

This thesis is a part of a research program funded by Swedish Council for Working Life and Social Research (FORTE), with focus on promoting and developing evidence-based practice in Swedish occupational health services (OHS). The research group at the Unit for the Intervention and Implementation Research for Worker Health, Institute of Environmental Medicine at Karolinska Institute, has developed and published several evidence-based guidelines for occupational health services. These address, for example, management of low back pain (Jensen & FöretagshälsansRiktlinjegrupp, 2013); promoting of good dietary habits and physical activity at workplaces (Kwak et al., 2012); and managing of work-related mental ill-health (Jensen & FöretagshälsansRiktlinjegrupp, 2015). The guidelines for the prevention and treatment of mental ill-health recommends that employers should invest in preventive measures, for example by regularly surveying stress/mental health and identifying specific risks in their own work context. It is recommended that they should follow up surveys by efforts/interventions which target the identified risks. Accordingly, one of the planned activities

of this research program was the evaluation of cost-effective and scientifically-sound methods to be used by occupational health services in their work to prevent of ill-health and promote health and work ability. The project that this thesis is built on is called the Stress Prevention at Work (SPA) project. Its aim was to evaluate one of these methods for organizational intervention, namely ProMES. The project was carried out in collaboration with a primary health care division of a county council in central Sweden and their occupational health services.

4.2 STUDY DESIGN, PARTICIPANTS AND DATA COLLECTION

4.2.1 Study design

Several methods and study designs were used in the thesis; quantitative (studies I-IV) and qualitative methods (studies I and II); cross-sectional (Study II and III) and longitudinal designs (studies I, III and IV); as well as multiple data collection methods (questionnaires, SMS-data collection, administrative data, check-lists, project logbook, individual interviews and a focus group interview).

The SPA study consisted of a two-armed randomized controlled trial (Study I, the effectiveness Study) and a process evaluation of a trial (Study II, with mixed method design). Study III was a methodological study, examining the psychometric properties of a single-item stress question. Study IV was an explorative study, using a longitudinal design.

The SPA study is registered in ClinicalTrials.gov (ID: NCT02694211). The randomization was at unit level and a web-based tool for randomization was used (www.random.org). As some units had a very small number of employees, we decided to randomize two units to one comparison group, because even a small drop out or amount of missing data would have made statistical analysis impossible. It was an open cohort study because the number of participants in the units at different measurement times changed due to staff turnover, parental leave, study leave, etc. The intervention group worked on the intervention according to ProMES, with an experienced consultant. The comparison group received treatment as usual (TAU).

Quantitative data for studies I, III and IV were collected by questionnaires at two baselines and at 6- and 12-month follow up. At the same time, the objective organizational data (e.g. hours worked, number of patient visits, number of administrative tasks, etc.) were collected monthly from the health care divisions' central administrative office from May 2013 to September 2014. In addition, the data from two time series of weekly administered SMS with a single-item stress question were collected during the first 12 weeks after the intervention start and for 26 weeks after the 6-month follow up.

For the process evaluation (Study II), a process evaluation questionnaire to gather quantitative data was administered two months after the 12-month follow up. Qualitative data was also collected during the intervention including checklists, administrative data, project logbook.

After the 12-month follow up one focus group and three purposefully sampled semi-structured interviews were conducted.

In Study III, cross-sectional data from the RCTs two baselines measurements and 6-month follow up measurement (i.e. data from employees who answered the questionnaire for the first time) were used to examine the convergent validity of the single-item stress question. The data on stress for employees who had no sick-leave and no signs of depression or exhaustion at the baseline was used to examine its predictive validity.

In Study IV, the association between the stress experience and objective, quantitative workload was examined using SMS data. Furthermore, the number of participants was shifting in Study IV depending on the research question. For example, to examine group level associations between the experience of stress and objective organizational measures of quantitative workload, we used the data from all participants who answered by SMS at least 80 % of weeks, regardless of whether they completed questionnaires. On the other hand, to describe the intra-individual variability we used only the data from employees who answered by SMS at least 80 % of weeks and answered questionnaires.

Table 1 displays an overview of the quantitative data collection in studies I-IV, i.e. measurements, eligible participants, responders and the timeline. First measurement (M0) was carried out in May 2013, which was the planned date of the start of the intervention. However, because of some practical obstacles the start of the intervention was postponed to the fall. Another baseline measurement was consequently conducted in September 2013. However, M0 was used in the validation study (Study III).

Table 1. Overview of quantitative data collection in study I-IV, i.e. measurements, eligible participants, responders and timeline.

Measurement	**M0**	**M1**	**M2**	**M3**
Date	May 2013	September 2013	March 2014	September 2014
Intervention start/stop		Start		Stop
Eligible participants, N	121	118	123	130
SMS[1] I and II		SMS I strats	SMS II strats	
		Study I		
Eligible, I/C, N		57/61	59/64	67/63
Responders I/C, N (%)		49 (86 %) / 40 (66 %)	50 (85 %) / 47 (73 %)	55 (82%) / 50 (79 %)
Objective organizational data for I and C	Gathered monthly	Gathered monthly	Gathered monthly	Gathered Monthly
		Study II		
Process evaluation questionnaire[2]				49 (73%)
		Study III		
Convergent validity:				
First time responders, questionnaire	83 (69 %)	Plus 18	Plus 17	
Predictive validity:				
Responders SMS I and questionnaire		83 (70 %)		
Non-depressed		80 (68 %)		64[3]
Non-exhausted		62 (75 %)		52[3]
No sick leave		74 (89 %)		62[3]
Reliability		Separate sample		
		Study IV		
All responders SMS I and II		94 (80 %)	97 (79 %)	
SMS responders 80% of weeks		90 (76 %)	82 (67 %)	
SMS responders 80% of weeks plus answered questionnaire		80 (68 %)	80 (65%)	
Objective organizational data		Gathered monthly	Gathered monthly	Gathered monthly

[1]SMS I series=12 weeks; SMS II series=26 weeks
[2]Intervention group, administered 2 months after the 12 months follow up
[3]Still employed at the time for the 12 months follow up

4.2.2 Recruitment

The participants in the four studies were employees of a Swedish primary health care division located in the central Sweden. The health care sector was chosen on the basis of Swedish statistics about populations highly exposed to stress and stress-related ill-health (Arbetsmiljöverket, 2012).

One inclusion criterion was that at least 20 % of employees in selected units should be experiencing job strain (i.e., a combination of low job control and high job demand). The second criterion was that units should not be conducting or planning to conduct any other organizational interventions. However, this was also a selective recruitment as the research team selected and approached this specific county council after consulting the partners in our practice-based research network mentioned. Of the 29 primary health care units forming this health care division and approached by the research team, four were not planning other interventions and agreed to participate. The decision to participate was made by consensus at unit staff meetings. The units were than randomized to an intervention or a control group. All individuals working on a regular basis at the units at the time of the study were invited to participate.

A separate convenience sample was used for the reliability sub-study in Study III. The inclusion criteria were older than 18, gainfully employed, having a mobile phone and agreeing to participate.

4.3 INTERVENTION

The main steps in the intervention are displayed in Table 2 below and described briefly on pages 32-33. A more detailed description of ProMES is presented in Paper I and in the original guidelines (Pritchard et al., 2012). The consultant who was working with the intervention group was an external, certified and highly experienced consultant in ProMES.

Table 2. Steps in the intervention

Main steps	Content
a) Formation of one or more design teams.	Consisting of representatives for employees. Design teams inform and collect input from the rest of employees between the design groups meetings.
b) Identification of objectives.	Identification of important and desirable results for the group and/or organization. General in nature.
c) Development of indicators.	Operationalization of results. Objective, quantifiable measures of output.
d) Approval from management.	Management agrees with objectives and the operationalization.
e) Development of contingencies.	Operationalization of relation between results and evaluation. Graphic utility function.
f) Approval by management.	Management agrees with contingencies.
g) Development of feedback reports.	Collection of data on indicators, printed feedback reports distributed to employees.
h) Conducting of feedback meetings.	Core components: information on results, evaluations of results for the determined time-period and, if needed, improvement/development of new strategies.
i) Monitoring over time.	

The intervention started with a whole day workshop in September 2013. During this workshop the unit members worked on their vision and the overarching objectives (high quality, good deliverability, skills development, a health-promoting and motivating work environment). After the initial workshop the unit was divided into one overarching design team and seven occupational design teams that consisted of 2–4 persons. Between design team meetings, occupational group meetings and workplace meetings were used to share information, get input from all employees and discuss and work on the development of evaluation systems. Written information was shared by email and on notice boards. Another whole day workshop for the entire unit was held in December 2013, when the occupational subgroups presented their work so far and working jointly on the overarching indicators “high quality” and “skills development”. The subgroups then continued to work on their indicators. The professional subgroups worked (discussion to consensus) with their own specific indicators and contingencies related to overarching objectives and every objective had several indicators, such as a total number of completed dictations; number of minutes devoted to skills development, positive feedback given to each other, and so on.

A contingency is the relationship between the amount of one indicator (horizontal axis) and the effectiveness of that amount, i.e., vertical axis, its contribution to the organization (Pritchard et al., 2012). The scale ranges from +100 (maximum, highly positive) to −100 (minimum, highly negative) effectiveness. A zero point is the expected level of effectiveness, i.e., minimum level of acceptable performance, neither good nor bad. The function line shows how a certain level of an indicator is related to effectiveness. The overall range shows the relative importance of each indicator and the zero point translates measurement into evaluation. For a more detailed description see Pritchard et al. (2008).

Feedback meetings are one of the core components of ProMES. It is during these meetings that the collected data (feedback reports) are discussed. The evaluation of the determined time-period is conducted during the meeting, and the employees discuss possible improvements/the development of new strategies.

4.4 CONTROL GROUP

The control groups were waiting list controls. After the first baseline measurement, the members of the research group gave a general feedback on selected results from the baseline questionnaire to the management of the two control groups (a minimal intervention). They were also given written feedback material (power point presentations of results with mean values and explanations of the presented work factors), to use at their discretion. The management agreed not to engage in any new organizational level interventions during the trial.

4.5 MEASURES

4.5.1 Demographics

The following demographic data were collected in all the studies: sex, age, working hours per week, overtime, overall health (from General Health Questionnaire, GHQ), level of formal education, type of household, years at the organization, profession (ten categories including manager) and years at current position. Educational level was categorized into comprehensive school, secondary school, university and higher academic education. Type of household was categorized into one-person household, single parent, couple without children, and couple with children. The professions represented were nurses, assistant nurses, midwives, physiotherapists, counsellors, physicians, biomedical (laboratory) technicians, medical secretaries, dietitians and managers. Years at the organization and years at current position were categorized into less than 1 year, 1-2 years, 3-5 years, 6-10 years and more than 10 years.

4.5.2 Outcome measures

The predictor and outcome variables in studies I, III and IV were collected by means of two validated instruments: the AHA questionnaire (Bergstrom et al., 2008) measuring the psychosocial work environment and employee health, and the effort-reward imbalance (ERI) questionnaire (Siegrist, 1996; Siegrist et al., 2014).

Table 3 presents summary of information about the measures reported in studies I, III and IV. Table 4 displays all the variables used in studies I-IV and their use in the various studies.

Table 3. Measures used in studies I, III and IV with range of possible scores, number of items and Cronbach`s Alpha for the subscales.

		Study I & IV	**Study III**
Subscale and total scores	N of items	Cronbach`s Alpha[b]	Cronbach`s Alpha
SISQ (1-5)	1	-	-
Job demand (1-5)	7	.77; .74; .76	.807
Job control (1-5)	8	.79; .83; .81	.806
Job strain (0/1, 1=strain)	-	-	-
Coworker support (1-5)	2	-	.894
Leadership support (1-5)	3	-	.791
Effort (6-24)	5	.64; .56; .64	.715
Reward (11-44)	11	.77; .73; .66	.782
ERI (>1=imbalance)	ratio	-	-
Overcommitment (6-24)	6	.81; .86; .84	.862
Global sleep quality (1-5)	1	-	-
Sleep diff.[a] (1-5)	1	-	-
Recovery (1-5)	1	-	-
Depression (0-21)	7	.86; .85; .84	.863
Exhaustion (8-32)	8	.84; .82; .84	.815
Sick leave (1-7)	1	-	-

[a] Sleep difficulties due to thinking about work.
[b]Cronbach´s Alpha displayed for the Measurements 1 (baseline), 2 (6 months follow up) and 3 (12 months follow up).

The scales in the AHA questionnaire about job demand, job control and social support were taken from the QPS Nordic Questionnaire (Dallner et al., 2000). The questionnaire also included the scale about depression from the Hospital Anxiety and Depression scale-HAD (Lisspers, Nygren, & Soderman, 1997; Spillane et al., 2007; Zigmond & Snaith, 1983); the scale about exhaustion from the Oldenburg Burnout Inventory-OLBI (Demerouti et al., 2001; Peterson, 2008); a validated question about sleeping problems due to thinking about work (Aronsson, Svensson, & Gustafsson, 2003); a validated question about overall sleep quality (Åkerstedt et al., 2002); a validated question about recovery (Aronsson et al., 2003) and a validated question about sick leave/sickness absence (Reilly, Zbrozek, & Dukes, 1993). The scales in accordance with the ERI model i.e. effort, reward and over commitment, were from the ERI Questionnaire.

The primary outcome measure in Study I was job strain (the relationship between high job demands and low job control). The cut off values for "high" and "low" were in this study taken from previous research into job strain in a Sweden (Bergstrom et al., 2008). Low job control was defined as mean < 3 and high job demands as mean ≥ 2.857). Secondary outcome measures in Study I were effort-reward imbalance (defined as ratio of effort and reward subscales, ratio > 1.0); exhaustion (0–17.59 non-exhaustion; 17.60–21.99 mild exhaustion; 22–32 severe exhaustion); problems with sleeping due to thinking about work and recovery.

In the examination of predictive validity of single-item stress question in Study III, sick leave, depression and exhaustion were used as outcome (dependent) variables. In Study IV, the objective monthly workload data at group level was used as predictor variable, and the outcome variable was monthly experience of stress.

4.5.3 Stress measure

The weekly experience of stress (reported in studies III and IV) was measured by a Swedish version of the single-item stress question or SISQ (Dallner et al., 2000; Elo et al., 2003): "Stress means a state in which a person feels tense, restless, nervous or anxious or is unable to sleep at night because his/her mind is troubled all the time. Do you feel this kind of stress these days?" The responses were on a Likert type scale from (1) "not at all" to (5) "very much". A text message system, SMS®, was used to administer the question ("SMS-Track ApS," 2007). The question was administered every Friday and a reminder was sent the following Sunday. Furthermore, the question was administered together with the baseline, 6 months and 12 months questionnaires.

Table 4. Variables used in studies I-IV.

Variables	Study 1	Study 2	Study 3	Study 4
Sex	X		X	X
Age	X		X	X
Immigrant			X	
Working hours per week	X			X
Overtime work	X			X
Overall health	X			X
Formal education level	X		X	X
Type of household	X			X
Years at this organization	X		X	X
Profession	X		X	X
Years at current position	X			
Individual Stress mean for week1-4			X	
Individual Stress mean for week1-8			X	
Individual Stress mean for week1-12			X	
Individual Stress mean week 1+2			X	
Individual Stress mean week 2+3			X	
Individual Stress mean week 3+4			X	
Individual Stress mean week 4+5 and so on…week 11+12			X	
Individual stress, monthly mean during SMS 1 series (Oct - Dec)				X
Individual stress monthly mean during SMS 2 series (March-Sept)				X
Single item stress question baseline 1			X	
Job strain at baseline 1			X	
Job demand at baseline 1			X	
Job control at baseline 1			X	
Co-worker support at baseline 1			X	
Leadership support at baseline 1			X	
Effort–reward ratio at baseline 1			X	
Effort at baseline 1			X	
Reward at baseline 1			X	
Over-commitment at baseline 1			X	
Global sleep quality at baseline 1			X	
Sleep difficulties at baseline 1			X	
SMS 1 series group stress mean week 1				X
SMS 1 series group stress mean week 2				X
SMS 1 series group stress mean week 3				X
And so on… week 12				X
SMS 2 series group stress mean week 1				X
SMS 2 series group stress mean week 2				X
SMS 2 series group stress mean week 3				X
And so on…. Week 26				X
Time (Hours worked)				X
Total amount of tasks				X
No of patient visits				X
No of administrative tasks				X
No of calls answered				X
Ratio time/total tasks	X			X
Ratio time/patient visits	X			X
Ratio time/admin. tasks	X			X
Ratio time/calls answered	X			X
Ratio No of pat. on unit list/Time	X			
Job strain at baseline 2	X			
Job demand at baseline 2	X			
Job control at baseline 2	X			
Effort–reward ratio at baseline 2	X			

Table 4. Continued: Variables used in studies I-IV.

Variables	Study 1	Study 2	Study 3	Study 4
Effort at baseline 2	X			
Reward at baseline 2	X			
Over-commitment at baseline 2	X			
Sleep difficulties at baseline 2	X			
Recovery at baseline 2	X			
Depression at baseline 2	X			
Exhaustion at baseline 2	X			
Job strain at 6 months	X			
Job demand at 6 months	X			
Job control at 6 months	X			
Effort–reward ratio at 6 months	X			
Effort at 6 months	X			
Reward at 6 months	X			
Over-commitment at 6 months	X			X
Sleep difficulties at 6 months	X			
Recovery at 6 months	X			
Depression at 6 months	X			X
Exhaustion at 6 months	X			X
Job strain at 12 months	X			
Job demand at 12 months	X			
Job control at 12 months	X			
Effort–reward ratio at 12 months	X			
Effort at 12 months	X			
Reward at 12 months	X			
Over-commitment at 12 months	X			X
Sleep difficulties at 12 months	X			
Recovery at 12 months	X			
Depression at 12 months	X		X	X
Exhaustion at 12 months	X		X	X
Sick leave at 12 months			X	
Intra-individual variability				X
Process evaluation variables[1], N=22		X		

[1]See appendix for all the questions in the process evaluation questionnaire.

4.5.4 Measures of workload

The objective quantitative workload (Study IV) was measured by the data collected from the central administration office, i.e. number of hours worked, number of tasks, number of patient visits, number of administrative tasks and number of phone calls answered. This data was collected for each unit separately and used both as raw data and to calculate the ratios between the number of hours worked and the other workload data.

4.5.5 Process measures

In Study II (the process evaluation), a web-based questionnaire was used to measure of participant satisfaction and the experience of working with the intervention. This questionnaire contained 21 questions. It was not a validated instrument, but it was based on the taxonomies described by Proctor (Proctor et al., 2011) and Linnan and Steckler (2002). Furthermore, while constructing the questionnaire for the process evaluation we consulted the ProMES

questionnaire, which was used in the meta-analysis of ProMES effectiveness for productivity. That questionnaire was developed by Professor Pritchard and colleagues (Pritchard et al., 2008). A table displaying all the questions in the evaluation questionnaire can be found in the process evaluation paper (Study II).

4.5.6 Internal missing data and non-responder analysis

4.5.6.1 Non-responder analysis

Table 5 displays available information about non-responders in Study I.

Table 5.

Descriptive data for the non-responders, study I.

	M1		M2		M3	
Variable	Interv. n=8	Control n=21	Interv. n=9	Control n=17	Interv. n=12	Control n=13
Sex, n, %						
Female	7 (88)	18 (86)	8 (89)	12 (71)	9 (75)	8 (62)
Male	1 (12)	3 (14)	1 (11)	5 (29)	3 (25)	5 (38)
Age, years, mean	39.5	46.6	43.3	47.1	45.3	45.0
Profession [a], n, %						
Nurse	3 (37)	7 (33)	1 (11)	4 (23)	3 (25)	1 (8)
Physical therapist	1 (13)	5 (24)	1 (11)	2 (12)	2 (17)	1 (8)
Physician	1 (13)	4 (19)	3 (33)	8 (47)	4 (33)	7 (54)
Medical secretary	0 (0)	1 (5)	2 (22)	1 (6)	1 (8)	0 (0)
Other	3 (37)	4 (19)	2 (22)	2 (12)	2 (17)	4 (30)

[a] *Only groups with more than 5 employees per group are displayed.*

To learn more about the non-responders, a letter was sent after the M2 (6-month follow up) to the control unit with the lowest response rate (35 % non-responders). For ethical reasons, the letter was sent to all employees (so as not to expose those who did not answer) although it instructed that only non-responders should answer. The letter contained the question about reasons for not responding with 12 alternative explanations. These included: "Time given to respond was too narrow", "I do not trust the confidentiality", "I have so much to do that I ignore everything that is not absolutely necessary", and so on. Respondents were also able to give an open answer. Six employees (55 % of non-responders) gave a response to letter. Two did not answer because they were recruited after the M1 and thought it was not necessary to participate when the baseline measurement was missing. One was studying at the time of measurement; one did not read e-mails at all because of a high workload, and therefore missed the measurement while two answered "I have so much to do that I ignore everything that is not absolutely necessary.

In Study II, there were 27 % non-responders to the process evaluation questionnaire (18 of 67 employed at the time). Of these 18, three were employed by the hour, three were newly employed, three were employed but on supplementary training and one was on parental leave.

Regarding SMS series 1 (the data used in studies III and IV) we know that 24 individuals (20 %) were non-responders. Of these, five (21 %) were males and 19 (79 %) females; eight were physicians and nine were nurses. Mean age was 47.3 years. We have not carried out a corresponding analysis for age, sex and occupation for the non-responders in the SMS series 2. We do know, however, that 34 individuals (28 %) were non-responders. Of 89 responders in SMS series 2, 75 individuals also participated in SMS series 1.

4.5.6.2 Internal missing data

In Study I, a small amount data was missing for the ERI questionnaire: 23 of 2231 possible answers or 2 % at M1, 16 of 2323 or 0.05 % at M2, and 60 of 2527 or 2 % at M3. For this missing data, the mean value for the associated occupational group of the individual concerned was imputed (Westergren & Jakobsson, 2006). The data for the AHA questionnaire was complete (it was not possible to continue to the next question without giving an answer).

Regarding the process evaluation questionnaire in Study II, only ten data points of a possible 1421 data points (i.e. 49 responders x 29 questions) were missing.

Regarding SMS series I and II (data used in studies III and IV), only four data points were missing in the SMS series I (four individuals who each failed to answer one week), while 30 values or 1.4 % of all the values were imputed in SMS series II.

As only a small amount of data was missing, the basis for the imputation was Last value carried forward (LVCF) (Elliott & Hawthorne, 2005). However, the decision about the imputed value was not based only on LVCF, but in some more difficult cases also on the "overall picture" around the missing value (e.g. next week' s value and the mean value of the rest of the weeks).

4.6 DATA ANALYSIS

4.6.1 Statistical analysis

All the analyses except for the weighted kappa were performed with IBM-SPSS Statistics V.22 in studies I and III, while version 25 was used in studies II and IV. For the weighted kappa a program was written according to the formula for weighted kappa (Fleiss, Levin, & Paik, 2004). The significance level was set at $p<.05$. The statistical methods used in the studies are displayed in Table 6.

Table 6. The statistical methods used in the four studies.

The purpose of the statistical test	Statistical method	Study I	Study II	Study III	Study IV
To describe the sample	Descriptive analysis	x	x	x	x
To assess the internal consistency of subscales used	Cronbach´s alpha	x		x	x
To study the convergent validity of the single item stress question (SISQ)	Spearman´s rho			x	
To analyze the predictive validity of SISQ	General Linear Model (GLM), univariate			x	
To test the reliability of SISQ (test-retest)	Weighted kappa			x	
To test for differences between the groups at the baseline (e.g. age, working hours, years at organization)	T test for continuous variables	x			
	Mann-Whitney test for ordinal variables	x			
To test for the unadjusted effect of ProMES	Generalized estimating equations (GEE)	x			
To determine which covariates should be adjusted for (e.g age, overtime, depression, experience, overcommitment, etc.)	Modified Poisson regression for variables with ordinal level data	x			
	Linear regression analysis for continuous variables	x			
Adjusted analysis of the effects of the remaining independent variables on the outcome variables	GEE	x			
Differences between groups regarding objective workload data	T test for the dependent variables	x			
Sub-group analysis, differences between active and less active employees	Mann-Whitney test		x		
To examine the association between the quantitative monthly workload and the monthly experience of stress	GEE				x
To analyze the intra-individual variability and form the subgroups	Computation of means and standard deviations				x
	Computation of speed of change by computation of first difference				x
To compare the formed (intra-individual variability) subgroups regarding background variables	Multinomial regression analysis				x

In Study I, the unadjusted effects of ProMES were tested for first. The adjusted effects were tested for after the covariates had been determined. The baseline levels of outcome variables were also included in this analysis. Finally, interaction effects were analyzed.

To analyze the predictive validity of the SISQ (Study III), only employees with no sick leave at baseline were included. Employees experience of stress during the first 12 weeks of the intervention was measured weekly by a single-item stress question, administered through SMS and examined in relation to the data from the 12-month follow up questionnaire.

Test–retest procedure (the SISQ was administered through SMS on two consecutive days) was used to analyze the reliability of this question.

In Study IV, individuals' weekly stress ratings were computed into their monthly mean, since the objective workload data of units was also collected on a monthly basis. In the analysis, the monthly workload levels of the different health care units were linked to their employees' monthly experience of stress, and in that way the unit was controlled for. To analyze the association between the intra-individual variability in stress experience, background variables, and baseline levels of exhaustion, depression and over-commitment, means (M) and standard deviations (SD) of a time series were calculated for each employee. In addition, by calculating so-called first difference, the speed of change in stress experience was analyzed for every individual. Four sub-groups were formed on the basis of a frequency table of means and standard deviations and four sub-groups were formed according to the rate of change in stress experience. These were called LL (low M and low SD), LH (low M and high SD), HL (high M and low SD) and HH (high M and high SD). A separate analysis was performed for the SMS series 1 and 2.

4.6.2 Qualitative analysis

In Study I, context information about all participating groups and information about the control group activities was collected for descriptive purposes (Paper I). In Study II, a content analysis was used for the analysis of collected qualitative data (three interviews and one focus group). A content analysis is a systematic text analysis that can use either inductive or deductive procedures (Mayring, 2000). In Study II, a deductive procedure was used. In other words, passages of text were categorized under theoretically derived categories. The categories for the deductive analysis were taken from the Consolidated Framework for the Implementation Research, CFIR (Damschroder et al., 2009). Two researchers coded the material and discussed disagreements to the consensus with a third researcher. To decide whether the influence of each coding on the implementation was positive or negative, two researchers coded the valence according to the rating rules in CFIR. However, the categorization is only the first step in the analysis and can lead to description of themes. Themes are "the red thread running through several categories" (Graneheim, Lindgren, & Lundman, 2017). All the steps in the analysis are described in paper II.

4.7 ETHICAL CONSIDERATIONS

The studies in the thesis were conducted according to the principles of Helsinki Declaration of Helsinki and the Ethical Review of Research Involving Humans Act. Studies were approved by the Stockholm regional Ethical Review Board (2012/2200-31/5).

All the data collected respected the privacy of participating employees. Informed consent was collected for every study. Measures to ensure confidentiality were taken during the entire project, regarding both data collection and storage. The data are stored in accordance with Karolinska Institute guidelines.

Conducting an interventions study raises many ethical issues. What should be done, for example, if a survey indicates that some employees according to the cut offs, are severely depressed? All ethical issues of any size which emerged during the course of the study were continuously discussed by the research group. For example, when data about reasons for non-responding were collected, letters were sent to all employees and not just to non-responders. In that way, non-responders were not exposed. Another important issue was not to expose (during the intervention process or in scientific papers) neither individuals nor small occupational subgroups.

One of the important issues was that the intervention made demands of the participating employees. Their participation required both their time and energy, not only for the surveys but also, in the interventions group, for working with ProMES. This was especially the case for the manager, group leaders and participants in the design teams. This question was not easy. However, research has shown that participation in work processes can be beneficial for the employees. Moreover, if they had not worked with ProMES, employees in the participating units would have been involved in another activity planned by the primary health care division. In addition, ProMES has in earlier research shown some promising signs regarding its stress preventive measures, which we hoped would be the case in this trial too. Finally, the informed consent regarding participation was given by all the employees in all groups during their workplace meetings.

5 SUMMARY OF MAIN FINDINGS

5.1 STUDY I

Study I (the effectiveness study), indicated that there were no significant differences between the intervention and the control group at any measurement point for the background variables (age, working hours, overtime, overall health, and so on). Mean age of the total study population at baseline (N=89) was 46.1 years with a standard deviation of 11.6 years. The majority were women (84 %). Eighty-three percent of employees had a university or higher academic education. Most had worked for five or less years at current workplace. Table 7 displays the most important background data at baseline for the intervention and the control

group separately. Complete information about the background variables for all measurements in Study I can be found in Paper 1, Table 2.

Table 7. Descriptive data, intervention and control group at baseline measurement (M1).

	(M1)	
Variable	Intervention n=49	Control n=40
Sex, n (%)		
Female	42 (86)	33 (83)
Male	7 (14)	7 (17)
Age, years, mean (SD)	44.4 (12.2)	48.2 (10.6)
Working hours[1], mean (SD)	37.3 (5.8)	37.8 (4.6)
Overtime work, mean, (SD)	5.3 (6.5)	5.5 (7.3)
Overall health[2], mean (SD)	1.94 (0.8)	1.97 (0.8)
Formal ed. level, n (%)		
Comprehensive school	0 (0)	0 (0)
Secondary school	9 (18)	6 (15)
University education	39 (80)	32 (80)
Higher academic ed.	1 (2)	2 (5)
Years at this organization, n (%)		
Less than 1 year	10 (20.5)	1 (2.5)
1-2 years	12 (24.5)	10 (25)
3-5 years	10 (20.5)	13 (32.5)
6-10 years	8 (16)	6 (15)
More than 10 years	9 (18.5)	10 (25)
Profession, n (%)		
Nurse	13 (27)	12 (30)
Physiotherapist	7 (14.5)	5 (12.5)
Physician	10 (20.5)	3 (7.5)
Medical secretary	6 (12)	5 (12.5)
Midwife	4 (8)	4 (10)
Laboratory technician	3 (6)	2 (5)
Assistant nurse	3 (6)	3 (7.5)
Counselor	2 (4)	3 (7.5)
Manager/Assist. Man.	1 (2)	2 (5)
Dietitian	0 (0)	1 (2.5)

The main analysis found no significant differences between the groups regarding the primary outcome, i.e. the change in levels of job strain at 6- and 12-month follow ups (RR= .947; 95 % CI = .730; 1.229). No significant differences between the groups were found for the secondary outcomes, i.e. changes in levels of ERI, effort, reward, problems with sleeping, recovery and exhaustion over time. Appendices 2 and 3 in paper I display all the parameter estimates.

The analysis did however reveal several significant interaction effects. Firstly, a significant interaction was observed between group, exhaustion and ERI. Subjects high on exhaustion at baseline had significantly higher ERI at follow up, compared to subjects who did not show signs of exhaustion. However, this was true only for the intervention group. Furthermore (also

in the intervention group), a significant interaction was observed between time and effort. Effort increased over time for those employees with high effort at baseline (i.e. effort > 18.4). On the other hand, effort decreased over time for employees in the intervention group with low effort at baseline. In addition, the intervention group employees who were low on exhaustion at baseline (exhaustion < 17) experienced their work as significantly more rewarding at follow up, compared with the control group. The reverse was true for the intervention group employees with high scores for exhaustion (exhaustion > 22) at baseline. Figure 3 is a visual representation of the interaction effect for reward. The blue line is a difference between the control and the intervention group. The green line is lower bound 95 % confidence interval (CI), and the grey line is the upper bound 95 % CI. The gray line crosses the horizontal line at baseline OLBI = 17, indicating that the difference between the control and the intervention group is starting to be significant at and below that score. In other words, control group employees (scoring 17 or lower on OLBI at baseline) feel that work is less rewarding at follow up then intervention group employees (scoring 17 or lower at baseline).

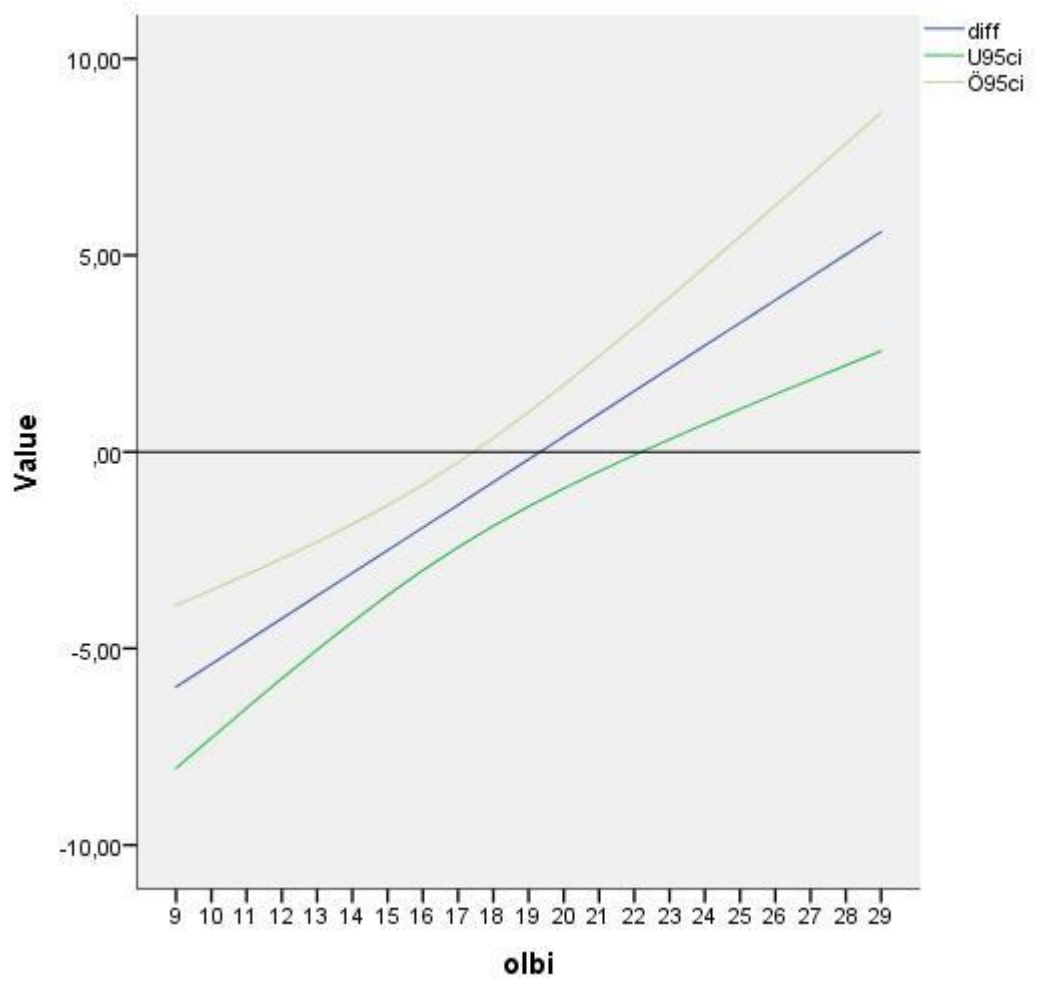


Figure 3. A visual representation of the interaction analysis, reward (measured by ERI questionnaire) as outcome. Differences in reward between the intervention and the control group, for different values of exhaustion at baseline (M1).

Some differences between the groups were also revealed by the monthly gathered objective organizational data. T-test for dependent observations indicated significant differences for workload between the intervention and control group. The differences were such that the intervention group had significantly less time per work task, more administration per hour worked, and more telephone calls answered per hours worked during the entire trial. Moreover, the number of patients on the units' lists rose faster for the intervention group than for the control group. Differences between the groups were not statistically significant regarding the number of patient visits per hour worked or the ratio of "number of listed patients at the unit" and "total number of hours worked". This information is important for the interpretation and discussion of trial results. Figure 4 is a visual representation of differences in workload between the intervention and the control group from May 2013 to September 2014.

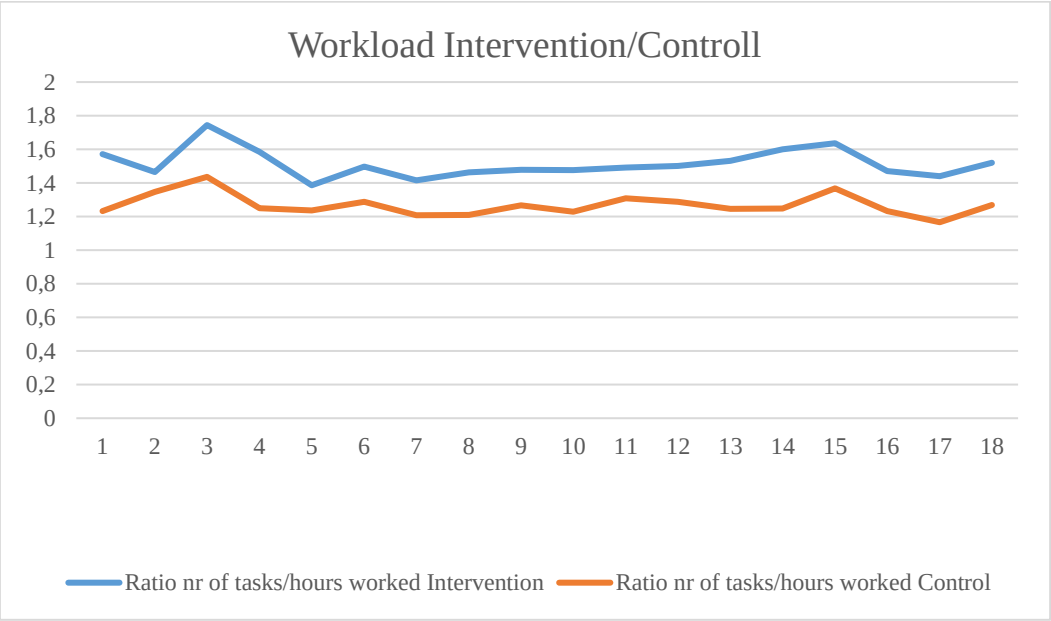


Figure 4. Differences in workload between the intervention and the control group (i.e. the group level ratio between the number of total tasks and the number of hours worked), May 2013 to October 2014. The intervention started in September 2013.

In conclusion, no significant effects of the intervention (ProMES) were found for job strain, ERI, sleep, recovery or exhaustion. However, for non-exhausted employees in the intervention group, work was significantly more rewarding at the follow up compared to the control group, while employees in the intervention group who showed signs of exhaustion at baseline reported a deterioration for ERI, effort and reward at follow up. Objective organizational data show that the workload was higher in the intervention group throughout the trial.

5.2 STUDY II

Regarding fidelity to the intervention guidelines, the process evaluation in Study II showed that several occupational units never reached the point in the intervention at which regular meetings with written feedback reports were given. In other words, not all steps in the intervention were implemented. The intervention was adapted to the context with seven design teams (one for each profession) being formed, rather than one large design team.

The recruitment outcome was not either as intended, i.e. of 29 primary care units only four agreed to participate. However, this was mostly because the other units were starting other activities which made them non-eligible. The reach in the intervention unit was satisfactory as 61 % of employees participated in the work of some of the seven design teams at some point in time, and only 2 % considered themselves to be completely passive with regard to participation in the intervention.

Dose delivered varied between the occupational groups. Some occupational groups' design teams met the consultant six or seven times, while others met him only one to three times. However, there was a high participation rate in workshops for all employees and in workplace meetings when ProMES was discussed between 60 and 93 %. The consultant spent a total of 558 working hours with the units.

The process evaluation questionnaire had a high response rate (73 %). Employees found ProMES postive in several regards, for example its potential to clarify what is important and to increase employee participation in decision making. They were also positive about its potential to give employees more control, and more opportunity to make improvements and fix problems before they become serious. However, a large proportion of the employees found involvement in ProMES time consuming.

The focus group and the three individual interviews provided information about the facilitating and hindering factors, associated with the implementation of ProMES in this context. The three main hindering factors were that ProMES was not fully implemented as intended, difficulties in obtaining the statistical data from the central administration office and shortage of time. The latter was influenced by two other factors, i.e. staff turnover and related staff shortage. Some of the facilitating factors were the support of the first line management and the engaged and accessible consultant. Table 8 displays the main results of the content analysis of the transcribed material.

Table 8. The table displays the facilitating and hindering factors when implementing ProMES in this context, categorized under the CFIR domains intervention characteristics, inner setting and process.

Facilitating factors (+)	Hindering factors (-)
Intervention characteristics	
ProMES´ contribution with structure	Measures seen by some as irrelevant
Help to reflect on the big picture	Measurement of quality missing
Facilitation of collaboration	Time consuming
Facilitation of the distribution of tasks	Dependency on consultant and his data program
Statistics from ProMES providing an overview	Some difficulties to understand ProMES and to interpret the graphical presentations produced by the program
Opportunity for better planning and documentation	Technical problems (independent of ProMES) hindering data collection for certain indicators, e.g. patient satisfaction
Reflection and possibility of adjusting work procedures	
Improving feedback process and help creating good working atmosphere	
Inner setting	
Engaged first line manager	Shortage of staff and time pressure resulting of that shortage
Manager communicating the importance of everyone´s engagement	High staff turnover and resulting time requirements for introduction and supervision of new employees
	Overcrowding
	Difficulties obtaining the needed administrative data from the central administration office
	Extra work due to manual data collection for some indicators
	Increasing number of patients
Process	
Accessible, committed, motivating and enthusiastic consultant	Engagement of unit members varied, partly due to the group size
Consultant giving practical help, his point of view on the work and initiating work on difficult issues	Noticing that the results were similar from week to week affected the momentum regarding regular feedback
Noticing progress boosted the willingness to continue	Too few meetings between the subgroups
	Not enough time for meetings with the entire unit
	Not knowing enough about the other groups work
Future reorganization into three care teams (more spin in the work due to fewer employees in each team)	Future reorganization (must deal with other things)

5.3 STUDY III

In Study III several reliability and validity tests were conducted for the single-item stress question (SISQ). The internal consistency of the subscales used in this validation of SISQ were computed by Cronbach' s alpha (see Table 3). They were satisfying, i.e. Cronbach' s alphas were observed between .715 (effort) and .894 (co-worker support).

The test-retest analysis of the reliability of SISQ showed that weighted kappa was between .804 and .868, i.e. regarded as acceptable stability (Schaeffer & Levitt, 1956).

The analysis of the convergent validity (Spearmans' rho) showed that a single-item stress question (SISQ) was significantly positively associated with job demands (rho= .357), effort (rho= .330), over-commitment (rho= .0627), exhaustion (rho= .580) and depression (rho= .456. The positive association between SISQ and job strain (rho= .182) was non-significant. The results also demonstrated significant negative associations between SISQ and supervisor support (rho= -.199) and co-worker support (rho= -.299). Furthermore, the association was significant and negative between SISQ and job control (rho= -.218,) and SISQ and reward (rho= -.347). These results support the convergent validity of the SISQ.

Regarding predictive validity, the SISQ administered through SMS predicted sickness absence at 12 months follow up. For example, for the predictor variable "SISQ mean value for week 1-2", the beta value for the dependent variable sickness absence increased by .357 units (95 % CI = .045; .648) for every step of increase in the SISQ. The predictor "mean value weeks 1-8" (B = .413; 95 % CI = .090; .736) and "mean value weeks 1-12" (B= .451; 95 % C = .121; .780) remained significant even when depression at baseline was controlled for. This means that the SISQ, administered for a few weeks by SMS, could be a useful instrument for screening of stress in working population, and for discovering individuals at risk for future sick leave.

SISQ could also predict depression and exhaustion at 12-month follow up, even when job strain was a covariate. For example, for every step of increase in the predictor variable "SISQ mean value for week 1-4", the dependent variable "exhaustion" increased by 1.753 units (i.e. beta value) with 95 % CI = .759; 2.748. Table 4 in Paper III displays all the results.

Overall, the results of Study III show that the SISQ, administered through SMS, can be useful for screening of stress levels in working population of health care employees.

5.4 STUDY IV

The analysis of the trajectories of stress experience, during the two SMS time-series in this study, showed clear fluctuations of stress over time both for the entire study sample, and for the subgroups with high and low mean stress. The subgroup with a high mean stress experience had a visibly more fluctuating pattern than the sub-group with low mean stress. The stress experienced in the sample was also higher in the fall than in the spring and summer. The highest levels of stress were experienced in mid-October, mid-November and before Christmas.

The analysis also revealed a significant association at a group level between the quantitative monthly workload, measured by different objective organizational data, and the experience of stress during SMS series 2. Stress increased when the number of hours worked, the total number of tasks, the number of patients, the number of administrative tasks and the number of phone calls answered increased. Beta values were highest for the number of administrative tasks and the number of phone calls answered, indicating that these were more stressful than other tasks. Moreover, the association between calculated workload ratios and the experience of stress was statistically significant. The higher the ratios, the fewer tasks were done per hour worked, which was accompanied by higher stress experience. For example, the higher the ratio "hours worked/number of patient visits", the higher the stress experience, indicating higher stress when performance regarding patient "flow" was lower. All parameter estimates were significant on a $p<.001$ level.

When it comes to intra-individual variability, the analysis reveals no differences between any sub-groups regarding age, children at home, years in the organization or overtime neither in SMS series 1 nor 2. However, when one looks at the measures of depression, exhaustion and over-commitment prior to the start of the SMS series, the sub-groups LL (low M and low Sd), LH (low M and high SD), HL (high M and low SD) and HH (high M and high SD) seem to "behave" somewhat different regarding their rate of change in stress experience. We calculated, using the rate of change, that for every increase in scores for depression, exhaustion and overcommitment, the odds of being in HL sub-group increased in SMS series 1. For the SMS series 2, for every increase in scores for depression or over-commitment, the odds of being in either the HL or the HH sub-group increased significantly, while an increase of scores on the exhaustion scale led to increased odds of belonging to the HH sub-group (OR = 1.463, 95 % CI: 1.180; 1.814).

Figure 5 displays an example of two individuals with almost the same standard deviation of their time series, which is the usual way of looking at intra-individual variability. Their standard deviation is almost identical (1.068 and 1.067). Furthermore, neither of them was depressed during the trial, according to their (very similar) scores on depression scale (HAD, not displayed in the figure). However, the two individuals differ in their intra-individual variability in terms of speed of change in stress experience. Individual A018 scores 22 on the exhaustion scale (OLBI), and individual B026 scores 16 on same scale. The cut-offs for the exhaustion in OLBI scale are: 0-17.59 non-exhaustion; 17.60-21.99 mild exhaustion; and 22-32 severe exhaustion.

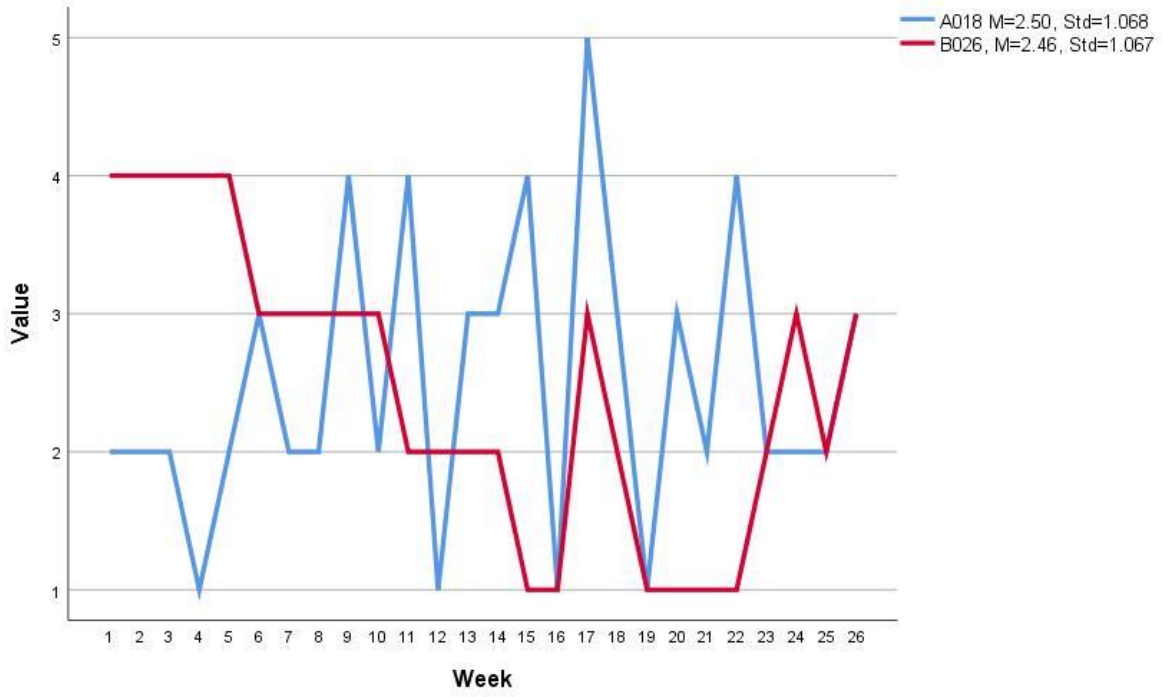


Figure 5. The visual representation of weekly answers on the SISQ in SMS series 2, for two employees of the same sex and similar age, with almost identical means and standard deviations (displayed in the figure), but different change of rate (Change of rate for A18 was Std = 1.8, and for B026 Std = .73).

6 DISCUSSION

The aim of this thesis was to examine whether an intervention which aims to change the employees' work environment by increasing their sense of control and active participation in the definition of job demands, can reduce work-related stress and prevent stress-related ill-health. We intended to accomplish this by examining the effectiveness of the intervention by means of a randomized controlled trial and by examining the implementation process of the intervention. In addition, we examined the longitudinal stress experience in the sample participating in the trial, the association of their stress experience with their objective workload and the intra-individual variability in their stress experience.

In this section, the main findings will first be discussed for studies I and II, and then for studies III and IV. It will be followed by a discussion of methodological considerations. Finally, implications for research and practice will be addressed.

6.1 THE EFFECTS OF AN ORGANIZATIONAL-LEVEL INTERVENTION ON WORK-STRESS RELATED RISK-FACTORS FOR MENTAL ILL-HEALTH

Even though the organizational-level intervention examined in this thesis was hypothesized to reduce job strain and effort-reward imbalance (by increasing job control and esteem reward),

no statistically significant differences in job strain, effort reward imbalance, exhaustion, sleep or recovery were found between the intervention and the control group in the randomized controlled trial (Study I). Our findings are in line with other research, indicating that there is not yet enough evidence to conclude that organizational-level interventions for the prevention of work-stress related mental ill-health are effective (Bhui et al., 2012; S. Joyce et al., 2016; Montano et al., 2014; Ruotsalainen et al., 2014).

The trial did establish however, that employees in the intervention group with no signs of exhaustion at baseline described their work as more rewarding at follow-up, while no change was detected for the employees in the control group. This was despite of the fact that the objective workload was higher in the intervention group compared to the control group during the entire intervention. Moreover, among employees in the intervention group who scored low on effort at baseline, their perceived effort decreased between the 6-month and 12-month follow ups. It is possible that their perception of lower effort and increased reward was due to the intervention. However, we cannot exclude the possibility that it was due to other, unknown confounding factors.

Employees in the intervention group who showed signs of exhaustion at baseline, had significantly higher scores on exhaustion at follow up. It is possible that this deterioration is a natural occurrence. However, there is also another possibility. The introduction of an intervention might by itself (because of demands implied by participation) contribute to higher job demands, contrary to intentions. In our study this could be the case for those employees who were already vulnerable, such as those who scored high on exhaustion. For these employees, the effort reward imbalance increased with time. The intervention may have come "too late" in their process, and at this point they might have been better served by a secondary or tertiary intervention. The notion that the intervention itself can put burden on employees is consistent with findings from another Swedish trial. The researchers in that trial concluded that the managerial intervention may actually have raised the level of job demand for their subordinates, thereby "leaving no room" for positive effects (Nylén, Lindfors, Le Blanc, Aronsson, & Sverke, 2018).

Any intervention may automatically lead to higher demands during the intervention period, which is hardly a desirable implication. This simple fact may be one of the explanations for the mixed results of some studies of organizational level interventions. This is clearly a challenge. It is possible that the amount of increase in job demand, due to the intervention, should be measured in future research. The employees scoring high on measures of ill-health at baseline, may need additional adaptations when implementing any organizational intervention.

6.1.1 Process evaluation

Even though RCT is a gold standard in many fields of research, some researchers question the risk of solely relying on effect evaluations in organizational settings. They argue that by

concentrating only on effect-outcomes, classic RCT can fail to detect implementation failure or positive outcomes (Karanika-Murray, Biron, & Saksvik, 2016). Productivity Measurement and Enhancement System (ProMES) was not fully implemented during the trial described in this thesis. This is one of possible explanations for the lack of its hypothesized effects on known risk-factors for mental ill-health.

Implementation failure and limited effects of organizational-level interventions might be due to many factors such as contextual conditions, intervention characteristics and low ownership/participation (Biron, Gatrell, & Cooper, 2010; Holman et al., 2018). The process evaluation in Study II was guided by the UK Medical Research Councils (MRC) guidelines (Moore et al., 2015). According to these guidelines, there is a reciprocal relationship between the context and the intervention, the implementation process, participants responses and intervention outcomes. For the analysis of context and the reciprocal relationships described in MRC, the Consolidated Framework for Implementation Research (Damschroder et al., 2009) was used. It is a meta-theoretical framework that encompass several other frameworks, and has five major domains: intervention characteristics, inner and outer setting, characteristics of individuals and process. In Study II, the inner setting and the intervention characteristics were identified as the two most prominent domains affecting the implementation of the intervention in this trial and will be discussed next.

6.1.1.1 Inner setting

Structural characteristics (e.g. size, staffing) and readiness for implementation (in terms of available resources such as time and access to information) were the two subdomains of inner setting appearing most frequently in the analysis.

One structural characteristic that may have impacted the implementation and the effectiveness of ProMES is shortage of staff. The level of staffing varied in the different occupational groups with some groups being understaffed and some fully staffed. Groups which were fully staffed got further in the ProMES process, participated more, and had fewer problems implementing the different steps of the intervention. As expected, the understaffed occupational groups had greater difficulty finding the time to work with ProMES. It has been shown that organizational and work-related conditions are important for involving health care employees in the organizational redesign of care processes, in particular top-down interventions (Dellve, Strömgren, Williamsson, Holden, & Eriksson, 2018). It is reasonable to believe that the staffing problem observed in this trial is an organizational condition that can have influenced the effectiveness of ProMES. When the problem reaches a critical level it might not matter whether the intervention is top down or bottom-up. Despite staff-shortage the overall participation in the ProMES meetings was still high. However, staff might have had less time and energy to implement what was discussed during the meetings. This could be one explanation for the lack of an effectiveness of ProMES. In addition, the number of patients on the intervention units' list was steadily increasing. With some occupational subgroups being

understaffed, this might have had a certain psychological effect on the intervention group, beyond the actual increase in tasks due to the new listed patients. The unpredictability of changes in perceived workload (for example due to staff turnover) may impact employee well-being beyond the level of the workload itself (Bowling & Kirkendall, 2012).

Staffing shortage can also have impacted the effectiveness of ProMES in other ways. The possible beneficial elements of ProMES (participation, increased control, feedback, problem solving) may have not been enough to affect well-being under the premises that arose after the trial started. If excessive workload due to the bothersome staff shortage is behind the perception of high job demand, supplying the remaining staff with feedback and support (resources) may give some relief, but will not be matching the demands. The empirical evidence for moderating effects of different resources without matching is missing (Jan de Jonge & Dormann, 2006; Häusser et al., 2010). Merely improving resources without targeting the workload does not necessarily create a buffer against future mental ill-health (Fagerlind Ståhl, Ståhl, & Smith, 2018). When the workload increases because of staffing shortage, steps to regulate the objective workload are needed. However beneficial an intervention might be for certain aspects of work (increased control, problem solving, etc.), there may be no statistically significant effect on measured outcomes, if the intervention does not target the most salient current problem (workload due to staffing shortage).

The other contextual factor that may have impacted the effectiveness of ProMES was the difficulty in obtaining the statistical data needed for producing feedback reports. This was despite several attempts by the consultant and the first line manager, and meetings with higher-level primary health care management, persons responsible for IT in the primary health care system, and with the data output group at county council level. It is not clear exactly why it was not possible to obtain the necessary data. However, one interviewee put it this way: "It is wrong to think that we can only go on measuring what the politicians or the leaders of the county council want to measure, wrong not to invest in the fact that working people have thoughts and ideas". Difficulties of obtaining the statistical data is interesting because Lean thinking has been implemented in Swedish health care over the past decade (Kaltenbrunner, Bengtsson, Mathiassen, & Engström, 2017), and a great deal of measuring is carried out in Swedish primary health care. It might be an indicator of the importance of involvement of highest leadership when implementing any intervention, because resources (for example, time and personnel who can be assigned to retrieve the necessary data) need to be sanctioned at a highest level.

It could be argued that ProMES itself is "too complicated", if it is so difficult to retrieve data needed. Nevertheless, it could also be a matter of the level on which the intervention is implemented. Even though many interventions are called organizational (because they target organizational risk factors), in practice they are often group-level interventions. In large organizations such as the health care service, implementation on organizational level may require decisions made at very senior levels, including political ones (Aarons, Ehrhart,

Farahnak, & Hurlburt, 2015). Not being implemented on a broad organizational level may give raise to obstacles when implementing a new group-level intervention.

6.1.1.2 Intervention characteristics

The process evaluation found that overall participants were positive about ProMES. They agreed that ProMES clarified what is important, gave more control and better feedback, and increased participation in decision-making. In other words, according to the participants, ProMES positively affected some of the known risk factors for mental ill-health. Despite this positive evaluation, only 16 % of participants strongly agreed that ProMES was a good method for reducing work-related stress. In addition, only about 50 % would have liked to continue working with ProMES.

There are several possible explanations, which could explain why employees gave positive assessments of ProMES but were unwilling to continue working with the method. One of them might be that the employees, due to non-complete implementation, had not yet experienced all the possible positive effects of the intervention. Another explanation is that, as described above, the context (e.g. staff shortage) was such that it was the wrong time for any kind of intervention. A third explanation could be that the theory is wrong, i.e. that increasing job control is not enough when certain high levels of job demands are reached, and therefore the employees did not see ProMES as appropriate for solving their current problems. We do not know exactly why the participants did not see ProMES, in its current form, as suitable for the prevention of their stress. However, there is another possible explanation. Swedish health care, including the units participating in Study I, have already implemented Lean or other Lean inspired approaches, which sometimes leads to frustration and "clash between managerialism and professionalism" (Dellve et al., 2018). Unlike Lean, which has its roots in the Japanese automotive industry, ProMES derives from psychological research on motivation. Nevertheless, both Lean and ProMES include a lot of quantitative measurements which can lead to frustration. Moreover, several interviewees expressed the need for qualitative measures.

Another reason for why participants were unwilling to continue with ProMES could be because ProMES was perceived as time-consuming and difficult to understand for new employees. Furthermore, employees found it difficult to interpret the graphic presentations and understand all the available charts. They were also reliant on the consultant to receive graphic presentations of their results. The graphic presentations and charts can be presented in many ways and the exact way of graphic presentation is not at the core of ProMES. However, Damschroder and colleagues have highlighted in their implementation framework CFIR that packaging of interventions can have an important impact on implementation (Damschroder et al., 2009).

In Paper I, we argued that ProMES (or any organizational intervention targeting job demands and job resources) should be combined with individual-level interventions for employees already affected by ill-health (i.e. scoring high on depression or exhaustion), and socio-

technical interventions that target workload, work procedures etc. In its present form, ProMES does not include any individual-level components. Recent research has shown that so called multimodal interventions, i.e. interventions involving several levels simultaneously (individual, group, leadership, organization) have greater effects (Holman et al., 2018; Nielsen et al., 2017). Examples of multimodal interventions are the interventions that combine job redesign with broad changes of organizational practices such as human resources management (Daniels, Gedikli, Watson, Semkina, & Vaughn, 2017). Research has also showen that more comprehensive interventions which simultaneously tackle material, organizational and work-time related conditions might give greater effects (Montano et al., 2014).

Multimodal interventions are also recommended by a systematic review of interventions to prevent physicians burn out, or a systematic review of interventions to promote the mental health of primary care nurses (Duhoux et al., 2017; West, Dyrbye, Erwin, & Shanafelt, 2016). However, more research is needed to decide which interventions or even intervention components are most effective for which populations, and we do not yet understand which interventions on which levels should be combined with each other.

6.2 STRESS EXPERIENCE, OBJECTIVE WORKLOAD, AND THE INDIVIDUAL VARIABILITY IN STRESS EXPERIENCE

In studies III and IV we examined employees' longitudinal stress experience by frequent SMS messages, and how this was associated with their objective workload and intra-individual variability. In this section the association with the objective workload will be discussed first, followed by a brief discussion of intra-individual variability, while the discussion of the use of single-item stress question and SMS messages will be discussed in the section about methodological considerations.

Bowling and colleagues (2015) defined workload as "an all-encompassing term that includes any variable reflecting the amount or difficulty of one's work" (Bowling, Alarcon, Bragg, & Hartman, 2015). They see the construct of workload as including both quantitative and qualitative dimensions and mental as well as physical sub-dimensions. In their meta-analysis, they included studies that examine perceived workload, because they see the perception of stressors such as workload as the cause of ill-health or well-being and not the workload itself. Bowling and colleagues (2015) concluded that workload is negatively associated with psychological well-being and positively associated with turnover intentions. However, excessive focus on the "perception" of stress instead on focusing on objective workload can lead to less research into organizational-level interventions and also affect organizations' attitudes.

This thesis focused on the objective quantitative workload measured on a group level. Study IV showed a strong positive association between objective workload (measured as hours worked, number of patient visits, number of administrative tasks, etc.) and the experience of

stress. It also indicated that health care employees were more stressed by administrative tasks and phone calls than by "patient load". This is in line with the final report of the national coordinator who was commissioned by the Swedish government to analyze efficiency problems in the Swedish health care system (Regeringskansliet, 2016). Below is a rough summary of what this final report to the government says about the administrative burden in health care:

The management of health care in Sweden is fragmented and the role of the various actors is not always clear. However, management control is detailed, it challenges professional autonomy and causes administrative overwork. The administrative burden has increased. Even if each administrative requirement can be legitimate in its own context, the social trend to pursue control has led to an overall number of administrative requirements that results in adverse effects such as frustration and increased workload. In addition, outdated IT-based operating systems do not automatically deal with certain types of necessary follow-up administration, which must then be performed manually. In some parts of Sweden, there are very detailed monetary remuneration systems that, in addition to infringing on professional autonomy, also affect the professionals' experience of being controlled and questioned.

This is in line with research showing that factors that hinder health care providers from doing their primary job are usually caused by inefficiencies in a work system (Carayon et al., 2011), in this case the number of administrative tasks. Moreover, the study by Anskär et al. (2019) showed that unnecessary work tasks are associated with role conflicts, and that the greatest problem was organization-related rather than patient-related administration.

In Study IV, we examined the intra-individual variability in stress experience. This is a phenomenon worth attention in many areas of research, as it can be an important "signal in its own right" (Nesselroade & Salthouse, 2004). It can give information beyond the estimated average of stress experience and inter-individual differences. The analysis of the intra-individual variability in our sample indicated that employees scoring high on exhaustion probably have higher intra-individual variability than other employees. They have a higher "rate of change" in their stress experience from week to week, possibly meaning that their stress reactions are triggered more easily than those of depressed or other employees. If this can be proved by further research, it can have both clinical and practical implications, for example regarding return to work practices. Some researchers see depression and exhaustion as separate constructs while others see exhaustion as just another subtype of depression (Schonfeld, Verkuilen, & Bianchi, 2019). However, even if this were the case, different types of depression should not be (and are not) treated in the same manner, for example chronic depression and major depressive disorder (Dunner, 2001; Furukawa et al., 2018). Behavior activation in terms of return to work activities may need to be adapted to the intra-individual variability in stress experience. In other words, if confirmed by research, it may be an important piece of information for organizations and managers who are responsible for supporting their employees and planning activities for their return to work after sick-leave.

6.3 METHODOLOGICAL CONSIDERATIONS

All four studies in this thesis have some methodological limitations, that are important for the interpretation of the results, and these limitations will be discussed for each study sequentially. However, some general considerations will be discussed first, such as study design, power, study population, generalizability and reversed causation.

The original research plan included the randomization of additional intervention and control units than the ones included. However, not unusual in the field of organizational intervention research, this was not possible due to various practical obstacles, such as other activities already being planned, as well as, possibly, lack of interest. Because of the small number of units participating in the study and the small number of participants in the intervention and control group it is likely that the study was underpowered to detect any significant effects of ProMES. The power was calculated prior to the trial start, based on one intervention and one comparison group and a total sample of 118 employees. As work units are "fixed", the number of employees could not be determined by the research team. However, with its predominance of middle aged women, the sample is representative of the Swedish health care sector and we agree that "the accuracy of the selection is more important than the size" (Berntson, Bernhard-Oettel, Hellgren, Näswall, & Sverke, 2016). It means that we can only generalize our findings for stress, exhaustion and workload to the population of Swedish, predominantly middle-aged women working in primary health care, even though we suspect that the findings would be similar in other Swedish health care sectors. Where the effects of the intervention are concerned, additional studies are needed before we can draw any conclusions about generalizability.

The problem of reversed causation, for example if it is job demands that cause stress or if people who are already experiencing stress appraise job demands more negatively, is widely discussed and far from unique to this trial. It has, for example, been shown that reversed causation explains at least some of the association between job demand and well-being (Häusser et al., 2010). The use of longitudinal design gives more support to the first hypothesis, i.e. that job demands lead to stress. However, the question of the timing of data collection remains. Even when exhaustion at follow up seems to be caused by job strain at baseline, it could be that the baseline job strain was affected by some existing degree of exhaustion before the baseline measurement. Nonetheless, most of research supports the notion that psychosocial risk factors are the cause of work-related mental ill-health.

One important limitation of Study I, related to the above discussion about study design and power, is that one of the control groups had high nonresponse rates (for example, 35 % of employees in that control group did not answer at 6-month follow up). One third of these employees failed to answer due to perceived high workload. This could mean that severely affected employees in the control group did not answer questionnaires. This would bias the analysis because the control group's level of job strain at follow up would appear to be lower than it really was. In other words, it would be a kind of a healthy worker effect (Shah, 2009) biasing conclusions about the effectiveness of the intervention.

In Study II, the research team did not have any influence over the implementation of ProMES, and therefore had less control over implementation fidelity, i.e. how the guidelines/manual was followed. Confidence in the highly experienced consultant was high, yet it is easy, in retrospect, to ask how the division of labor into seven design teams instead of one, affected the process and the results of this trial.

In studies III and IV, a single-item measure of stress was used and administered by SMS. In Study III it was shown that this measure was valid and reliable to use to measure stress. It was validated against subscales that measure important psychosocial risk factors for work-related mental ill-health stress, such as job strain, effort-reward imbalance and over-commitment. It could be argued that, ideally, the question should have been validated against a stress questionnaire, such as Perceived Stress Scale (PSS) (Cohen et al., 1983) and we agree. However, for practical reasons, this was not possible.

Another consideration is related to discussions about the appropriateness of the use of single-item measures. The argument against the use of single-item measures has to do with whether it is possible to judge their construct validity (Cohen et al., 1997). It can be argued that a single-item measure can have external correlates but cannot have internal consistency. Furthermore, it is sometimes said that it cannot cover the relevant content domain. Nonetheless, newer research supports the use of single-item measures. Fisher and colleagues (2016) examined the reliability; convergent, discriminant, and content validity of 37 single items used in organizational research. concluded that (even though scales are preferable from a psychometric standpoint) many single-item measures can provide useful information (Fisher et al., 2016). In Study III, validation is seen as a continuous process without an end point. The validity of an instrument is ascertained by collecting different kinds of empirical evidence that can support its validity in a specific context (Berntson et al., 2016). The reliability of single-item measures can be estimated by adapting methods or by combining several methods of assessment (Fisher et al., 2016). In Study III, we argue that the choice of time interval for test-retest is a crucial factor when measuring the reliability of single-item measures for fluctuating conditions.

The study carried out by Houdmont et al. (2019) also supports the use of single-item measures in occupational health research. Their qualitative study identified different frames of reference people use when answering a single-item question about job stress. The most common frame of reference was the presence of several precarious psychosocial working conditions, one of them being job demand. Another frame of reference was poor psychological wellbeing in terms of symptoms. In our study the symptoms “feeling tense, restless, nervous or anxious” were part of the SISQ, i.e. of the definition of stress given to responders. Houdmont et al (2019) concluded that the frames of reference support the use of single-item measures of job stressfulness to identify individuals at risk of work-related mental ill-health.

The question we used in our study, made no explicit reference to work. In Paper III, we argued that it is the total experience of stress that will affect employees’ performance, well-being, etc. Moreover, we felt it was highly likely that employees would answer with reference to their work because the study was carried out in a work context.

Another limitation of Study IV was that it was not possible to carry out a detailed examination of the objective data, for example weekly workload on occupational subgroup level, because of difficulties with data collection, as described earlier. The measurement is therefore, "approximate", as is the association with stress experience. In future research, more detailed analyses and more exact estimates will hopefully be possible.

6.4 IMPLICATIONS FOR RESEARCH AND PRACTICE

One implication of this thesis is the need for thoughtfulness when implementing any intervention. That means that already in the planning phase we should be prepared to adapt the intervention to different subgroups, such as those already showing sign of exhaustion. For people already showing signs of exhaustion, any additional activities and tasks can be experienced as "putting more burden on already heavy shoulders". Therefore, it might be necessary with more individual "hands on" support for this subgroup during an intervention, independent of which intervention we use. In other word, "one size fits all" might be false both when talking about differences between the contexts, and also within the same context.

Moreover, this is an important notion even for organizational practice, i.e. when considering organizational change. Some research suggest that leaders should be selective when implementing organizational changes, and try to understand how the total amount of changes is affecting employees and taxing their resources (Cullen-Lester, Webster, Edwards, & Braddy, 2019). Our trial signals that this would be especially true regarding already burdened employees that may need individual attention.

Studies I and II highlight the utmost importance of involving all levels of management when planning and implementing an intervention, because successful implementation of an intervention may depend on allocation of resources that are not under the jurisdiction of lower management. Furthermore, more overall discussion is needed about what is measured in health care organizations and why. Goals that cannot be met due to circumstances beyond one's control, but which are continuously measured and fed back, may lead to feelings of more stress.

Studies III and IV highlight how new technologies give new possibilities. Single-item measure administered by SMS messages makes it possible to continuously monitor stress levels of work units, and to take early problem-solving actions. In addition, to measure workload on a group level and show how it is related to employees' experience of stress on group level, is one way of moving the spotlight from the individual to the flaws of the system. A next step would be to examine the workload of different occupations or units, as daily, weekly, monthly, seasonal and other patterns are probably different in different groups. The more detailed and frequent the tracking of workload and stress experience is, the more fine-grained analysis is possible, and the more attuned problem solving is possible.

Lastly, the common question of managers, how to identify individuals at risk, might have a quite simple answer, as indicated by Studies III and IV. When people say they are stressed,

they probably are. Finding solutions to problems related to feelings of stress can prevent sick leave. Preventing sick leave is necessary for various reasons, one of them being a shortage of workforce among health care systems throughout Europe (Vornholt et al., 2018). Many workplaces do however not accept deviating performance related to capacity limitations (Vornholt et al., 2018). This can lead to more feelings of stress and to sick leave. People with stress symptoms can have temporarily lower work ability but still be a valuable resource in the workforce, if given the right conditions.

6.4.1 Intervention research is not apolitical

One important future research area in the field of work-related stress research is to, informed by sociology, examine the impact of management systems and ideologies on the employee stress, which is discussed in this section. In the background section, Figure 1 displayed a model of causes and consequences of work-related stress. In that model, inspired by the models from the European Foundation for Improvement of Living and working Conditions and the Psychosocial Safety Climate Theory of work-related stress (Dollard et al., 2019), the external context including political power relations, economic context, culture and corruption are postulated to influence psychosocial safety climate, which in turn influences risk factors at work.

However, according to some researchers, there is "an increasing societal orientation towards blaming the individual for his/her wellness" (Theorell, 2016). Therefore, it is not surprising that there is relatively little research on workload and interventions to reduce workload compared to psychosocial interventions, such as adding social support, communication training, professional training, etc. (Hurrell, 2005). Theories of origins of work stress will have an impact on what interventions are recommended and used, and theories are not free from the economic, ideological and political systems we live in (Dollard et al., 2019). Researching on individual differences and helping the individual to manage their stress by education, mindfulness, professional- or communication training is good and commendable. Nevertheless, research on work-related stress has a lot to learn from sociology. Sociology highlights how economic and political systems influence work organization, management, control systems, resourcing, rationalizations, and at the end influence the perceived stress and health of workers (Bal & Dóci, 2018). Moreover, it is important to reflect on how ideology affects which research questions that are asked, and how the research results are interpreted (Bal et al., 2019).

Neoliberal ideology has been growing since 1970s and is now prevailing within management practice (Bal & Dóci, 2018). New public management is an integral part of the Swedish health care system, and quantitative assessment, control and monitoring are integral part of new public management (Bal & Dóci, 2018). Conell and colleagues wrote back in 2009 that "Neoliberals first gain a position of power (by appointment, by election, or by financial pressure in the case of the IMF), and then introduce neoliberal policies by a kind of

organizational coup. This has been the usual process in public sector institutions; the coup is called 'restructuring', and staff down the line are confronted with decisions rather than being involved in them" (Connell, Fawcett, & Meagher, 2009). They go on explaining how neoliberal ideologist, together with mass media and businessmen have promoted competition, choice, and individualism which than justifies social inequality and "winning'. Another researcher expressed that it should be a research priority to ask when, why and how, performance, productivity, and efficiency have become the dependent variables of most interest in the organizational research (Pfeffer, 2016). In health care, too much focus on productivity and efficiency can also be a threat to good quality of care (Orvik, Dellve, & Eriksson, 2013). Furthermore, with ever prevailing efficiency demands, quantitative goal setting and control by measurement, it may be that "stress is nothing more (and nothing less) than the experience of encountering or anticipating adversity in one's goal-related efforts" (Carver & Connor-Smith, 2010; Semmer et al., 2019) .

In retrospect, it is easy to see how the unhealthy environments and physically heavy work of the early industrialization era in the19th century affected the health of industrial workers. It is equally important to reflect over our own modern era, with its constant technical progress and requirements for continuous development and profit, efficiency and measurement, rationalization and control systems, and the resulting administrative burden. All these requirements and the fast pace of work can tax our cognitive and affective resources and affect our health (Berg-Beckhoff, Nielsen, & Ladekjær Larsen, 2017; Westgaard & Winkel, 2011).

Organizational conditions include leadership, human resource management practices, working hours, downsizing, restructuring, etc., while psychosocial working conditions are grouped into job demands and job resources (Sverke et al., 2017). However, in practice, organizational factors such as leadership shape employees' psychosocial job demands, for example their workload (Dellve et al., 2018; Dollard et al., 2019). In public organizations in Sweden the political leadership is the highest level of leadership and ultimately controls the work requirements and workload in public organizations. As the Psychosocial Safety Climate Theory of work stress states, the psychosocial safety climate is dependent on senior management and is the ultimate determinant of both job design and social relations (Dollard et al., 2019). It is, therefore, the "theoretical precursor" of work stress. As the operational leadership cannot work against the political leadership, it may be time to have a more extensive discussion about the association between ideologies, political systems, management philosophies and research into work-related stress.

7 CONCLUSIONS

Organizational-level interventions are important for the primary prevention of stress. Developing effective interventions and building scientifically sound evidence for their effectiveness is important. This thesis evaluated one such organizational intervention in a primary health care context but could not find statistically significant support for it having an

effect on job strain, effort-reward imbalance, exhaustion, sleep or recovery. The process evaluation concluded that several obstacles arose during the project which prevented full implementation of the intervention. No definitive conclusions can therefore be drawn about its effects. However, several other lessons were learned: A) The effects of an intervention can differ for different subgroups, such as employees already showing signs of exhaustion. Special consideration should accordingly be given to these subgroups when designing any intervention. B) Employees showing signs of exhaustion experience more rapid fluctuations in their experience of stress from week to week, possibly demonstrating reduced resilience to additional stress. C) Employees' experience of stress is related to objectively measured quantitative workload and is more closely linked to administrative than to patient-related tasks. D) Managing to complete fewer tasks per hour worked was associated with increased stress which may imply that employees are stressed due to not achieving their goals. E) A single-item stress measure (SISQ) administered by weekly SMS messages is a valid and reliable measure of experienced stress in a Swedish population of predominantly female primary health care employees. F) New technologies such as SMS messages can be a useful tool for continuous monitoring of employees' stress levels for preventive purposes. G) Prolonged stress (as measured by SISQ for several weeks in a row) can predict sick-leave and exhaustion one year later.

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