The art of balance: addressing occupational stress and well-being in emergency department nurses

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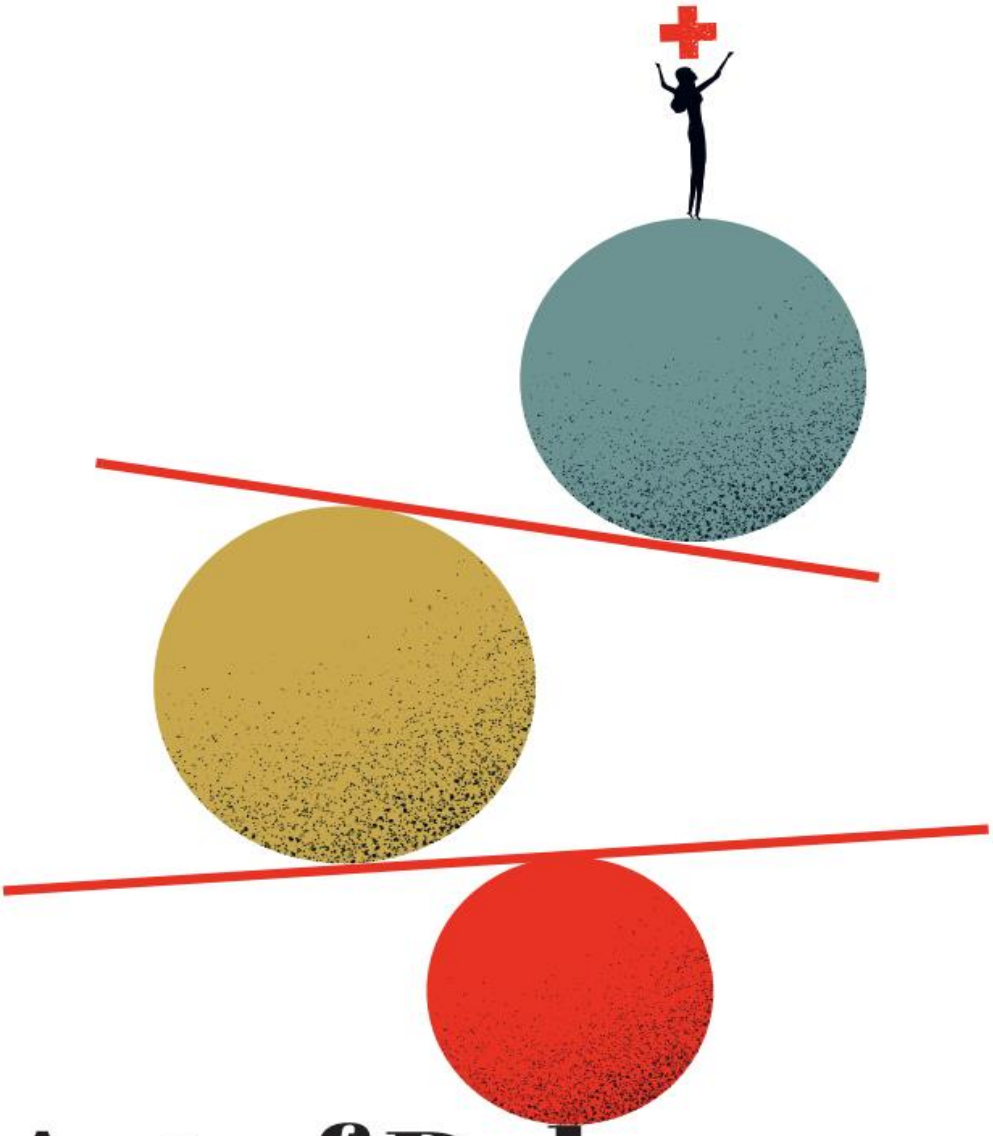

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CHAPTER 1

General introduction

The research described in this dissertation evolves around stress and well-being in emergency department (ED) nurses and is divided into two parts. The first part focusses on the prevalence of stress-related outcomes and occupational well-being of ED nurses. In addition, the most prominent (combination of) job factors related to these outcomes are assessed. The second part reports the findings of an intervention implementation project conducted in 15 EDs to improve the working environment and the well-being of ED nurses. In addition, potentially effective elements in stress management regarding *what* is implemented (i.e. intervention characteristics), *how* it is implemented (i.e. the implementation process), and *under what circumstances* (i.e. Psychosocial Safety Climate (PSC)) are studied. The current chapter serves as an introduction to the topic, the main concepts and the research design. The introduction concludes with an outline of the dissertation.

Occupational stress in emergency department nurses

Nursing is regarded as one of the most demanding professions, both physically and mentally (Roberts & Grubb, 2014). As such, nurses are a relevant population for researchers, mainly in the field of stress, to study. Previous studies have identified a subpopulation of nurses, the emergency department (ED) nurses, that are particularly at risk of stress and stress-related health problems (Adriaenssens et al., 2011; Johnston et al., 2016). In addition, studies indicate that the ED nurses differ in terms of demographic variables (including more male nurses and more advanced qualifications (Johnston et al., 2016)) and job factors (more worktime pressure, less autonomy and (financial) rewards (Adriaenssens et al., 2011)) from the nursing population in general. Bearing in mind that stress is considered the result of an interaction between the person and the (working) environment, previous findings on stress occurrence and stress management interventions for the nursing population in general may only partly apply here. Still, limited research has been performed regarding the specific job factors connected to stress-related outcomes in ED nurses (Johnston et al., 2016), let alone interventions to reduce stress and increase well-being in this setting (Basu et al., 2017; Johnston et al., 2016).

The ED is at the frontline of the hospital and specialized in treating patients in need of acute medical care. It is regarded a unique work setting and often described from two perspectives (Johnston et al., 2016). On the one hand, the diversity in medical conditions and types of patients requires a high level of clinical skills and makes it an interesting and challenging place for nurses to work. On the other hand, there is unpredictability regarding the number of

patients attending the ED, and their physical and mental state (e.g. anxiety, intoxication) upon arrival. As a result, the ED can also be a hectic working environment including life and death decisions, high workload and overcrowding. In addition, emotionally demanding situations, aggression/conflict situations, and potentially traumatic events such as confrontation with suffering in patients and death, occur more often than in other departments of the hospital (Adriaenssens et al., 2012; Crilly et al., 2004; Gacki-Smith et al., 2009; Johnston et al., 2016). With nurses as first point of contact for patients and/or their accompanies, they are particularly exposed to these patient-related stressful situations.

Stress in nurses can have can have serious consequences for the nurse themselves, their patients and the healthcare organization. For example, increased stress levels are related to physical outcomes including somatic complaints, higher cholesterol levels, increased blood pressure, and cardiovascular diseases (Roberts & Grubb, 2014) and mental outcomes such as anxiety, depression and burnout (Roberts & Grubb, 2014). In addition, nurses experiencing high stress levels have difficulties providing good patient care and are more likely to make medical errors which poses a risk to patient safety (Hall et al., 2016). Finally, high stress levels in nurses are related to more sickness absenteeism (Brborovic et al., 2017), lower job satisfaction and increased turnover intention (Roberts & Grubb, 2014). The latter is especially worrisome as the ED is known for their difficulties in attracting and retaining qualified staff. Furthermore, considering that many countries have an aging population in need of more complex medical care, it is expected that the demands on the EDs and ED staff will only increase in the future.

Overall, we can conclude that it is important to on the one hand gain a better understanding of the situation regarding occupational health and well-being of the ED nursing population and predominant job factors related to these outcomes, and on the other hand develop and implement effective measures to improve the working environment and reduce current stress-related health problems.

Theoretical framework

Within the field of occupational health psychology, there are a number of theoretical models aiming to explain how the working environment relates to employee well-being. One of the most prominent models is the Job Demands-Resources (JD-R) model (Demerouti et al. 2001),

which was first introduced in 2001 and forms the theoretical basis for most of the research described in the current dissertation. The JD-R model has three main propositions. The first proposition is that all jobs entail job demands and job resources. Job demands refer to "…those physical, social or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs (e.g. exhaustion)" (Demerouti et al., 2001, p. 501). Examples of job demands include worktime demands, emotional demands and role unclarity. Job resources "refer to those physical, psychological, social, or organizational aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands at the associated physiological and psychological costs; (c) stimulate personal growth and development" (Demerouti et al., 2001, p. 501). Examples of job resources include social support, feedback and autonomy.

A second important proposition of the model is that job demands and job resources activate two different processes that are related to employee health and well-being. The first, the health-impairment process, suggests that continuous exposure to high job demands can wear out cognitive, emotional, and physical resources which eventually results in strain. A key outcome of this process, and also often studied among nurses, concerns burnout which refers to a state of emotional exhaustion (feeling emotionally drained), depersonalization (cynicism towards patients) and reduced personal accomplishment (feelings of inadequacy) (Maslach et al., 2001). The second process, the motivational process, suggests that job resources (alone or in combination with challenging demands) have a direct motivational effect, fostering learning, development and growth. A key outcome of this process is work engagement which can be described as "a positive, fulfilling, work-related state of mind that is characterized by vigour, dedication, and absorption" (Schaufeli et al., 2002, p. 74).

Finally, the third and last proposition implies that job resources do not only play a motivational role but are also able to buffer the impact of job demands on stress-related outcomes (i.e. the buffer hypothesis). An overview of this model including all three propositions can be found in figure 1.

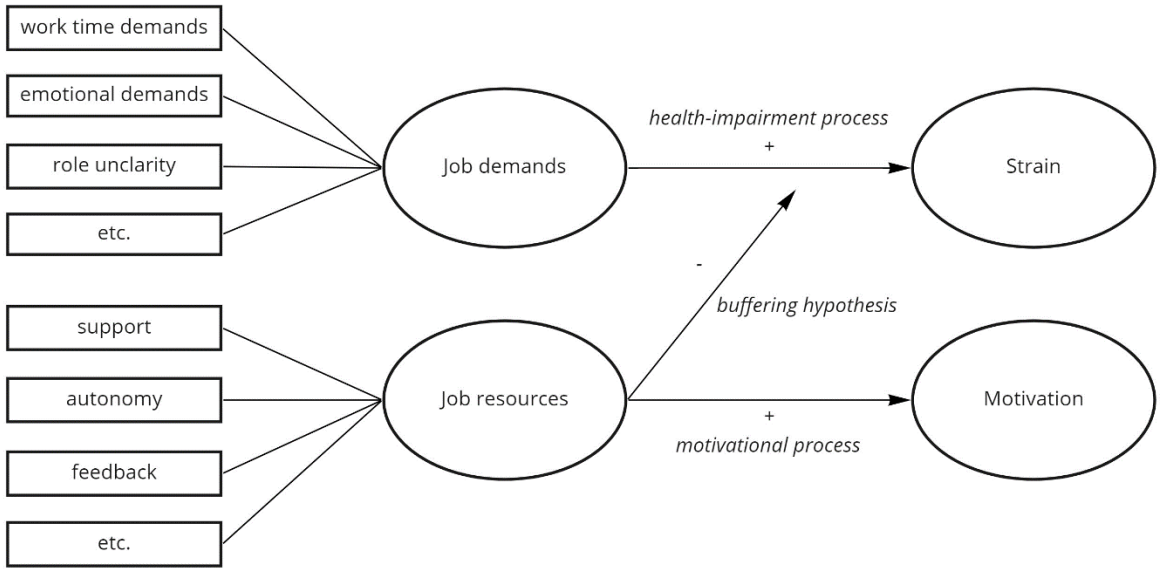

Figure 1. The Job Demands-Resources model (adapted from Bakker & Demerouti, 2007, p. 313).

In comparison to previous occupational stress models, (e.g. the Job Demand-Control model (Karasek, 1979) and the Effort-Reward imbalance model (Siegrist, 1996)), the JD-R model has some important benefits. First of all, this model has no restrictions regarding the type of job resources that could play a buffering role. In fact, it assumes that any demand or resource can influence employee well-being. As such, it can provide a more complete understanding of the impact of the working environment on employees. Second, in line with the emerging field of positive occupational health psychology (Bakker & Derks, 2010), it integrates a positive focus on how job factors do not only lead to stress-related outcomes and disease, but can also be a source of motivation and health.

Up till now, the limited research performed on the impact of the ED environment on nurses` well-being focusses mainly on the protective effect of autonomy and social support (Adriaenssens et al., 2015a, 2015b; Bruyneel et al., 2017; Hunsaker et al., 2015), whereas (as far as we know) no research is available regarding the benefits of adequate recovery in this occupational group. In the highly demanding working context of the ED, where some situations (i.e. resuscitation of a patient) are particularly demanding on employee resources, opportunities for recovery seem essential to prevent stress-related outcomes. This is best described by the Effort-Recovery model (ER-model) by Meijman and Mulder (1998). According

to the ER-model, employees actively engage with their working environment, i.e. when faced with job demands they will always develop a work procedure or action plan to meet these. This effort includes short-term psychological (e.g. enhanced mental focus) and physical reactions (e.g. elevated heartrate) in the employee. In general, these responses are adaptive and reversible: these changes will return to baseline levels as soon as the demands decrease. The latter is called recovery and normally occurs after a short respite from work (Geurts & Sonnentag, 2006). However, continued exposure to job demands and ample opportunities for recovery can deregulate this process, resulting in dysfunction (e.g. difficulties in concentration) and over time may lead to more structural changes to physiological and psychological functions (e.g. burnout) (Geurts & Sonnentag, 2006; Meijman & Mulder, 1998). Overall, opportunities for timely and adequate recovery may thus play an important role in maintaining a healthy recovery process and preventing stress-related outcomes. Based upon the ER-model, we studied within worktime recovery (e.g. breaks) and recovery experiences during leisure time, to provide additional insights in how stress-related outcomes in nurses can be prevented and reduced.

Stress management interventions

In order to reduce and/or prevent stress related health complaints and increase employee well-being, most organizations implement stress management interventions which can be defined as "… any activity, or program, or opportunity initiated by an organization, which focuses on reducing the presence of work-related stressors or on assisting individuals to minimize the negative outcomes of exposure to these stressors" (Ivancevich et al., 1990, p. 252). Due to its broad definition, stress management interventions cover a range of interventions including, but not limited to, yoga, mindfulness, cognitive behavioural therapy, physical exercise, self-rostering, and communication training (Ivancevich et al., 1990). Commonly these interventions are divided in either person-directed which aim to increase employees' coping skills, or organization-directed which aim to improve the working environment by optimizing the balance between job demands and resources (Ivancevich et al., 1990). Whilst the first approach targets the beliefs, attitudes and behaviours of individual employees, the latter targets job conditions and organisational policies that may be the sources of stress (Heaney & Van Ryn, 1990). Based upon several meta-analyses on stress management intervention studies for the general working population we can conclude that there is considerable evidence for the effectiveness of person-directed interventions in their ability to

reduce/prevent stress-related symptoms (Richardson & Rothstein, 2008; Van der Klink et al., 2001). In general, greater effect sizes for cognitive behavioural based interventions than for relaxation interventions are found (Richardson & Rothstein, 2008; Van der Klink et al., 2001). Although, there is reason to believe that this may differ per occupational sector (Richardson & Rothstein, 2008). In contrast to person-directed interventions, the limited number of organization-directed interventions reported in the literature often show little to now effects at all (Ruotsalainen et al., 2015; Van der Klink et al., 2001), and in some cases even adverse effects have been found on stress-related outcomes (Holman et al., 2018). Still, due to their preventative approach, many researchers consider them to be promising and plea for further research on this type of interventions (Holman et al., 2018). In addition, it has been argued that their low effectiveness may be the result of the use of randomized controlled trials, which is considered the golden standard in research but considered poorly equipped to assess the effectiveness of organization-directed interventions (Kompier & Kirstensen, 2001; Nielsen & Miraglia, 2016). Instead of comparing an intervention with a control group and merely focus on the outcome, it is necessary to also gain understanding regarding what factors make an intervention more or less effective. In the current study we adopted a realist approach in which not only the outcome of the intervention is studied, but also under what circumstances (context) and through what processes (or mechanisms) interventions are effective (Nielsen & Miraglia, 2016).

A plea of researchers (Abildgaard et al., 2016; Nielsen & Miraglia, 2016; Nielsen & Noblet, 2018) to study the mechanisms by which organizational-directed interventions fail or succeed, has resulted in an increasing number of studies that conduct and report the results of process evaluations. The results suggest that the process of designing and implementing an organization-directed intervention (e.g. is there good communication on the intervention project, and are employees involved in the development and implementation of the intervention?) plays an important role in effective improvement of the working environment and employee well-being (Kompier & Kirstensen, 2001; Nielsen et al., 2007; Randall et al., 2009). Suggesting that organization-directed interventions can be effective as long as the implementation is optimal.

On another level, the circumstances under which such a favourable implementation process is triggered, has received far less research attention. In 2010 the concept of Psychosocial Safety Climate (PSC) was first introduced as an important contextual predictor of job demands and resources in an organization (Loh et al., 2020) and has recently received increased research attention. In an organization with a favourable PSC, there is acknowledgement of, and commitment to reduce the (consequences of) psychosocial workload by top management, the direct supervisor, and within the group or department. Furthermore, there is open communication on psychosocial risks at work, and all parties (e.g. (top) management, employees, human resources) within an organization are involved in initiatives to improve and/or maintain psychosocial safety (Bronkhorst, 2015; Bronkhorst et al., 2018; Dollard & Bakker, 2010). As such, one might wonder whether an organizational climate in which the psychosocial health of employees is highly valued, e.g. a favourable PSC (Dollard & Bakker, 2010), needs to be in place in order to have a successful intervention project (e.g. the design of (fitted) actions implemented through a favourable process). However, up till now, contextual factors are considered an understudied and often overlooked factor in intervention research (Nielsen et al., 2016).

Thesis outline

The goal of this dissertation is two-fold. First, we aim to assess the prevalence of stress-related outcomes and levels of well-being of Dutch ED nurses, and identify the most prominent (combination) of job factors related to these outcomes. Second, we aim to assess the effectiveness of an intervention implementation project conducted in multiple EDs in the Netherlands and pinpoint effective elements regarding intervention characteristics, the approach (person-directed, organization-directed or multilevel), the process of implementation (e.g. the number and fit of actions, communication, employee involvement) and the influence of the organizational context in terms of Psychosocial Safety Climate.

Central in this dissertation is a 2.5-year (2017-2019) intervention implementation project conducted in 15 EDs in the Netherlands. The project is the result of a collaboration between Stichting IZZ (a collective for healthcare employees in the Netherlands), the participating EDs, and the department of Health, Medical and Neuropsychology of University Leiden. This project offered the opportunity to answer the indicated questions regarding the well-being of ED

nurses, underlying job demands and resources, and relevant aspects that contribute to a successful intervention project.

The intervention project is based upon the `psychosocial risk management approach`(PRIMA) by Leka and Cox (2010) and consists of research cycles including four steps: 1. assessing the most prominent psychosocial risks in the organization, 2. translating these risks into action plans, 3. implementing actions, 4. evaluating the effects of those actions and the process by which these were implemented, and (if necessary) adjusting the approach. In addition, to empower EDs in designing and implementing their own actions to reduce psychosocial risks at work, principles of participatory action research (PAR) were integrated (Dollard et al., 2008; McVicar et al., 2013). Several inspiration sessions were organized to educate EDs on topics such as burnout and share best practises regarding stress management, to create a learning network, and to motivate and empower them to implement actions during the project. The role of the researchers was mainly supportive by conducting the risk assessment, interpreting the findings, evaluating the effects halfway and at the end of the project and giving advice based upon the results and the scientific literature.

There are several advantages to this approach. First of all, by implementing a process (research cycle) rather than a predefined intervention, it is more likely that the intervention will fit the current working context and existing psychosocial risks. This is particularly important as little was known regarding effective interventions in this setting. Second, considering that organizations are changing entities, new challenges to employee health and well-being may arise, which are more easily to tackle with a flexible approach. Finally, by empowering EDs to design and implement actions themselves, it is more likely that the intervention will continue to create positive outcomes even after the official project has come to an end.

According to the risk assessment, there was a high prevalence of stress-related outcomes among ED nurses, which was related to several job factors. Stress-related outcomes in this population thus appeared to be mainly the result of working environment rather than inadequate individual coping abilities (Heaney & Van Ryn, 1990). As a result, the working environment became the primary target of the current intervention project. Still, considering that organization-directed interventions are mainly preventative, EDs were encouraged to also implement person-directed interventions to reduce existing stress-related outcomes.

Chapter 2 presents the prevalence of stress-related outcomes (e.g. burnout symptoms, sleep problems, post-traumatic stress) and levels of occupational well-being (e.g. work engagement, job satisfaction and turnover intentions) of ED nurses in the Netherlands at the start of the intervention project in 2017. In addition, the most prominent (combinations of) job demands and/or resources related to these outcomes are assessed.

Chapter 3 assesses the effects of patient-related stressful situations (e.g. emotional demands, aggression/conflict situations, traumatic events) on stress-related outcomes. These situations are an inherent part of work in the ED and difficult if not impossible to reduce by means of an intervention. In addition, potential buffering (e.g. autonomy, social support, recovery at work, recovery experiences during leisure time) and/or reinforcing (work time demands) job factors in the relationship between patient-related stressful situations and stress-related health outcomes (emotional exhaustion and symptoms of post-traumatic stress) are evaluated.

After gaining more insight in the relationship between job factors and indicators of well-being in ED nurses, chapter 4, 5 and 6 explore ways to prevent and/or reduce stress-related outcomes in this population and increase levels of work engagement.

Chapter 4 reports the findings of a meta-analysis on the effectiveness of interventions in preventing and reducing stress-related outcomes in nurses working in a hospital setting. Apart from the overall effectiveness, potential moderators related to the study design, the approach (i.e. person-directed, organization-directed or multilevel), intervention content (i.e. cognitive versus relaxation interventions), and the process of intervention implementation (i.e. employee participation) are assessed.

Chapter 5 focusses on Psychosocial Safety Climate (PSC) as contextual factor and aims to study whether a more favourable PSC in the EDs triggers important processes related to greater intervention success in terms of optimizing the working environment, reducing stress-related outcomes and increasing employee well-being. Potential mechanisms of the effect of PSC that are assessed include the number and fit of actions implemented, communication on and employee participation in the design and implementation of interventions, and positive appraisals of employees towards the project.

In **chapter 6** the effect of the current intervention implementation project in the 15 EDs on job factors and well-being is reported. In addition, potential moderators related to greater intervention success, including the approach (organization-directed or multilevel), the number and fit of actions taken, the implementation process (information provision and employee participation), and whether or not taking part in an intervention to improve PSC, are assessed. In the final chapter, **chapter 7,** the main findings are integrated and discussed.

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“Het is de leukste afdeling van het hele ziekenhuis. Het werk is uitdagend en je bent nooit uitgeleerd. Het gaat van botbreuken tot grote trauma’s.”

- SEH-verpleegkundige in opleiding, juli 2017 -

“Het geeft een kick - zeker als het op rolletjes loopt - om voor zoveel mensen wat te kunnen betekenen.”

- SEH-verpleegkundige, juli 2017 -

“Als je iemand weer stabiel hebt gekregen, dan geeft dat super veel voldoening. Dat is gaaf als je dat met elkaar bereikt.”

- SEH-verpleegkundige, juni 2017 -

“Het is wekelijks soms zelfs dagelijks te druk. Personeel zet zich echt maximaal in, maar aan het einde van de dienst of soms zelfs halverwege de dienst merk je dat ze kapot zijn. Dat het ze boven de pet gaat.”

- SEH-verpleegkundige, juli 2017 -

“Soms ben ik wel moe, maar ik ben positief ingesteld, dus dan ga ik gewoon door. Ik weet niet of dat wel goed is.”

- SEH-verpleegkundige, juli 2017 -

“Bij drukte worden er tijdelijk plekken gecreëerd, vaak patiënten op de gang. Ja, dat kan eigenlijk niet. Ik vind het mensonterend. Een paar jaar terug hadden we dit niet geaccepteerd, maar je verlegt steeds je grenzen… op een gegeven moment vind je het normaal.”

- SEH-verpleegkundige, juni 2017 -

“Het uniform biedt ook afstand tussen jou en de patiënt, een soort scheidingslijn. Dat is ook wel bewust. Je merkt het wel bij collega’s, dat ze afvlakken.”

- SEH-verpleegkundige, juni 2017 -

“Velen weten ook pas wat het met ze doet als de emmer al is overgelopen. Dat zie je bij collega’s, die zitten dan thuis om de een of andere reden en dan komt opeens alles eruit.”

- SEH-verpleegkundige, juli 2017 -

CHAPTER 2

The prevalence of stress-related outcomes and occupational well-being among emergency nurses and the role of job factors

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Abstract

Aims: This study aims to assess the prevalence of stress-related outcomes (burnout, sleep problems and post-traumatic stress) and occupational well-being (work engagement, job satisfaction and turnover intention) of Dutch emergency room nurses and to identify job factors related to key outcomes.

Background: While emergency nurses are prone to stress-related outcomes, no large-scale studies have been conducted in the Netherlands. Furthermore, few studies considered combined effects of job factors on emergency nurses' well-being.

Methods: In 2017, an occupation-specific survey was filled out by 701 (response: 74%) emergency nurses from 19 Dutch hospitals. Decision tree methods were used to identify the most important (combination of) job factors related to key outcomes**.**

Results: High prevalence of stress-related outcomes and turnover intention were found, while the majority experienced work engagement and were satisfied with their job. Emotional exhaustion was mainly associated with worktime demands and aggression/conflict situations. Work engagement was mainly associated with developmental opportunities.

Conclusions: Dutch emergency room nurses are at risk of stress-related outcomes and have high turnover intention, while feeling engaged and satisfied with their job.

Implications for Nursing Management: To retain and attract emergency room nurses, it is recommended to focus efforts on increasing developmental opportunities, while reducing worktime demands and aggression incidents.

Introduction

Emergency room (ER) nurses are exposed to a number of occupational risks including high worktime demands and potentially traumatic events such as violence and aggression, suffering in patients, severe injuries and even death (Adriaenssens et al., 2011, 2012; Richardson et al., 2018). As a result, stress-related symptoms such as burnout, post-traumatic stress and sleep problems are common in this occupational group (Adriaenssens et al., 2012; Gomez-Urquiza et al., 2017; Li et al., 2018), which can have serious consequences for patients' wellbeing and safety (Hall et al., 2016). In addition, high stress levels in nurses are related to both more absenteeism and presenteeism (Brborovic et al., 2017), reduced job satisfaction and higher turnover intention (Bruyneel et al., 2017; Roberts & Grubb, 2014). The latter is of particular concern as health care demands are predicted to increase in the future due to an aging population, resulting in an estimated worldwide shortage of 5.9 million nurses by 2035 (World Health Organization, 2020). Focusing on the situation in the Netherlands, ER visits of patients 65 and older are rising, while the number of vacancies that are difficult to fill have increased from 4.3% of the total fulltime equivalent (FTE) for ER nurses in 2016 to 9.1% in 2018 (Capaciteitsorgaan, 2018).

Overall, it is essential to understand how the working environment of ER nurses can be improved to reduce stress-related outcomes and increase well-being, and as such attract as well as retain qualified nurses. While large-scale studies on the well-being of ER nurses were performed in Belgium (Adriaenssens et al., 2011; Bruyneel et al., 2017), Canada (Sawatzky & Enns, 2012) and the United States (Hunsaker et al., 2015), no such screening has been conducted in the Netherlands. To fill this gap, the present study focuses on the prevalence of stress-related outcomes and occupational well-being of Dutch ER nurses and aims to identify job factors related to these outcomes.

Background

According to the Job Demands-Resources model (JD-R model), job factors influence employee well-being through two processes (Bakker & Demerouti, 2017). The health-impairment process suggests that enduring exposure to high job demands (e.g., worktime demands) can exhaust physical and mental resources and lead to stress-related outcomes, such as burnout. On the other hand, the motivational process postulates that job resources (e.g., autonomy and social support) can have a motivational role and lead to increased

occupational wellbeing (e.g., work engagement, job satisfaction and less turnover intention). In addition, adequate job resources can buffer the health impairment process (Bakker & Demerouti, 2017).

Previous research has identified a number of job factors related to stress-related outcomes in ER nurses. Identified job demands include high worktime demands (Adriaenssens et al., 2011, 2015a, 2015b; Bruyneel et al., 2017; O'Mahony, 2011; Sorour & El- Maksoud, 2012), emotional demands (Adriaenssens et al., 2015b) and exposure to morally distressing (Fernandez-Parsons et al., 2013) or even traumatic events (Adriaenssens et al., 2012). In addition, identified job resources protecting ER nurses from stress-related outcomes include adequate staffing levels (Adriaenssens et al., 2015b; Bruyneel et al., 2017; Sawatzky & Enns, 2012) and social factors such as social support from the supervisor and/or colleagues (Adriaenssens et al., 2015a, 2015b; Bruyneel et al., 2017; Hunsaker et al., 2015), good collaboration between nurses and physicians (Adriaenssens et al., 2015b; Bruyneel et al., 2017; O'Mahony, 2011) and teamwork (Adriaenssens et al., 2015b; O'Mahony, 2011).

Far less research has been done on the motivational process of the JD-R model (i.e., predicting occupational well-being) in ER nurses. A quick literature search revealed four studies that (in line with the JD-R model) found a prominent role for job resources such as job control (Adriaenssens et al., 2011, 2015a; Bruyneel et al., 2017), social support from the supervisor and/or colleagues (Adriaenssens et al., 2011, 2015a; Bruyneel et al., 2017; Sawatzky & Enns, 2012), good collaboration with physicians (Sawatzky & Enns, 2012), adequate (financial) rewards (Adriaenssens et al., 2011, 2015a), adequate staffing levels (Sawatzky & Enns, 2012) and developmental opportunities (Sawatzky & Enns, 2012).

Still, many of the aforementioned studies examined only a limited range of job demands and resources. As a result, important predictors of outcomes related to well-being in ER nurses might have gone unnoticed. Furthermore, most studies performed in the ER explore the main effects of job demands and resources on outcomes, providing little insight in their additive or interactive effects (Schneider & Weigl, 2018). Yet, there is growing recognition that stressors occur and act in combination, especially in poorly designed working environments (Jimmieson et al., 2017).

Current study

The aim of the study is twofold: First, we will assess the situation regarding stress-related outcomes (burnout, sleep problems and posttraumatic stress) and occupational well-being (work engagement, job satisfaction and turnover intention) of ER nurses in the Netherlands. Second, we aim to identify (specific combinations of) demands and resources that best predict (i.e., are most strongly associated with) reduced as well as enhanced employee well-being using regression tree analyses. Emotional exhaustion, the key dimension of burnout, was chosen as an indicator of reduced well-being as this variable typically correlates with other mental and physical stress-related symptoms (Maslach & Leiter, 2016). Work engagement, defined as a positive work-related state of mind characterized by vigour, dedication and absorption (Schaufeli & Bakker, 2003), was chosen as an indicator of enhanced well-being. Regression tree analyses can deal with a large number of predictors, as well as possible non-linearities and interactions, while also allowing for direct identification of subgroups with markedly higher or lower values of the outcome (Strobl et al., 2009). Identifying the main predictors for ER nurses' well-being will provide clear targets for improving the working environment, reducing the burden on current staff and attracting qualified nurses.

Methods

Study design

The current study has a cross-sectional design.

Procedure

All ERs in the Netherlands were invited to participate in the study. The human resources department of each participating hospital provided work e-mail addresses and demographic variables (age, gender, occupational role [registered nurse or in training], having a supervisory role [yes/no] and number of years of working experience in the ER) of currently enlisted ER nurses. A project manager (often the ER manager) was appointed to function as a point of contact for the researchers and to increase response rates on the questionnaires. In January/February 2017, all nurses received an e-mail including information on the study, an informed consent and a link to the online survey (about 30 minutes completion time). The survey remained open for 5–6 weeks, and regular reminders were automatically sent to employees who had not yet responded. The collected data were anonymized and stored under a personal code. Participation in the study was voluntary. The current study was approved by

the ethical review board of Leiden University (approved on the 2nd of January 2017, CEP17-0102/3).

Sample characteristics

Overall, ERs from 19 Dutch hospitals (representing 27% of all ERs and 34% of all ER nurses in the Netherlands) took part in the study, including 4 academic hospitals (representing 50% of all academic hospitals in the Netherlands) and 4 trauma centres (representing 36% of all trauma centres in the Netherlands). From the 949 ER nurses enlisted, 701 (74%) filled out the survey and were included in the current study. Most nurses were female (76%) with an average age of 42.4 (*SD* = 11.4), and 12.0 (*SD* = 10.4) years of working experience. On average, they worked 29.1 hours a week (*SD* = 7.3) in the ER. The majority of the sample were registered nurses (90.6%), the others were nurses in training (9.4%) and 4.4% had a supervisory role. Most nurses were married or living together with a partner (76.5%). About a quarter had young (≤6 years) children (23.3%), and about half (48.2%) had children between 6 and 12 years of age living at home. About one in five (22.6%) performed informal caregiving tasks, such as taking care of an elderly or disabled family member. Compared with nonrespondents, respondents worked significantly more hours a week (*M* = 29.1, *SD* = 7.3, vs. *M* = 27.2, *SD* = 10.1, $p < .01$); no other differences on sociodemographic variables were found.

Measurements

An overview of all measures is presented in Table 1.

Stress-related outcomes

Two key symptoms of burnout, emotional exhaustion and depersonalization, were measured with the Dutch version of the Maslach Burnout Inventory-Human Services Survey (MBI-HSS), which has excellent internal consistency and test–retest reliability (Schaufeli & Bakker, 2003). Sleep problems were based on the Diagnostic and Statistical Manual of Mental Disorders IV (DSM IV) criteria for sleep disorders (American Psychiatric Association, 2000). High reliability for this tool has been found (Adriaenssens et al., 2012). Post-traumatic stress symptoms were measured with the Dutch version of the Impact of Events Scale, which has found to be a reliable and valid instrument (van der Ploeg et al., 2004).

Table 1. Description of measures used in the current study

Dimensions	Questionnaire	Number of items	Scale	Cronbach's alpha	Example item
Job demands					
Freq. of Emotional demands	Inventory of stressful situations	4	"never" (1) to "daily" (7)	.78	In my work I am confronted with patients in a hopeless situation.
Freq. of Aggression/conflict situations	Inventory of stressful situations	7	"never" (1) to "daily" (7)	.86	In my work I am confronted with patients and/or accompanies who are physically aggressive.
Work time demands	LQWQ-n	5	"totally disagree" (1) to "totally agree" (4)	.72	During my shift, I am responsible for the care of too many patients.
Social harassment	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.88	In my department, some employees are belittled and / or ridiculed.
Role ambiguity	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.70	As an emergency room nurse, I know exactly what others expect from me at work (reversed).
Job resources					
Autonomy	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.62	I can decide for myself when to carry out patient-related tasks and when to carry out non-patient-related tasks.
Social support from the supervisor	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.90	I feel appreciated by my supervisor.
Social support colleagues	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.84	My colleagues give me emotional support when I'm having difficulties.
Collaboration with physicians	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.55	In my department, nurses and doctors work well together.
Work procedures	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.75	In my department, procedures and rules are often unclear (reversed).
Internal communication	LQWQ-n	5	"totally disagree" (1) to "totally agree" (4)	.65	In this organisation, one must ask a question repeatedly before getting an answer.

Abbreviations: DSM IV, Diagnostic and Statistical Manual of Mental Disorders IV; IES, Impact of Events Scale; LQWQ-n, Leiden Quality of Work Questionnaire for Nurses; MBI-HSS, Maslach Burnout Inventory-Human Services Survey; UWES, Utrecht Work Engagement Scale.

Table 1. *Continued*

Dimensions	Questionnaire	Number of items	Scale	Cronbach's alpha	Example item
Staffing levels	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.73	In my department, there are enough nurses to provide good patient care.
Materials/equipment	LQWQ-n	3	"totally disagree" (1) to "totally agree" (4)	.72	Materials, equipment and/or instruments are not always available when necessary (reversed).
(Financial) rewards	LQWQ-n	6	"totally disagree" (1) to "totally agree" (4)	.71	Nurses working in the emergency room are not sufficiently valued within this hospital (reversed).
Developmental opportunities	LQWQ-n	4	"totally disagree" (1) to "totally agree" (4)	.84	In my work I have the opportunity to further develop my capacities.
Within worktime recovery	Self-developed	4	"totally disagree" (1) to "totally agree" (4)	.59	During my shift, I regularly have to skip breaks (reversed).
<u>Stress-related outcomes</u>					
Emotional exhaustion	MBI-HSS	8	never (0) to daily (6)	.89	I feel tired when I get up in the morning and have to face another day on the job.
Depersonalization	MBI-HSS	5	never (0) to daily (6)	.73	I feel that I treat some patients too impersonally.
Sleep problems	Based on DSM IV	3	"not at all" (0) to "very much" (4)	.71	Items related to the initiation, duration and maintenance of sleep (e.g. "I have a restless or disturbed sleep").
Post-Traumatic Stress	IES-15	15	"not at all" (0), "rarely" (1), "sometimes" (3), "often" (5)	.92	Items measuring avoidance (avoidance of feelings and thoughts about the impactful event) and intrusion (intrusive thoughts, intrusive feelings, nightmares).
<u>Occupational well-being</u>					
Work Engagement	UWES-9	9	never (0) to daily (6).	.90	Items measuring absorption (e.g. "I am completely absorbed in my work"), vitality (e.g. "At work I am bursting with energy"), and dedication (e.g. "My work inspires me").
Job satisfaction	LQWQ-n	3	"totally disagree" (1) to "totally agree" (4)	.78	I am satisfied with my job.
Turnover intention	LQWQ-n	3	"totally disagree" (1) to "totally agree" (4)	.81	I plan to look for a job outside this hospital within the next 3 years.

Abbreviations: DSM IV, Diagnostic and Statistical Manual of Mental Disorders IV; IES, Impact of Events Scale; LQWQ-n, Leiden Quality of Work Questionnaire for Nurses; MBI-HSS, Maslach Burnout Inventory-Human Services Survey; UWES, Utrecht Work Engagement Scale.

Occupational well-being

Work engagement was measured using the Dutch version of the nine item Utrecht Work Engagement Scale, which has excellent internal consistency and test–retest reliability (Schaufeli & Bakker, 2003). Job satisfaction and turnover intention were measured with the Leiden Quality of Work Questionnaire for Nurses (LQWQ-n) (Gelsema et al., 2005; Maes et al., 1999), an occupation-specific screening instrument including two factors related to occupational well-being. Satisfactory to good reliability for the subscales has been found (Gelsema et al., 2005).

Job factors

The LQWQ-n (Gelsema et al., 2005; Maes et al., 1999) was also used to measure job demands and resources (see Table 1). In addition to the LQWQ-n, we assessed the frequency of verbal and physical aggression and the frequency of emotionally demanding situations based on an inventory of stressful situations previously used in a study on staff working in organisations providing care for mentally and physically disabled individuals (Bolhuis et al., 2004). Furthermore, within worktime recovery was assessed using a self-developed questionnaire including four statements: 'If I want to, I can leave my workplace for a short while', 'I can have a chat during my work', 'During my shift, I regularly have to skip breaks' (reversed) and 'During my breaks, I must remain available for urgent cases' (reversed).

Statistical analyses

Differences between respondents and non-respondents were assessed by *t*-tests and χ^2 tests. Prevalence of stress-related outcomes and work engagement were based on cut-offs indicated in the manuals of the questionnaires: For the prevalence of sleep problems, a score of 4 or higher on at least two statements was used (Adriaenssens et al., 2012). For turnover intention and job satisfaction measured with the LQWQ-n, a percentage of the sample that answered (totally) agree on a representative item (see Table 1) was calculated.

Generalized linear mixed-model (GLMM) trees, a multilevel decision tree method (Fokkema et al., 2018, 2021), was applied to identify predictors of (i.e., variables associated with) work engagement and exhaustion. In order to account for hospital-level effects, a random intercept term with respect to hospital was estimated. We used the intraclass correlation to assess the extent of hospital-level effects (Bernaldo-De-Quiros et al., 2015). Both trees were controlled

for the variables age, number of hours working a week and job title (registered vs. in training) (engagement: bivariate r = .11, r = .08, r = .09; emotional exhaustion: r = .08, r = .01, r = .04). To obtain effect sizes of subgroup differences on work engagement and emotional exhaustion, we also computed standardized subgroup means, based on z-scores of the response variables. Due to missing values, the analyses include 695–701 cases.

Results

Prevalence of stress-related outcomes and occupational well-being

Table 2 gives an overview of (sub)clinical levels of stress-related outcomes and the levels of occupational well-being. More than one third of the sample (39.6%) scores above the (sub)clinical level for emotional exhaustion and almost half (48%) above the (sub)clinical level for depersonalization. Furthermore, one out of seven ER nurses (14.4%) report sleep problems on a clinical level and almost one out of six nurses (15.7%) report post-traumatic stress symptoms on a (sub)clinical level. Overall, ER nurses score significantly higher on stress-related outcomes (emotional exhaustion, depersonalization, and symptoms of post-traumatic stress) than the normative sample (working population in general). Regarding occupational well-being, ER nurses report significantly higher levels of work engagement than the normative sample, with more than half of the ER nurses (61.4%) being (very) highly engaged. Furthermore, the majority of the ER nurses (84.9%) (totally) agree with the statement 'I am satisfied with my job', while about one third (32.7%) (totally) agree with the item 'I plan to look for a job outside the hospital within the next three years'. Finally, work engagement and emotional exhaustion have a bivariate correlation of .40.

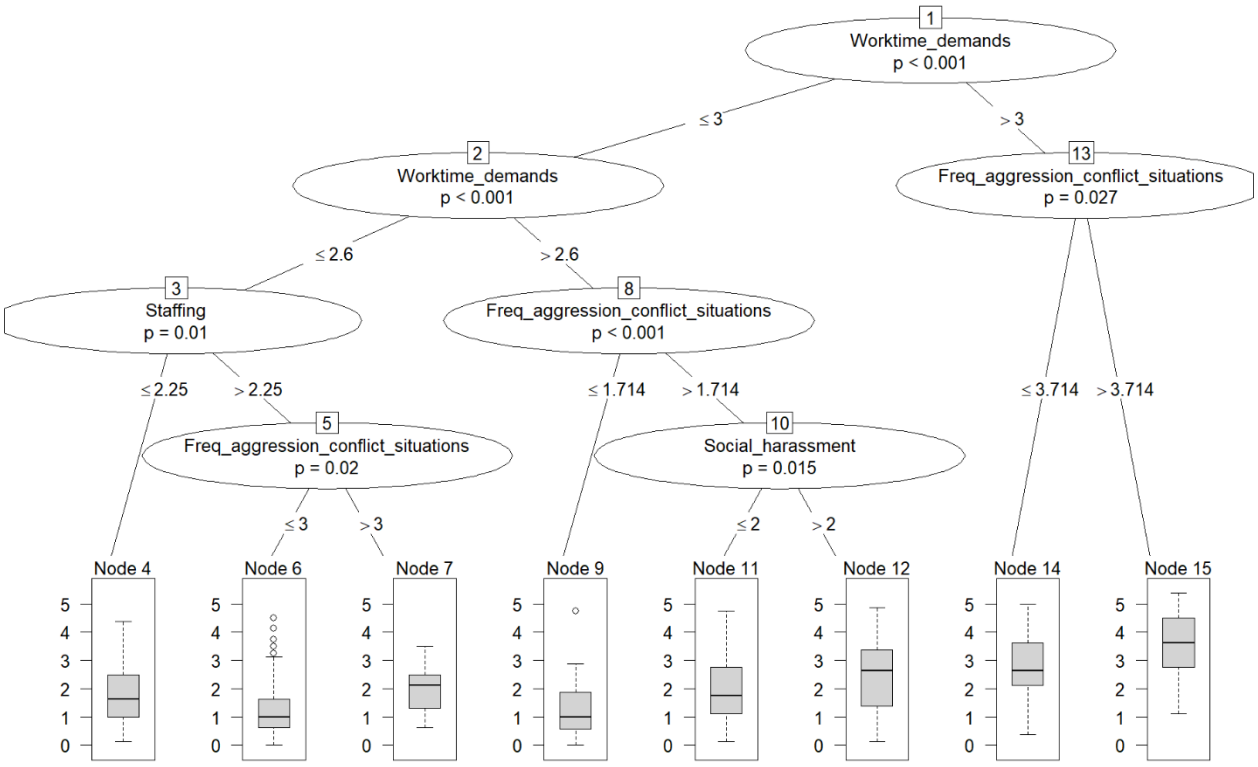
Predictors for emotional exhaustion and work engagement

Figure 1 shows the GLMM tree model for emotional exhaustion. Note that variables that do not appear in the tree show weaker associations with the outcome than the variables that are selected at every split and are therefore not selected for splitting. The primary variable that distinguishes higher and lower levels of emotional exhaustion is worktime demands, which appears in inner nodes (splits) 1 and 2. A second important variable concerns the frequency of aggression/conflict situations, which appears in the nodes 5, 8 and 13. The GLMM tree algorithm recursively separated the observations into eight subgroups with different levels of emotional exhaustion.

Table 2. Levels of stress-related outcomes and occupational well-being in Emergency Room nurses (N=695) compared to a normative sample (working population in general)

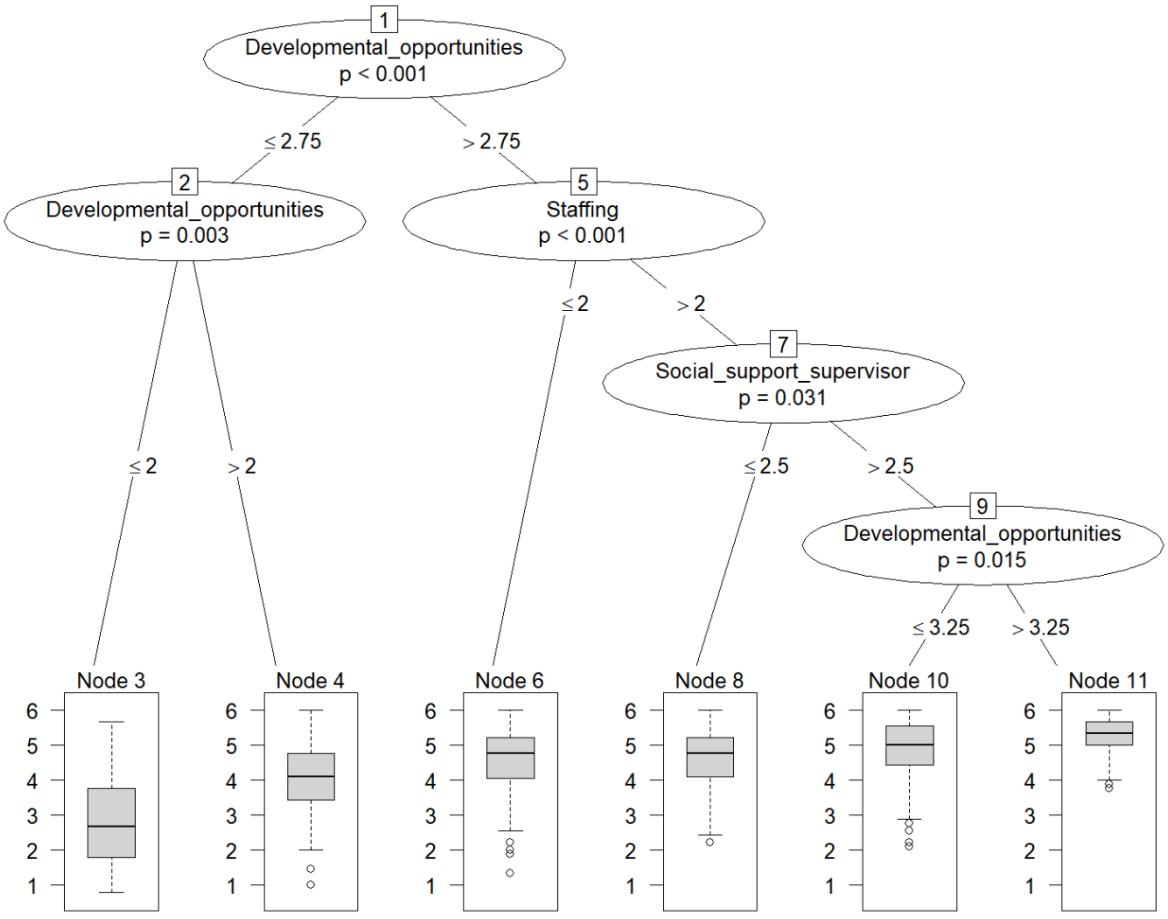
Stress-related outcomes	Mean	SD	Min	Max	*p*-value	Cut-off	Subclinical level N (%)	Cut-off	Clinical level N (%)
Emotional Exhaustion (MBI-HSS)									
ER nurses	2.06	1.22	0.00	5.38	*p*<.001	2.38-3.62	178 (25.6%)	≥3.63	97 (14%)
Normative sample	1.78	0.99	-	-					
Depersonalization (MBI-HSS)									
ER nurses	1.69	1.15	0.00	5.60			178 (25.6%)		156 (22.4%)
	F:1.64	1.13	-	-	*p*<.001	F:1.60-2.59			
	M:1.86	1.20	-	-	*p*<.001	M:1.80-2.79			
Normative sample	F:1.12	0.77	-	-					
	M:1.27	0.85	-	-					
Sleep problems									
ER nurses	2.19	0.92	1.00	5.00				≥2 x score ≥ 4	100 (14.4%)
Post-Traumatic Stress (IES)									
ER nurses	9.16	11.45	0.00	61.00	*p*=.015	20-25	39 (5.6%)	≥26	70 (10.1%)
Normative sample	8.10	12.30	-	-					
Occupational well-being						**Cut-off**	**High N (%)**	**Cut-off**	**Very high N (%)**
Work engagement (UWES)									
ER nurses	4.65	1.00	0.78	6.00	*p*<.001	4.67 - 5.50	278 (40%)	≥5.51	149 (21.4%)
Normative sample	3.74	1.17	-	-					
Job Satisfaction (LQWQ-n)	2.91	0.50	1.00	4.00			84.9%†		
Turnover intention (LQWQ-n)	2.19	0.62	1.00	4.00			32.7%‡		

Cut-offs: for MBI-HSS (W.B. Schaufeli & Van Dierendonck, 2000), sleep problems (Adriaenssens et al., 2012), IES (Briere & Elliott, 1998) and UWES (V. B. Schaufeli & Bakker, 2003). † percentage (totally) agree with the item "I am satisfied with my job" ‡ percentage (totally) agree with the item "I plan to look for a job outside this hospital within the next 3 years". Abbreviations: ER= Emergency Room, F=Female, M=Male.



Node	4	6	7	9	11	12	14	15
N	57	163	23	36	135	109	145	32
M	1.58	1.01	1.80	1.00	1.76	2.27	2.56	3.38
M_z	-0.40	-0.87	-0.22	-0.87	-0.25	0.17	0.40	1.08

Figure 1. Tree for predicting emotional exhaustion. Each inner node depicts the variable used for splitting, with splitting values depicted below the nodes. The *p*-values quantify the strength of the association between the predictor variable and the outcome, with lower values indicating a stronger association. The terminal nodes provide boxplots, representing the distribution of emotional exhaustion values in each of the subgroups (terminal nodes). Below each terminal node, the table provides the corresponding group size (N); estimated group means on emotional exhaustion, corrected for covariates and hospital (M); and the same group means, standardized as a z-score (M_z). Predictors *not* selected by the model: emotional demands, role ambiguity, autonomy, social support supervisor, social support colleagues, collaboration with physicians, work procedures, internal communication, materials/equipment, (financial) rewards, developmental opportunities, and within worktime recovery.



Node	3	4	6	8	10	11
N	18	126	156	41	240	119
M	2.76	4.01	4.46	4.46	4.83	5.13
M_z	-1.90	-0.64	-0.19	-0.19	0.17	0.48

Figure 2. Tree for predicting work engagement. Each inner node depicts the variable used for splitting, with splitting values depicted below the nodes. The *p*-values quantify the strength of the association between the predictor variable and the outcome, with lower values indicating a stronger association. The terminal nodes provide boxplots, representing the distribution of emotional exhaustion values in each of the subgroups (terminal nodes). Below each terminal node, the table provides the corresponding group size (N); estimated group means on work engagement, corrected for covariates and hospital (M); and the same group means, standardized as a z-score (M_z). Predictors *not* selected by the model: worktime demands, aggression/conflict situations, emotional demands, social harassment, role ambiguity, autonomy, social support colleagues, collaboration with physicians, work procedures, internal communication, materials/equipment, (financial) rewards, and within worktime recovery.

Three subgroups stand out due to high deviations from the mean: Subgroups 6 (N = 163; mean z = 0.87) and 9 (N = 36; mean z = 0.87) show low levels of emotional exhaustion and are both characterized by lower levels of worktime demands and aggression/conflict situations. Subgroup 6 in addition reports higher staffing levels. Subgroup 15 (N = 32; mean z = 1.08) shows high levels of emotional exhaustion and is characterized by high reported levels of worktime demands and aggression/ conflict situations.

The intracluster correlation is .04, indicating 4% of variance is accounted for by hospital-level differences. The total R^2 for the GLMM tree model is .32, indicating that (32% - 4% =) 28% of variance is accounted for by the splitting variables occurring in the tree. Because computing R^2 on the data used for fitting the model gives inflated estimates of accuracy (de Rooij & Weeda, 2020), we also computed R^2 based on 10-fold cross-validation, yielding an R^2 of .20.

Figure 2 shows the GLMM tree model for work engagement. Developmental opportunities is the primary variable distinguishing lower and higher levels of work engagement, which appears in inner nodes 1, 2 and 9. Subgroups 3 (N = 18, mean z = 1.90) and 4 (N = 126, mean z = 0.64) show the strongest deviation from the overall mean reflecting lower levels of work engagement, associated with lower levels of developmental opportunities. Subgroups 6, 8 and 10 show only small deviations from the mean (mean z ranging from 0.19 to 0.17), suggesting that variables such as staffing and social support from the supervisor significantly contributed to small changes in work engagement, but to a (much) lesser extent than developmental opportunities. Finally, Group 11 (N = 119; mean z = 0.48) shows considerable deviation from the mean, a profile with high work engagement and characterized by high scores on all aforementioned job resources (social support supervisor, staffing and developmental opportunities).

The intracluster correlation is .04, indicating only minor residual hospital-level differences. The R^2 for the GLMM tree model is .28, again indicating that the majority of variance is accounted for by the splitting variables occurring in the tree. The R^2 based on 10-fold cross-validation is .17.

Discussion

The current study conducted in 19 hospitals in the Netherlands shows a high prevalence of stress-related outcomes (emotional exhaustion, depersonalization, symptoms of post-traumatic stress and sleep problems) and substantial turnover intention among ER nurses. On a positive note, ER nurses experience high levels of work engagement and job satisfaction. The GLMM tree models (for two representative outcomes) show that emotional exhaustion is mainly related to higher worktime demands and higher prevalence of aggression/conflict situations and, to a lesser extent, lower staffing levels and more social harassment. Work engagement is mainly related to developmental opportunities and, to a lesser extent, adequate staffing levels and social support from the supervisor.

The high prevalence of stress-related outcomes and turnover intention in the current study are in line with international findings regarding this occupational group (Adriaenssens et al., 2011, 2012; Bruyneel et al., 2017; Gomez-Urquiza et al., 2017; Li et al., 2018). At the same time, more than half of the ER nurses were (highly) engaged and the vast majority reported to be satisfied with their job. The coexistence of stress-related outcomes and outcomes of positive wellbeing might be explained by the content of the work: The variety in patients, pathology and medical urgency renders the ER a burdening as well as an exciting and challenging place to work (Glynn & Silva, 2013). Another explanation is provided by recent research suggesting that high levels of engagement might result in overcommitment (Leiter, 2019), including exaggerating efforts beyond what is formally required and having difficulties to withdraw from work (Leiter, 2019). Especially in a situation with high job demands, overcommitment might strengthen the energy depletion process and lead to symptoms of burnout (Leiter, 2019). Finally, due to the heavy mental burden (as reflected by the level of stress-related outcomes), many work-engaged and satisfied nurses might still consider changing to a less demanding profession explaining the high turnover intention in this population.

In comparison to previous research, the use of decision tree methods allowed us to study a broad range of job factors and also assess possible combined effects of these. In line with previous research (Adriaenssens et al., 2015b; Bruyneel et al., 2017; O'Mahony, 2011) and the JD-R model, we found that emotional exhaustion was mainly related to job demands, with a primary role for worktime demands. Yet, especially the combination of worktime demands

and aggressive-conflict situations seemed detrimental. This is in line with the limited research on additive effects of job demands and suggests that improving some job demands can already reduce negative stress-related outcomes (Jimmieson et al., 2017). This finding has important practical implications as certain job demands (e.g., worktime demands and social harassment) are more easily to modify than others (e.g., aggression or emotional demands) in this setting (Jimmieson et al., 2017).

In contrast to previous studies, the current study did not find a large role for social factors in the occurrence of emotional exhaustion with the exception of social harassment. This can be explained by the high levels of social support (with limited variance) found in our sample, which reduces the power to find a statistically predictive effect of this resource. On the other hand, the absence of job resources in the GLMM model of emotional exhaustion, with the exception of a small reducing effect of higher staffing levels, suggests that the buffering effect of job resources on stress-related outcomes in this setting overall is limited and efforts should focus on reducing job demands.

In line with the JD-R model, work engagement was mainly related to job resources, with a primary role for developmental opportunities and some small additive effects for staffing levels and social support from the supervisor. A comparison with the limited available literature on engagement in ER nurses shows that the identified job factors are in line with the study of Sawatzky and Enns (2012), and partly in line with studies by Adriaenssens et al. (2011, 2015a), who identified the importance of social support from the supervisor but did not include developmental opportunities in the model. Overall, this suggests that efforts should focus on creating possibilities for professional development to keep the ER nursing workforce engaged.

Strengths

The current study has a number of strengths. First of all, this is the first study to determine the prevalence of stress-related outcomes and occupational well-being of ER nurses in the Netherlands. Second, it answers to a call for studies on combined effects of job demands and resources and thereby gives a more complete view on job factors related to well-being in the ER (Schneider & Weigl, 2018). The use of an occupation-specific questionnaire also ensured the identification of demands and resources relevant for ER nurses. Furthermore, it is the first study to explore job demands and resources in this setting by the use of regression tree

analyses. This resulted in identifying important variables (e.g., aggression/conflict situations and developmental opportunities) often not considered in studies that aim to understand how job factors influence ER nurses' well-being and highlights the combined effects of job factors. Finally, the large number and diversity of the participating ERs in the study and the high response rate increase the generalizability of the findings.

Limitations and future directions

The sole use of questionnaire data increases the probability of common method bias. This has been addressed by the including valid questionnaires and guaranteeing anonymity in the current study (Conway & Lance, 2010). Additionally, given that well-being is subjective, it is best measured using self-reported methods. A second limitation concerns the use of a cross-sectional design, which does not allow for causal attributions. Still, although stress levels might also influence how employees experience their working environment, limited evidence exists for the reverse-effects hypothesis (Guthier et al., 2020). Third, the high levels of work engagement and limited explanatory value of job factors (apart from developmental opportunities) on this outcome suggest that other factors are of influence. Future studies might consider including factors related to the job content (e.g., positive patient contact and meaningfulness of work) to enhance our understanding regarding predictors of work engagement in ER nurses. Finally, the concept of moral distress, a reaction to knowing the right thing to do but being constraint from taking this action due to environmental circumstances (e.g., lack of time, supervisory reluctance and institutional policy) (Corley et al., 2001), is receiving increased research attention in studies on health care professionals (Epstein et al., 2019). Due to high worktime pressure and overcrowding, it is possible that especially ER nurses are confronted with morally distressing events (e.g., sending patients home who under normal circumstances would be hospitalized or performing procedures for which they are not qualified), which can have a lasting negative impact on their well-being (Wolf et al., 2016). As such, future research on predictors of stress-related outcomes in this population should consider including morally distressing events next to other job demands.

Conclusions

The current study shows a high prevalence of stress-related outcomes among ER nurses in the Netherlands and substantial turnover intention. At the same time, ER nurses are highly work engaged and the majority is satisfied with their job. The results of the current study

suggest that stress-related outcomes in ER nurses can be reduced by creating manageable job demands, with special attention to the reduction of worktime demands and aggression/conflict situations, while opportunities for professional development are essential to keep ER nurses engaged at work.

Implications for nursing management

The high prevalence of stress-related outcomes and turnover intention of ER nurses found in this study should be a concern for hospital management. Poor (occupational) well-being has important organisational consequences including increased absenteeism and presenteeism, of which the latter is related to reduced productivity, increases in medical errors and reduced quality of patient care (Letvak et al., 2012). In addition, with growing nursing shortages, it is important to optimize the working environment to retain and attract qualified staff. The results of the current study suggest that a reduction in job demands, mainly worktime demands and the prevalence of aggression/ conflict situations, will have the most beneficial effect on stress related outcomes. Promising effects have been found for programmes including the involvement of senior doctors on the ER, specific care pathways for geriatric emergency care, and extending the role of paramedics (e.g., paramedic practitioner), on reducing worktime demands in this setting (Manson et al., 2014). Aggression training, accurate reporting of violent incidents, a positive context in which management and employees are committed to reduce violence and comfortable waiting rooms to reduce stress in patients can lead to less aggressive incidents at the ER (D'Ettorre et al., 2018). Furthermore, although the high levels and limited variance of social support in the current study suggest that Dutch ERs have good social structures (briefings, debriefing and chaplaincy support) in place, the importance of social support in the ER has been reported in other studies (Adriaenssens et al., 2015a, 2015b; Bruyneel et al., 2017; Hunsaker et al., 2015) and thus could be an issue in other countries. Finally, to keep employees engaged and retain and attract qualified staff, hospital management might explore possibilities for professional development including rotation with the ambulance or intensive care or opportunities to specialize (e.g., physician assistant). However, it must be noted that very high levels of engagement in a demanding environment might lead to energy depletion and stress-related outcomes. As such, ER managers should find a balance between stimulating engagement while controlling the level of job demands.

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“Eindeloos reanimeren en dan toch overleden.
Alle kinderen die onder mijn handen zijn overleden
ken ik nog bij naam bij wijze van spreken.
Dat is bagage wat je meeneemt.”

- SEH-verpleegkundige in opleiding, juli 2017 -

“Vaak is het juist de impact van de familie,
het verdriet, geschreeuw en de wanhoop.”

- SEH-verpleegkundige, juli 2017 -

“Vanuit ziekte is agressie prima. Maar asociale personen brengen veel druk met zich mee. Het de-escaleren van een conflictsituatie leer je in een training, maar zelf neem je die boosheid en irritatie gewoon weer mee.”

- SEH-verpleegkundige, juni 2017 -

“Soms sta ik nog tot mijn knieën in het bloed, dient de volgende patiënt zich alweer aan.”

- SEH-verpleegkundige in opleiding, juli 2017 -

“Heftige casussen, daar zit je altijd wel een paar dagen mee. Dan ga je ermee naar bed en sta je ermee op.”

- SEH-verpleegkundige, juli 2017 -

“Soms hebben we per dienst meerdere presentatiestops. We komen eigenlijk niet aan pauzes toe. Het is drukker maar ook langer druk.”

- SEH-verpleegkundige, juni 2017 -

CHAPTER 3

Patient-related stressful situations and stress-related outcomes in emergency nurses: The role of work factors and recovery during leisure time

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Abstract

Background: Emergency nurses are frequently exposed to patient-related stressful situations, making them susceptible to emotional exhaustion and symptoms of post-traumatic stress disorder. The current study aims to assess differential effects of patient-related stressful situations (emotionally demanding situations, aggression/conflict situations, and critical events) on stress-related outcomes in emergency nurses, and to identify moderating factors based on the Job Demands-Resources model and the Effort-Recovery model (job demands, job resources, and recovery experiences during leisure time).

Method: A cross-sectional study was carried out among nurses working in the emergency departments of 19 hospitals in the Netherlands (N = 692, response rate 73%). Data were collected by means of an online survey. Multiple hierarchical regression analyses were performed, controlling for sociodemographic variables.

Results: The frequency of exposure to patient-related stressful situations was positively related to stress- related outcomes, with emotionally demanding situations and aggression/conflict situations mainly explaining variance in emotional exhaustion (β = 0.16, p < .01, R^2 = 0.08, and β = 0.22, p < .01, R^2 = 0.13), whereas critical events mainly explained variance in post-traumatic stress symptoms (β = 0.29, p < .01, R^2 = 0.11). Moderating effects were found for within worktime recovery and recovery during leisure time. Work-time demands, autonomy and social support from the supervisor were predictive of stress-related outcomes irrespectively of exposure to patient-related stressful situations.

Conclusion: As patient-related stressful situations are difficult if not impossible to reduce in an emergency department setting, the findings suggest it would be worthwhile to stimulate within worktime recovery as well as recovery experiences during leisure time, to protect emergency nurses from emotional exhaustion and symptoms of post-traumatic stress. Furthermore, this study underscores the importance of reducing work-time demands and enhancing job resources to address stress-related outcomes in emergency nurses. Practical implications, strengths and limitations are discussed.

What is already known about the topic?

- Emergency nurses are frequently exposed to patient-related stressful situations even more so than nurses working in other settings.
- Frequent exposure to patient-related stressful situations is related to stress-related outcomes such as emotional exhaustion and post-traumatic stress in emergency nurses.
- Research on potential moderating effects of work factors and recovery experiences during leisure time in this association is limited.

What this paper adds

- This study demonstrates that patient-related stressful situations have differential effects on stress-related outcomes in emergency nurses: Exposure to emotionally demanding situations and aggression/conflict situations has a stronger relation- ship with emotional exhaustion whereas exposure to critical events has a stronger relationship with post-traumatic stress symptoms.
- Within work-time recovery and recovery experiences during leisure time can buffer the relationship between exposure to patient-related stressful situations and stress-related outcomes. Work-time demands, autonomy and social support from the supervisor are predictive of stress-related outcomes irrespectively of the exposure to patient-related stressful situations.

Introduction

Nurses working in the emergency department face a number of occupational stressors such as a high and mostly unpredictable workload, working in rotating shifts, staffing shortages, overcrowding and critical decision making under pressure (Adeb-Saeedi, 2002; Johnston et al., 2016). Moreover, due to their close contact with patients and their accompanies they are regularly confronted with patient-related stressful situations, including emotionally demanding situations, aggression and critical events (Adriaenssens et al., 2012; Copeland and Henry, 2017), even more so than nurses working in other settings (Gerberich et al., 2005; O'Connor and Jeavons, 2003).

Previous research shows that repeated exposure to patient-related stressful situations makes nurses especially susceptible to stress-related outcomes such as emotional exhaustion and post-traumatic stress disorder (PTSD) (Adriaenssens et al., 2012; Bernaldo-De-Quiros et al.,

2015; Chou et al., 2012). Not surprisingly, prevalence of stress-related outcomes in emergency nurses is high: 26% to 41% score above the cut-off for emotional exhaustion (Adriaenssens et al., 2015; Li et al., 2018) and 20–24% report PTSD symptoms on a (sub)clinical level (Adriaenssens et al., 2012; Laposa et al., 2003). Stress-related outcomes in nurses can lead to serious consequences including depression, lower job satisfaction, increased risk of medical errors, lower productivity, more absenteeism, and higher turnover intentions (Li et al., 2018; Van Bogaert et al., 2014).

Up till now, research has mainly focused on the prevalence of patient-related stressful situations and their direct relations with stress-related outcomes in emergency nurses (Schneider and Weigl, 2018). Little research has been done investigating potential moderating factors at work and outside work that might weaken or strengthen these relationships. This research is important as patient-related stressful situations are difficult and to some extent impossible to prevent in an emergency department setting.

Background

The Job Demands-Resources model (Demerouti et al., 2001; Bakker and Demerouti, 2017) and the Effort-Recovery Model (Meijman and Mulder, 1998) were used as a theoretical framework for the current study. According to the Job Demands-Resources model, work factors can be categorized into job demands and job resources. Job demands are those work factors that require sustained psychological or physical effort and thereby are associated with physiological or psychological costs and eventually illness. Job resources include work factors that can facilitate the achievement of work goals, reduce the effects of job demands on health impairment and stimulate growth and development (Bakker and Demerouti, 2017). In the current study, patient-related stressful situations are identified as job demands, as these situations ask for psychological effort from the nurse (e.g. regulating one's own emotions as well as those of the patient and patients accompanies). Following the health-impairment process of the Job Demands-Resources model, we expect that the more often emergency nurses are exposed to patient-related stressful situations, the more likely they will drain their psychological resources and experience stress-related outcomes. Furthermore, as the intensity of patient-related stressful situations differs, confrontation with these situations is expected to have differential effects on stress-related outcomes. For example, emotionally demanding situations are low intensity situations that require emotional effort, but in general

will not exceed nurses' coping resources. In contrast, critical events and aggression/conflict situations are far more likely to include high intensity stress situations and even traumatic events, defined as "…actual or threatened death, serious injury, or sexual violence" (American Psychiatric Association, 2013, p. 271). According to Hobfoll (2001), the process of slowly running out of resources leads to "feelings of being overextended and depleted of one's emotional and physical resources" also called emotional exhaustion (Maslach et al., 2001, p. 399), whereas encountering a high intensity situation in which all coping resources are depleted at once, will rather elicit symptoms of PTSD, including uncontrolled re-experiences and avoidance of thoughts and feelings of the event (American Psychiatric Association, 2013; Gerhart et al., 2015). Indeed, a study by Adriaenssens et al. (2012) found that the frequency of reported critical events by emergency nurses was directly related to the amount of PTSD symptoms experienced. Whereas in a study by Chou et al. (2012) the frequency of negative interactions with patients (e.g. dealing with difficult or complaining patients) was directly related to emotional exhaustion in hospital nurses.

Apart from patient-related stressful situations, work-time demands are identified as demands within the framework of the Job Demands-Resources model: work-time demands require physical energy as well as psychological energy of the emergency nurse, resources that are needed when confronted with patient-related stressful situations. Thus far, research on the combined effects of various job demands on stress-related outcomes is limited (Bakker and Demerouti, 2017). A study by Jimmieson et al. (2017) among three different samples of health care professionals (hospital employees, ambulance service workers, and aged care/disability workers) found significant intensifying effects of combinations of emotional demands, cognitive demands, and work-time demands on stress-related outcomes. Furthermore, a recent study by Riedl and Thomas (2019) found that the association between emotional demands and emotional exhaustion was stronger when nurses experienced higher work-time demands. These studies suggest that exposure to multiple job demands simultaneously will lead to a faster wear out of resources, making the nurse more susceptible for stress-related outcomes. Finally, the Job Demands-Resources model proposes that job resources can be protective and are able to buffer the effect of job demands on stress-related outcomes (Bakker and Demerouti, 2017). Within an emergency department setting, social support from colleagues and the supervisor, and autonomy have been indicated by previous research as important job resources (Adriaenssens et al., 2011; Garcia-Izquierdo and Rios-Risquez, 2012; Hunsaker et

al., 2015; Johnston et al., 2016). In addition, a review by Schneider and Weigl (2018) suggested that positive social relations at work can alleviate the burden of emotional demands and work-time demands faced by emergency department staff. A promising, but far less studied resource are sources of recovery. According to the Effort-Recovery model of Meijman and Mulder (1998), recovery is necessary in order to reverse changes in the psycho-biological system due to confrontation with job demands (e.g. faster heart rate, release of hormones including cortisol), and thereby protect employees from becoming ill. In a situation where employees are regularly confronted with patient-related stressful situations, time to process the event and restore energy levels after a highly intensive event (e.g., resuscitation), seems particularly important. Indeed, a study among ambulance personnel found that those with high scores on emotional exhaustion were also more likely to report never having time to recover between critical events (Alexander and Klein, 2001).

Furthermore, recent reviews show that interventions that aim to stimulate within worktime recovery (e.g., having a break) are positively related to nurse well-being (Nejati et al., 2016; Wendsche et al., 2017). However, recovery research thus far mainly focusses on sources of recovery during leisure time (e.g. psychologically detaching from work, relaxing, degree to which persons can decide what to do during leisure time, and mastering new skills) (Sonnentag et al., 2017). These recovery experiences are related to less burnout symptoms and better well-being in studies among nurses (Poulsen et al., 2015; Singh et al., 2016). Furthermore, in other occupational groups recovery experiences appear to have a buffering role in the job demands–well-being relationship (Sonnentag et al., 2017).

The current study aims to assess buffering and intensifying work and non-work factors in the relationship between exposure to patient-related stressful situations and stress-related outcomes (emotional exhaustion and PTSD symptoms) in emergency nurses. Identifying these factors will help to direct efforts to improve the work context and recovery outside work in order to reduce and prevent stress-related outcomes in emergency nurses. The following hypotheses are proposed (see figure 1):

1. Frequent exposure to patient-related stressful situations is directly and positively related to emotional exhaustion and symptoms of PTSD.
2. There is a differential effect of patient-related stressful situations on stress-related outcomes: The frequency of emotionally demanding situations is more strongly

associated with emotional exhaustion than with PTSD symptoms, whereas the frequency of critical events and aggression/conflict situations is more strongly associated with PTSD symptoms than with emotional exhaustion.

3. The association between patient-related stressful situations and emotional exhaustion and PTSD symptoms is strengthened by work-time demands: Under higher work-time demands, exposure to patient-related stressful situations is more strongly related to emotional exhaustion and post-traumatic stress compared to working under lower work-time demands.
4. The association between patient-related stressful situations and emotional exhaustion and PTSD symptoms is buffered by job resources (autonomy, social support from colleagues, social support from the supervisor, and within worktime recovery).
5. On top of job resources, the relationship between patient-related stressful situations and emotional exhaustion and PTSD symptoms is buffered by recovery experiences during leisure time (psychological detachment, mastery, control, and relaxation).

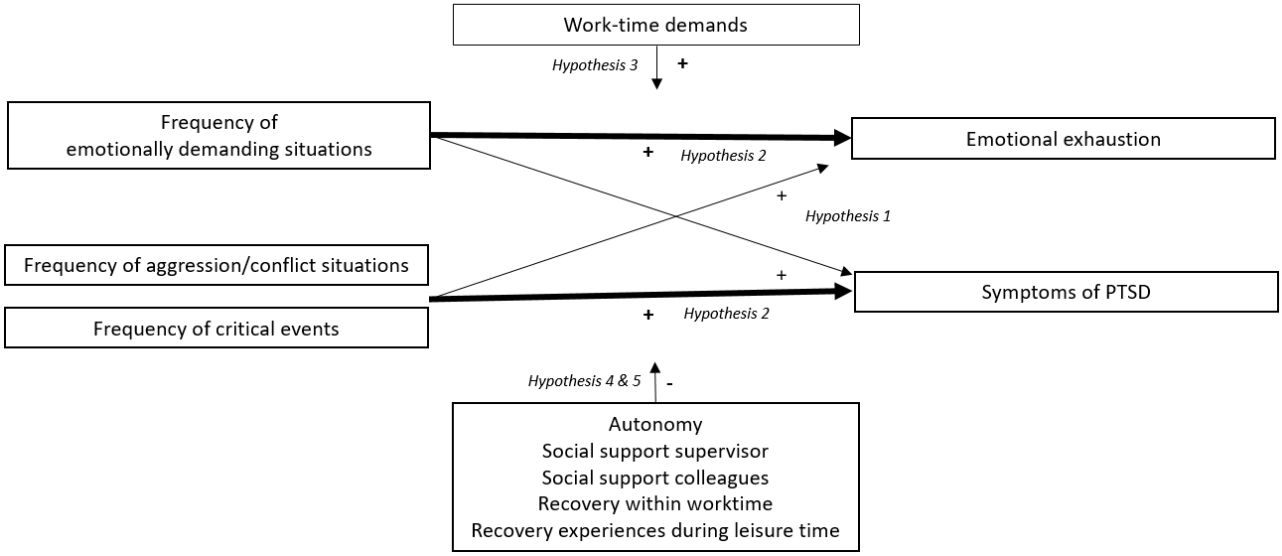


Figure 1. Proposed hypotheses of the study

Methods

Design

A cross-sectional study was performed.

Participants and setting

The sample consisted of the 949 emergency nurses and emergency nurses in training employed in 19 hospitals in the Netherlands participating in an ongoing study on occupational stress in the emergency department.

Data collection

The data were collected between January 2017 and March 2017 by means of an online survey. The questionnaire took about 30 min to complete. Each hospital had a project leader (often the emergency department manager or a team leader) assigned to stimulate participation in the study. In addition, multiple reminders were sent out resulting in a total of 692 completed questionnaires (72.9% response). Demographic data and work-email addresses of the staff were obtained through the hospitals administration.

Predictors

The *frequency of emotionally demanding situations* and *aggression/conflict situations* with patients and/or accompanies were measured with an inventory of stressful situations that has been used in studies on staff working in organizations providing care for mentally and physically disabled individuals (α= 0.90) (Bolhuis et al., 2004). The questionnaire included two subscales: the frequency of verbal and physical aggression from patients and/or accompanies (7 items) ("In my work I am confronted with patients and/or accompanies who are physically aggressive"), and the frequency of emotionally demanding situations (4 items) ("In my work I am confronted with patients in a hopeless situation"). All statements were rated on a 7-point Likert scale ranging from *never* (1) to *daily* (7).

In line with the study by Adriaenssens et al. (2012) *critical events* were measured with a single question in which emergency nurses were asked to report the number of patient-related stressful situations that they experienced as emotionally upsetting in the past six months. Responses were collected on a 7-point Likert scale ranging from *none* (0) to *more than* 5 (6).

Outcomes

Emotional exhaustion was measured with the Dutch version of the Maslach Burnout Inventory-Human Services Survey (Schaufeli and Van Dierendonck, 2000). The emotional exhaustion subscale included eight statements which were rated on a 7-point Likert scale from *never* (0) to *daily* (6). The Dutch version of the Maslach Burnout Inventory-Human Services Survey has shown to be a valid and reliable instrument (Schaufeli and Van Dierendonck, 2000).

Symptoms of PTSD (15 items) including avoidance ("Any reminder brought back feelings about it") and intrusion ("I thought about it when I didn't mean to") were measured with the Dutch version of the Impact of Events Scale (Horowitz et al., 1979; Van der Ploeg, Mooren, Kleber, Van der Velden, and Brom, 2004), Responses were collected on a 4-point Likert scale: *not at all* (0), *rarely* (1), *sometimes* (3), and *often* (5). The Impact of Events Scale has shown to be a reliable and valid instrument (Salsman et al., 2015).

Moderators

Possible moderating work factors were measured with the Leiden Quality of Work Life Questionnaire for Nurses (Gelsema et al., 2005; Maes et al., 1999): *Work-time demands* (5 items) (e.g. "I must care for too many patients at once"); *Autonomy* (4 items) (e.g. "I can decide for myself when to carry out patient-related tasks and when to carry out non-patientrelated tasks"); *social support from the supervisor* (4 items) (e.g. "I can count on the support of my direct supervisor when I face a problem at work"); *social support from colleagues* (4 items) (e.g. "My colleagues give me emotional support when I'm having difficulties"). All statements were rated on a 4-point Likert scale from *entirely disagree* (1) to *entirely agree* (4). The Leiden Quality of Work Life Questionnaire for Nurses is an occupation specific questionnaire tested in multiple studies and moderate to high reliability (α = 0.67 - 0.96) for the subscales has been found (Adriaenssens et al., 2012; Gelsema et al., 2005; Pisanti et al., 2016).

As no validated questionnaire was found in the literature to measure *within worktime recovery* in an emergency department setting, four items were developed to measure this construct: 1. "If I want to, I can leave my workplace for a short while", 2. "I can have a chat during my work", 3. "During my shift, I regularly have to skip breaks", 4. "During my breaks, I must remain available for urgent cases". Responses were collected on a 4-point Likert scale from

never (1) to *always* (4). Scores for the last two items were reversed, with higher scores indicating more within worktime recovery.

Recovery experiences during leisure time (16 items) was measured with the Dutch version of the Recovery Experiences Questionnaire (Sonnentag and Fritz, 2007; Geurts et al., 2009), including four subscales: Psychological detachment (e.g. "During the time after work I don't think about work at all"), relaxation (e.g. "during the time after work I kick back and relax"), mastery (e.g. "during the time after work I do things that challenge me"), and control (e.g. "during the time after work I feel like I can decide for myself what to do"). Each item was rated on a 5-point Likert scale ranging from *never* (1) to *always* (5).

Ethical considerations

Participants received an invitation for the online survey via their work-email. Informed consent was obtained at the beginning of the survey. All individual responses were anonymized by storing the data under a unique personal code. Only the authors of this paper had access to the key that links the personal code to the individual. This study was approved by the ethical review board of the university (approved on the 2nd of January 2017, CEP17- 0102/3).

Data analysis

Descriptive statistics (means, standard deviations, frequencies, skewness and kurtosis) and Pearson's correlations between variables were computed. Due to non-normality of PTSD symptoms (with skewness of 1.71 (*SE* = 0.093) and kurtosis of 2.94 (*SE* = 0.186)) a square root transformation was performed (Tabachnick & Fidell, 1996). As this resulted in more normally distributed scores (skewness of 0.438 (*SE* = 0.093) and Kurtosis −0.677 (*SE* = 0.186)), all analyses were done using the transformed data. Independent sample *t*-tests and Chi ²tests were performed to compare respondents and non-respondents. Next, the contribution of each predictor to each outcome and the buffering and reinforcing effects of moderators were assessed through multiple hierarchical regression analyses. Age, working experience in years, number of working hours a week, nightshifts, children between 6–21 years of age living at home and informal caregiving tasks outside work had significant correlations with the outcome variables and were therefore included as covariates in block one of the regression analyses. Gender, marital status (married/living together versus other), children under the age of 6, supervisory role, or occupational group (registered nurse or nurse in training) had no

significant correlations with the outcome variables and were therefore not included as covariates. Exposure to patient-related stressful situations was added in block two, work factors in block three, interaction terms between patient-related stressful situations and work factors in block four, recovery experiences during leisure time in block five and interaction terms between patient-related stressful situations and recovery experiences during leisure time in block six. To prevent multicollinearity, predictors (including possible moderators) were centralized around the mean (Field, 2013). Block one, two, three and five were added using forced entry of the variables. Block four and six (interaction terms) were added using the backward method to avoid suppressor effects (Field, 2013). To avoid overfitting and reduced generalizability of the findings, only significant interaction terms were included in the final model.

Visual inspection of histograms and P-P plots showed normal distributions of the standardized residuals. Scatterplots between standardized residuals and standardized predicted variables showed linear relationships and homoscedasticity. All Durbin-Watson values were between one and three, and the VIF's scores below 10, indicating independent errors and a lack of multicollinearity (Field, 2013). In conclusion, all assumptions for multiple linear regression were met. A *p*-value below 0.05 was considered statistically significant. All analyses were performed with the Statistical Package for Social Sciences (SPSS) version 23.

Validity and reliability

With the exception of the scales autonomy ($\alpha = 0.62$) and within worktime recovery ($\alpha = 0.59$), all scales had a Cronbach's Alpha above 0.70 which corresponds with an acceptable internal consistency (Tavakol and Dennick, 2011) (see Table 2). As a higher internal consistency for within worktime recovery could not be achieved by deleting an item, the original four item scale was used.

Results

Sample characteristics

A complete overview of the sample demographics is provided in Table 1. The majority of the respondents was female (75.6%). The average age was 42.4 years (*SD* = 11.3), and nurses had an average of 12.1 (*SD* = 11.1) years of working experience in the emergency department. Compared to non-respondents, respondents worked significantly more hours a week (*M* = 29.1 vs *M* = 27.3, $p < .01$) and had more often a supervisory role ($\chi^2 = 4.39$, $p < .05$). In our sample 39.7% scored above the cut-off for high emotional exhaustion (Schaufeli and van Dierendonck, 2000), and 15.7% reported (sub)clinical levels of PTSD symptoms (Orsillo, 2001).

Table 1. Demographics respondents versus non-respondents

		Respondents (N=692)		Non-respondents (N=257)	
		M	*SD*	*M*	*SD*
Age		42.4	11.3	43.1	11.9
Nr. of years working in the ED		12.1	11.1	12.9	11.7
Nr. of working hours a week **		29.1	7.3	27.3	10.1
		N	%	*N*	%
Gender	Female	523	75.6	186	72.4
	Male	169	24.4	54	21
	Missing	0	0	17[a]	6.6
Marital status	Married/living together	529	76.4		
	Other	163	23.6		
Children < 6 years living at home	Yes	161	23.3		
	No	531	76.7		
Children 6-21 years living at home	Yes	217	31.4		
	No	475	68.6		
Informal caregiving tasks	Yes	157	22.7		
	No	535	77.3		
Occupational group	Registered nurse	626	90.5	225	87.5
	Nurse in training	66	9.5	32	12.5
Supervisory role *	Yes	31	4.5	4	1.6
	No	661	95.5	236	91.8
	Missing	0	0	17[a]	6.6
Night shifts	Yes	596	86.1		
	No	96	13.9		

[a] not included in Chi² test. * $p < .05$, ** $p < .01$

Regression analyses

An overview of the results of the multiple regression analyses is presented in Table 3. Controlling for covariates, separate regression analyses for the three types of patient-related stressful situations (block 2) consistently showed that patient-related stressful situations were significant predictors of emotional exhaustion as well as PTSD symptoms. However, emotionally demanding situations and aggression/conflict situations explained more variance in emotional exhaustion (respectively 8% and 13%) than in PTSD symptoms (respectively 2% and 3%), whereas critical events explained more variance in PTSD symptoms (11%) than in emotional exhaustion (6%).

When adding work factors to the model (block 3) higher work-time demands was a strong predictor of emotional exhaustion (β = 0.30, $p < .01$, β = 0.28, $p < .01$ and β = 0.33, $p < .01$) and to a lesser extent of PTSD symptoms (β = 0.09, $p < .05$, β = 0.07, $p > .05$, and β = 0.11, $p < .01$). In terms of job resources, lower autonomy was the strongest predictor of emotional exhaustion, whereas higher social support from the supervisor predicted less PTSD symptoms as well as lower emotional exhaustion. Overall, work factors explained an additional 18–25% of the variance in emotional exhaustion and 5% in PTSD symptoms.

When adding interaction terms (block 4) two moderating effects for the working environment were found: Recovery within worktime was a significant moderator in the relationship between emotionally demanding situations and PTSD symptoms, and social support from colleagues was a significant moderator between aggression/conflict situations and emotional exhaustion. However, the latter became insignificant when adding recovery experiences during leisure time to the model (block 5) and was therefore not interpreted. Simple slopes analysis showed under lower exposure to emotionally demanding situations, nurses with more within worktime recovery reported less PTSD symptoms compared to those with less within worktime recovery. However, when exposed to a higher number of emotionally demanding situations, nurses with higher and nurses with lower within worktime recovery experienced similar levels of PTSD symptoms (see Fig. 2).

Table 2. Means, standard deviations (SD), correlations and reliabilities (Cronbach's alpha; on the diagonal) of the study variables, N=692

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Emotional Exhaustion	2.07	1.22	(.89)													
2.	PTSD symptoms	9.17	11.47	.39**	(.92)												
3.	Emotionally demanding situations	4.61	1.07	.28**	.13**	(.77)											
4.	Aggression/conflict situations	2.58	.83	.35**	.18**	.56**	(.86)										
5.	Nr. of critical events	3.80	1.93	.24**	.27**	.21**	.22**	.									
6.	Work-time demands	2.87	.43	.49**	.25**	.28**	.34**	.10**	(.72)								
7.	Autonomy	2.70	.37	-.34**	-.20**	-.11**	-.15**	-.10*	-.35**	(.62)							
8.	Social support supervisor	2.97	.54	-.22**	-.15**	.01	-.03	-.06	-.18**	.31**	(.90)						
9.	Social support colleagues	3.21	.42	-.14**	-.06	-.03	-.03	.04	-.05	.17**	.29**	(.85)					
10.	Recovery within worktime	1.97	.42	-.28**	-.16**	-.26**	-.26**	-.11**	-.44**	.25**	.13**	-.04	(.59)				
11.	Recov. Exp. Control	3.89	.66	-.21**	-.16**	.01	.00	-.07	-.09*	.07	.11**	.12**	.02	(.81)			
12.	Recov. Exp. Mastery	3.52	.68	-.26**	-.10**	.00	-.03	-.04	-.12**	.11**	.09*	.04	.04	.45**	(.82)		
13.	Recov. Exp. PD	3.37	.78	-.35**	-.25**	-.04	-.07	-.15**	-.20**	.12**	.09*	.10**	.06	.53**	.37**	(.85)	
14.	Recov. Exp. Relaxation	3.95	.61	-.30**	-.19**	.00	-.02	-.08*	-.14**	.11**	.12**	.19**	.03	.67**	.48**	.55**	(.88)

Abbreviations: Recov. Exp. = Recovery Experiences, PD = Psychological Detachment
* $p<.05$, ** $p<.01$

Table 3. Results of Regression of Exposure to Patient Related Stressful Situations, Work Factors, and Recovery Experiences During Leisure Time on Emotional Exhaustion and PTSD symptoms (N=692)

	Emotional Exhaustion			PTSD symptoms			Emotional Exhaustion			PTSD symptoms			Emotional Exhaustion			PTSD symptoms		
	ΔR^2	β		ΔR^2	β		ΔR^2	β		ΔR^2	β		ΔR^2	β		ΔR^2	β	
Block 1: Covariates	.02*			.03**			.02*			.03**			.02*			.03**		
Age		.03			.04			.06			.06			.02			.03	
Working experience (nr. of years)		.01			-.01			.00			-.01			.00			-.01	
Nr. of hours working a week		.02			-.03			.03			-.02			.03			-.03	
Nightshifts (Y=1, N=0)		-.01			-.06			-.01			-.07			-.01			-.08	
Children between 6-21 years living at home (Y=1, N=0)		-.09	**		-.06			-.10	**		-.06			-.11	**		-.08	*
Informal caregiving tasks outside work (Y=1, N=0)		.01			.07			-.01			.06			.01			.07	*
	Block 2: Emotionally demanding situations						Block 2: Aggression/conflict situations						Block 2: Critical events					
Block 2: PRSS	.08**			.02**			.13**			.03**			.06**			.11**		
PRSS		.16	**		.10	**		.22	**		.12	**		.16	**		.29	**
Block 3: Work factors	.22**			.05**			.18**			.05**			.25**			.05**		
Work-time demands		.30	**		.09	*		.28	**		.07			.33	**		.11	**
Autonomy		-.13	**		-.07			-.13	**		-.06			-.12	**		-.05	
Social support supervisor		-.07	**		-.08	*		-.08	*		-.09	*		-.05			-.07	
Social support colleagues		-.04			.03			-.04			.03			-.06			.01	
Block 4: Moderators at work				.01*			.01**											
PRSS * Work-time demands																		
PRSS * Autonomy																		
PRSS * Social support supervisor																		
PRSS * Social support colleagues								.06	(*)									
PRSS * Recovery within worktime					.08	*												

Abbreviations: Y=yes, N=No, Recov. Exp. = Recovery Experiences during leisure time, PD = Psychological Detachment, PRSS = Patient-related stressful situations, β = Beta at last sign. block, ΔR^2 = change in explained variance, sign.= significant, Adj. = Adjusted. * $p<.05$, ** $p<.01$. (*) significant at $p<.01$ before adding block 5

Table 3. *Continued*

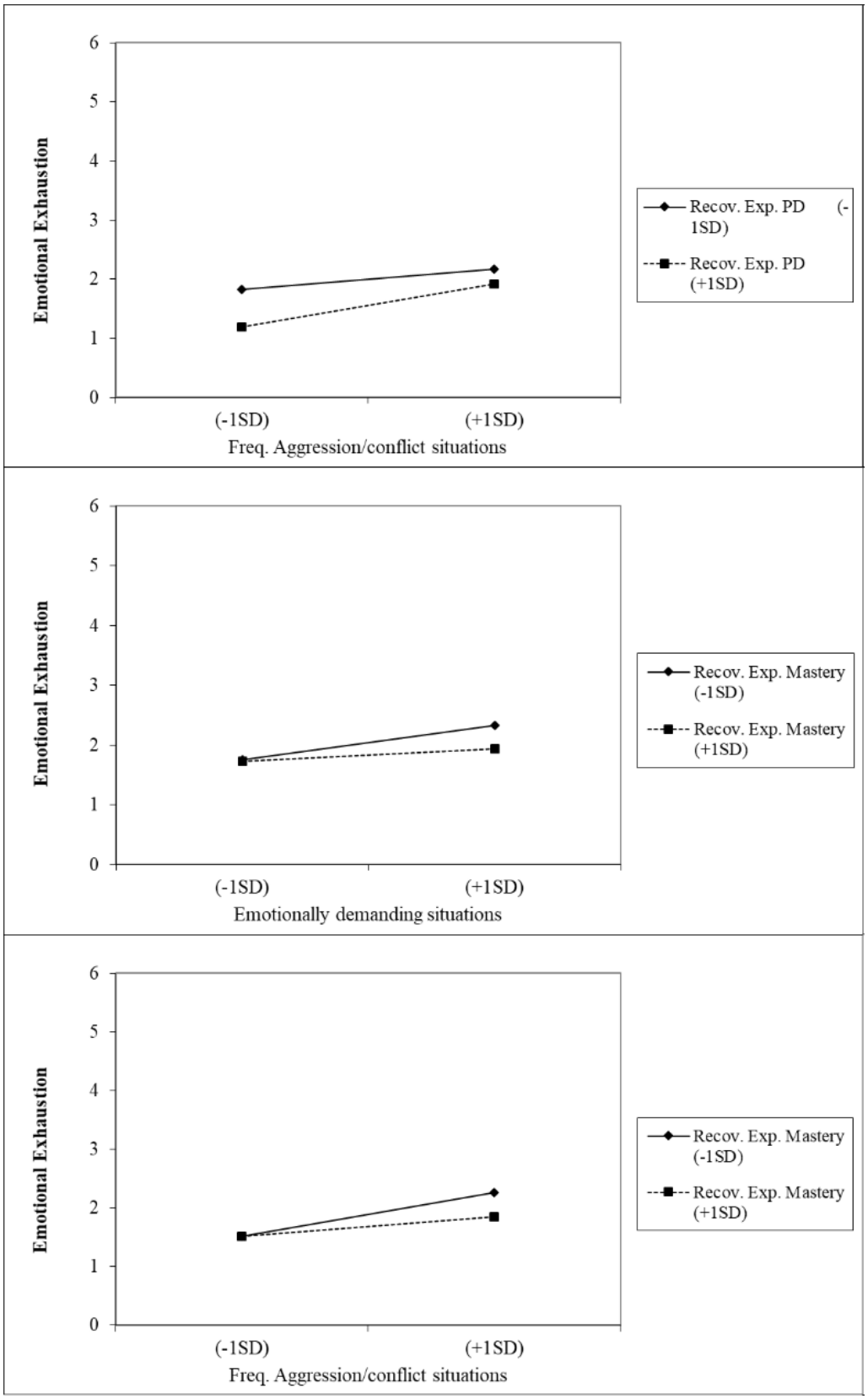
	Emotional Exhaustion		PTSD symptoms		Emotional Exhaustion		PTSD symptoms		Emotional Exhaustion		PTSD symptoms	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
	Block 2: Emotionally demanding situations				Block 2: Aggression/conflict situations				Block 2: Critical events			
Block 5: Recovery experiences	.08**		.04**		.07**		.04**		.07**		.03**	
Recov. Exp. Control		.04		-.06		.02		-.06		.05		-.04
Recov. Exp. Mastery		-.08 *		.02		-.09 *		.02		-.10 **		.01
Recov. Exp. PD		-.18 **		-.17 **		-.18 **		-.17 **		-.16 **		-.14 **
Recov. Exp. Relaxation		-.12 **		-.03		-.10 *		-.02		-.11 *		-.02
Blok 6: Moderators outside work	.01**				.01*		.01*				.01*	
PRSS * Recov. Exp. Control												-.09 *
PRSS * Recov. Exp. Mastery		-.08 **				-.08 *						
PRSS * Recov. Exp. PD						.09 **						
PRSS * Recov. Exp. Relaxation								-.07 *				
R^2 model	.40		.15		.42		.15		.40		.22	
Adj. R^2 model	.39		.13		.40		.13		.38		.20	

Abbreviations: Y=yes, N=No, Recov. Exp. = Recovery Experiences during leisure time, PD = Psychological Detachment, PRSS = Patient-related stressful situations, β = Beta at last sign. block, ΔR^2 = change in explained variance, sign.= significant, Adj. = Adjusted. * p<.05, ** p<.01. (*) significant at p<.01 before adding block 5

When adding recovery experiences during leisure time to the model (block 5), direct effects for almost all recovery experiences were found, with psychological detachment having the most consistent effects. Overall, recovery experiences during leisure time explained an additional 7–8% of the variance in emotional exhaustion and 3–4% in PTSD symptoms.

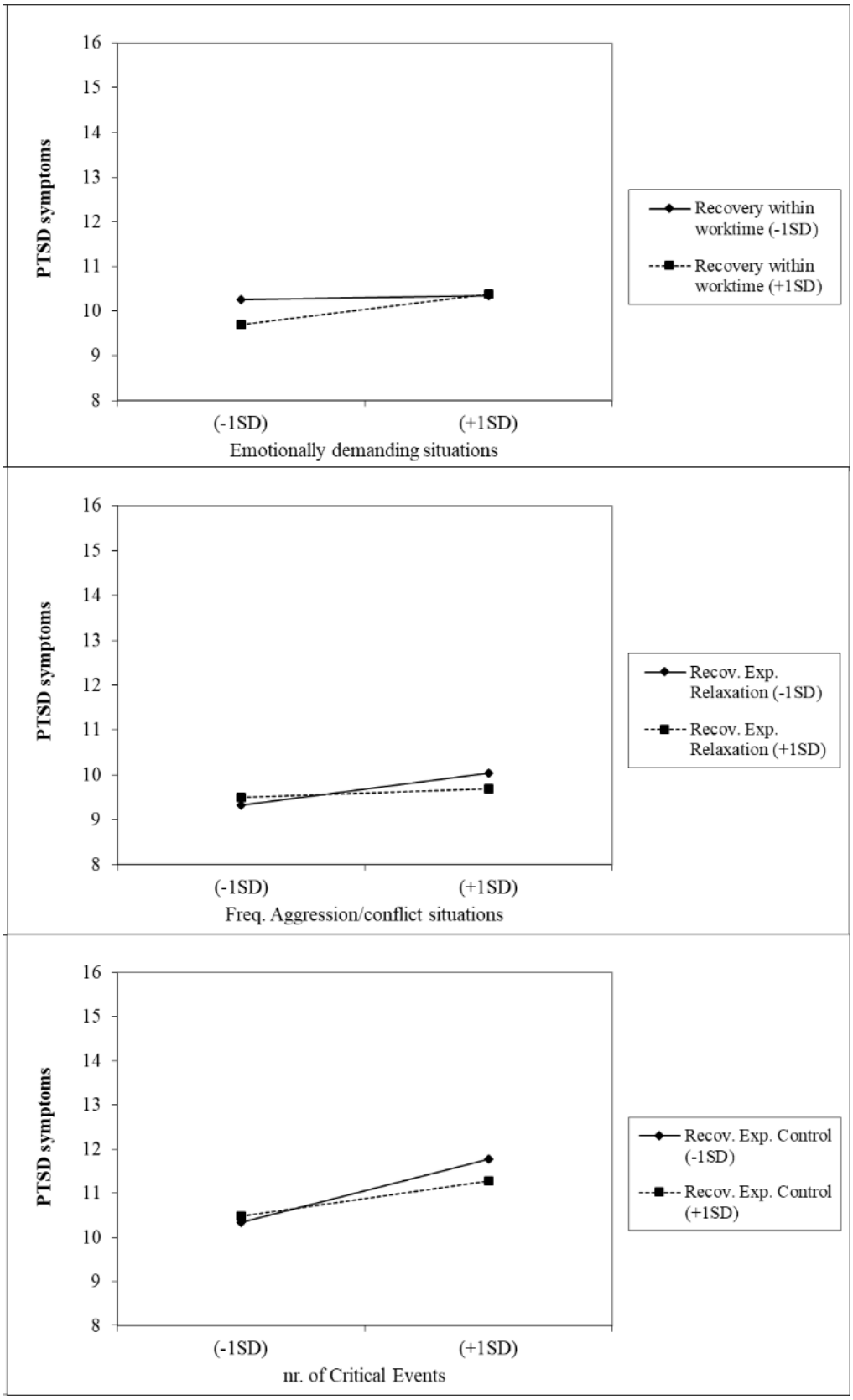
On top of direct effects, a number of significant interaction effects of recovery experiences were found (block 6). Simple slope analysis showed that mastery buffered the effects of emotionally demanding situations and the effects of aggression/conflict situations on emotional exhaustion. Furthermore, when exposure to aggression/conflict situations was lower, those with more psychological detachment had lower emotional exhaustion compared to those with less psychological detachment. However, when exposed to a higher number of aggression/conflict situations this difference was not present. For PTSD symptoms, relaxation buffered the effect of aggression/conflict situations, whereas control buffered the effects of critical events. Results of these simple slopes analyses can be found in Fig. 2.

Overall, the three complete models mainly explained variance in emotional exhaustion (respectively 40%, 42%, and 40%), and to a lesser extent in PTSD symptoms (respectively 15%, 15%, and 22%).



Abbreviations: Recov. Exp. = Recovery Experience, Freq. = frequency, PD = Psychological Detachment

Figure 2. Significant two-way interactions between patient-related stressful situations and recovery within worktime, and relaxation experiences during leisure time (mastery, psychological detachment, relaxation) on PTSD symptoms and emotional exhaustion.



Abbreviations: Recov. Exp. = Recovery Experience, Freq. = frequency, PD = Psychological Detachment

Figure 2. Continued

Discussion

In the current study the association between different types of patient-related stressful situations (emotional demanding situations, aggression/conflict situations and critical events) and stress-related outcomes (emotional exhaustion and PTSD symptoms) in emergency nurses was examined. Furthermore, potential buffering and intensifying effects of work factors and recovery during leisure time were studied.

First of all, in line with the Job Demands-Resources model, frequent exposure to patient-related stressful situations was associated with emotional exhaustion as well as PTSD symptoms in emergency nurses. In addition, 40% of the emergency nurses in the current sample scored above the cut-off for high emotional exhaustion and 16% reported (sub)clinical levels op PTSD symptoms. These results confirm previous studies on the high prevalence of stress-related outcomes in emergency nurses and the positive association with exposure to patient-related stressful situations (Adriaenssens et al., 2012; Copeland and Henry, 2018; Schneider and Weigl, 2018).

Second, differential effects were found for patient-related stressful situations. As expected, emotionally demanding situations had a stronger relationship with emotional exhaustion compared to PTSD symptoms, whereas the number of critical events had a stronger relationship with PTSD symptoms than with emotional exhaustion. However, against our expectations the frequency of exposure to aggression/conflict situations was more predictive of emotional exhaustion than of PTSD symptoms. A possible explanation for this finding is that most aggressive/conflict situations that occur in the emergency department are unlikely to have a traumatic impact on emergency nurses. For example, a study by Partridge and Affleck (2017) found that from all forms of aggression, emergency nurses were most often confronted with patients using a threating tone or abusive language. In addition, a study by Bernaldo-De-Quiros et al. (2015) found that the frequency of verbal aggression was related to higher emotional exhaustion (and depersonalization), and situations including physical aggression were related to anxiety in pre-hospital emergency staff. This suggests that the less frequent and more intense forms of aggression in the emergency department are more likely to relate to anxiety related disorders, such as PTSD, whereas the more frequent and less intense forms of aggression lead to emotional exhaustion in emergency nurses.

With regard to moderating effects, against expectations nurses that experience higher work-time pressure do not experience more emotional exhaustion or PTSD symptoms when exposed to patient-related stressful situations than nurses experiencing lower work-time pressure. This is in contrast to other studies in the field that did find intensifying effects of exposure to multiple job demands on stress-related outcomes (Jimmieson et al., 2017; Riedl and Thomas, 2019). However, in the study by Jimmieson et al. (2017), whereas evidence was found for an exacerbating effect of cognitive demands (e.g. demands that ask for intense concentration) on the positive relationship between emotional demands and emotional exhaustion, this was not the case for work-time demands. Riedl and Thomas (2019) did find an intensifying effect of work-time demands on the positive relationship between emotional demands and emotional exhaustion for nurses. However, in this study work-time demands included both time related work pressure as well as attention-related work pressure. These results suggest that the association between emotional demands and emotional exhaustion is exacerbated by cognitive demands rather than by work-time demands. Another explanation for the absence of an intensifying effect of work-time demands, is that different combinations of job demands have differential effects depending on the outcome measured. For example, although Jimmieson et al. (2017) did not find an exacerbating effect of work-time demands on the relationship between emotional demands and emotional exhaustion, work-time demands did intensify the relationship between emotional demands and sleep problems. In conclusion, more research is required to fully understand the effects of multiple job demands on the health-impairment process.

We did find some support for the buffering effect of job resources proposed by the Job Demands-Resources model: Emergency nurses reported less PTSD symptoms when they experienced high within worktime recovery rather than low within worktime recovery, but only when exposure to emotionally demanding situations was relatively low. Furthermore, no buffering effects of within worktime recovery for aggression/conflict situations or critical events were found. Neither did we find any buffering effects of autonomy, social support from the supervisor or social support from colleagues.

A possible explanation for the absence of buffering effects for most job resources might be an imperfect fit between these job resources and the demands. For example, the Demand-Induced Strain Compensation Model (DISC-Model) implies that buffering effects are more

likely to be found for resources that match the demands in terms of similar processes (e.g. cognitive, behavioral, emotional) than for resources that do not match (de Jonge and Dormann, 2003) and evidence for this hypothesis has been found in several studies (Balk et al., 2019; De Jonge, Spoor, Sonnentag, Dormann, and Van den Tooren, 2012). In the current study rather broad measures of work factors were used which could have entailed an imperfect match to the demands of patient-related stressful situations. For example, emotional support might be a more fitting resource when faced with patient-related stressful situations than the more global social support measure in the current study which also includes instrumental support and appreciation.

Work factors were however important contributors to emotional exhaustion and PTSD symptoms in emergency nurses. Higher work-time demands and lower autonomy were the strongest predictors of emotional exhaustion irrespective of the exposure to patient-related stressful situations. Furthermore, social support from the supervisor was directly related to less PTSD symptoms as well as lower emotional exhaustion in emergency nurses. These findings are in line with previous research in which work-time demands, autonomy and especially social support from the supervisor has been found to be directly related to emergency nurses' well-being (Adriaenssens et al., 2012; Basu et al., 2017; Schneider and Weigl, 2018).

Finally, we assessed whether apart from the influence of work factors, recovery experiences during leisure time could buffer the negative effects of patient-related stressful situations. First of all, we found direct effects of recovery experiences on the well-being of emergency nurses, with the strongest effects for psychological detachment. This finding - including the importance of psychological detachment in comparison to the other recovery experiences - is in line with previous studies (Sonnentag et al., 2017). Second, confirming the Effort-Recovery model (Meijman and Mulder, 1998), recovery experiences buffered the association between patient-related stressful situations and stress-related outcomes. This implies that, similar to what has been found in other occupations (Sonnentag et al., 2017), engaging in recovery experiences during leisure time is important for emergency nurses to regain their resources and protect them for stress-related outcomes.

Strengths, limitations and future directions

The large number of participants (*N* = 692) in the study working in different hospitals all over the Netherlands, the high response rate (73%), and the use of an occupation specific questionnaire to measure work factors are important strengths of this study. Furthermore, this study is innovative as it is the first to examine the differential effects of patient-related stressful situations on stress-related outcomes, and the impact of recovery within worktime and recovery experiences outside work as buffers in the relationship between patient-related stressful situations and stress-related outcomes in emergency nurses.

However, some limitations must be taken into account when interpreting the results. First of all, the cross-sectional design of the study does not permit any conclusions regarding the causal relationship between the variables. Although it seems more likely that patient-related stressful situations cause stress-related health complaints, we cannot rule out that emergency nurses experiencing emotional exhaustion or PTSD symptoms perceive patient-related stressful situations as occurring more frequently or interpret situations more often as emotionally upsetting. Similarly, we cannot rule out that those nurses that experience stress-related outcomes might also have difficulty to engage in recovery experiences. Up till now only a small number of longitudinal studies have been done on recovery experiences during leisure time and their results regarding causality remain inconclusive (Sonnentag et al., 2017).

In addition to the cross-sectional design, data was based solely on self-report measures which might have led to common method bias (Podsakoff, Mackenzie, and Lee, 2003). However, a study by Siemsen et al. (2010) shows that considering multivariate linear relationships, adding independent variables with common method variance to the model generally leads to a reduction rather than an increase of common method bias (Siemsen et al., 2010). Furthermore, they argued that interaction effects cannot be artifacts of, but can be deflated by common method variance (Siemsen et al., 2010), providing further support for the interaction effects found in the current study. Still, especially considering work factors, future studies may benefit from adding more objective measures (e.g. number of patients visiting the emergency department).

A final limitation to this study includes the moderate internal consistency of the scale measuring within worktime recovery. One possible reason for this is that the current scale measures different types (e.g. short unofficial breaks and official breaks) and experiences (e.g. opportunities for detachment from work by leaving the workplace for a short while) of recovery during worktime, which could have led to a lower internal consistency.

Taking these limitations into account, in future research longitudinal designs are necessary to gain more insight in the causal relationships between patient-related stressful situations, work factors, recovery experiences during leisure time and stress-related outcomes in emergency nurses. Furthermore, we suggest to extend the scale measuring within worktime recovery and differentiate between official breaks, micro breaks and recovery experiences during breaks, based on recent recovery research (Bosch and Sonnentag, 2019; Kim et al., 2018). In terms of directions, based on previous research regarding the Demand-Induced Strain Compensation Model (de Jonge and Dormann, 2003), it would be worthwhile to study the buffering effects of more focused resources matching the specific patient-related demands.

Practical implications

Providing that, longitudinal studies confirm the findings of the current study, the following recommendations are warranted.

First of all, although patient-related stressful situations are to some extent inherent to the emergency department setting, effort should be invested to reduce the number of these situations. Relevant measures in this respect could be, for example, providing information on the processes in the emergency department and current waiting times (See & Catterson, 2017), providing adequate pain management (Husebo et al., 2014), and education and training for emergency nurses on ways to prevent/manage aggressive behavior (Kynoch et al., 2011). Second, due to their direct relationship with stress-related outcomes, it is important to lower work-time demands and ensure adequate levels of job resources. Special attention might be given to guarantee recovery within work-time and stimulate recovery during leisure time. Current reviews show that interventions can stimulate within worktime recovery which in turn increases well-being of nurses (Nejati et al., 2016; Wendsche et al., 2017). Furthermore, training including education on recovery experiences, reflecting on one's current recovery experiences, and goal setting to achieve more recovery experiences, has been found effective

on both achieving more recovery experiences as well as better well-being (Hahn et al., 2011). Finally, as performing work-related activities during leisure time is related to less recovery experiences (Sonnentag et al., 2017), hospital management may stimulate psychological detachment from work by ensuring that employees are not required to read work-related emails, attend work-related courses, or take calls for work-related problems during their leisure time.

Conclusion

Exposure to patient-related stressful situations is an inevitable part of the job of emergency nurses and is related to emotional exhaustion and symptoms of PTSD. In the current study within worktime recovery and recovery during leisure time were found to be important resources, whilst other work factors were directly associated with these stress-related outcomes. The results emphasize the importance of ensuring adequate job resources, reducing work-time demands, and stimulating recovery during leisure time, to safeguard emergency nurses' well-being.

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CHAPTER 4

The effectiveness of stress management interventions for nurses: Capturing 14 years of research.

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Abstract

Nurses are considered to have one of the most demanding professions and are at risk of developing stress-related outcomes. As a result, many stress management interventions (SMIs) have been published in the literature, but there is a lack of a systematic quantitative approach to assess their effectiveness. The current study uses meta-analytic techniques to evaluate their overall effectiveness and potential moderators related to greater intervention success. Databases were searched for articles published between 2007-2020, measuring stress-related outcomes before and after the SMI and including a control group. Based on 85 publications (83 SMIs) a combined medium effect (Hedges' g = 0.42) was found. Person-directed interventions yielded larger effects than organization-directed or multilevel interventions, but this could only be concluded regarding their short-term effectiveness. For person-directed interventions, higher exposure and a homogenous sample of nurses were related to greater effectiveness, whereas the type (cognitive behavioral, relaxation, work skills or a mix), the length of the intervention, target group (primary or secondary) and type of control group used, were not. In addition, person-directed interventions were more effective on current stress levels (e.g. work-related stress) than on outcomes indicating strain (e.g. burnout). As all organization-directed interventions used a participatory approach, this process variable could not be examined as potential moderator. To conclude, SMIs can effectively prevent and reduce stress-related outcomes in nurses. To further evaluate factors contributing to their effectiveness, more detailed reporting in publications is necessary. Furthermore, especially for person-directed interventions, long term measurements are needed to determine the longevity of their effects.

Introduction

Background

It is well known that nursing is a stressful profession. Nurses are exposed to a wide range of work-related stressors including heavy workload, rotating schedules and night work, confrontation with loss, grief and suffering in patients, and aggression/conflict situations with patients and/or their accompanies (Liu et al., 2019; McVicar, 2016). In addition, they often have limited resources to deal with these demands, including limited decision authority and staffing shortages (McVicar, 2016). High stress levels in nurses can have serious consequences. First of all, it has been related to a range of mental health problems and physical complaints (Roberts & Grubb, 2014). Not surprisingly, stress-related outcomes are highly prevalent in this occupational group, with one out of three nurses reporting symptoms of burnout (Monsalve-Reyes et al., 2018). Furthermore, high workload can cause nurses to miss important changes in their patient (McHugh et al., 2011), leading to a rise of seven percent in mortality rates with every patient added per nurse (Aiken et al., 2002). Finally, high stress levels in nurses are related to decreased job satisfaction, more absenteeism and higher turnover intentions (Roberts & Grubb, 2014). Scholars predict that stress levels in nurses will only rise in the future as the number of patients increases with the aging population and less people are choosing for the nursing profession (Aiken et al., 2002; McVicar, 2016). As such, effective interventions to reduce stress in nurses are imperative.

Stress management interventions

According to the transactional model of stress, stress arises in the judgement that environmental demands exceed individual psychological or physical resources (Lazarus, 1995). This judgement is based on two consecutive processes. During the primary appraisal process meaning is given to the event as the person judges the situation as harmful, threating or challenging. During the second appraisal process, available coping resources to deal with the event are evaluated. As such, the resulting stress response depends upon the interpretation of the event given by the person (primary appraisal) and his or her coping resources (secondary appraisal) (Lazarus, 1995). Strong stress responses (e.g. due to a traumatic event) or enduring stress responses (e.g. due to continuous exposure to high job demands) can lead to a depletion of coping resources, deregulate the sympathetic nervous system, and eventually result in stress-related outcomes (e.g. anxiety or symptoms of burnout, depression or post-traumatic stress) (Heaney & van Ryn, 1990). To prevent and/or reduce the negative impact of

work stress on employee well-being many organizations have adopted stress management interventions (SMIs), which can be defined as "(…) any activity, or program, or opportunity initiated by an organization, which focuses on reducing the presence of work-related stressors or on assisting individuals to minimize the negative outcomes of exposure to these stressors" (Ivancevich et al., 1990, p. 252). In the literature these interventions are commonly categorized in person-directed and organization-directed interventions.

Person-directed interventions aim to enhance employees` skills to manage, cope and reduce stress (Holman et al., 2018). Two types of person-directed interventions that are extensively reported in the literature include interventions based on cognitive behavioral techniques and relaxation interventions. In line with the transactional model of stress, cognitive behavioral interventions focus on the interpretation of the stressor (primary appraisal process) as well as enhancing available coping resources (secondary appraisal process) and thereby aim to prevent and/or reduce a stress response. Within these interventions maladaptive thoughts are challenged and changed into more helpful ones and/or problem solving skills are learned (Beck & Dozois, 2011).

Relaxation interventions, including both mental (e.g. meditation) and physical relaxation techniques (e.g. progressive muscle relaxation), aim to prevent stress reactions to endure and become pathological by using breathing exercises, autogenic training or progressive muscle relaxation. In addition, practicing relaxation on a regular basis can increase available coping resources (secondary appraisals) to deal with potentially threatening events. The effectiveness of these interventions is generally based on the assumption that stress and relaxation are opposite poles on the same continuum, which implies that relaxation equals less stress (Holman et al., 2018).

A second type of SMIs focusses on the working environment, and has been labelled as organization-directed interventions (Ivancevich et al., 1990). Most organization-directed interventions are based on the Job Demands-Resources model which postulates that work stress mainly occurs in poorly designed working environments referring to a combination of high job demands (e.g. work time demands, emotional demands) and limited job resources (e.g. social support, autonomy, and feedback) (Bakker & Demerouti, 2017). Examples of organization-directed interventions include the implementation of rostering fitting to the

circadian rhythm of employees, optimizing workflow, and changes in leadership style (e.g. from transactional to transformational leadership). An important difference between person-directed and organization-directed interventions is that the first focuses on preventing and/or reducing the stress response, whereas the latter addresses the contextual causes of stress by reducing job demands and/or enhancing job resources. As such, organization-directed interventions often work preventative.

Finally, multilevel interventions intervene at both the organizational and the individual level. The advantage of a multilevel approach is that it can reduce the causes of stress as well as help those employees that are at risk of, or already experiencing stress-related outcomes (Holman et al., 2018). Not surprisingly, the implementation of multilevel interventions is often advocated by scholars in the field (Lamontagne et al., 2007; McVicar, 2016; Murphy, 1996; Semmer, 2006).

Stress management interventions for nurses

Concerns over stress levels and their consequences have made nurses a popular target group for SMIs. In the past, multiple (systematic) reviews have summarized the effectiveness of these interventions (Henry, 2014; Mimura & Griffiths, 2003; Westermann et al., 2014). The first documented review on SMIs for nurses was performed by Mimura and Griffiths in 2003 and included seven randomized controlled and three quasi-experimental studies. Overall, positive effects were reported of SMIs on stress-related outcomes. However, due to the limited amount and low quality of the included studies no conclusions could be drawn concerning what approach (for example implementing a person-directed or organization-directed intervention) would be most effective. Reviews after Mimura and Griffiths (2003) focused on a specific group of nurses (e.g. mental health nurses (Edwards & Burnard, 2003), oncology nurses (Henry, 2014; Wentzel & Brysiewicz, 2017) and nurses working in the inpatient elderly and geriatric long term care (Westermann et al., 2014)) and on specific stress-related outcomes (burnout or compassion fatigue). Although the focus on a specific group of nurses has several benefits (e.g. taking into account the various settings in which nurses work), it often leads to a small number of studies to be included. Since studies are likely to differ in terms of the type of intervention implemented and how the effect is measured, this makes it difficult to reach conclusions regarding effective elements, or assess the generalizability of the overall results (Richardson & Rothstein, 2008). Furthermore, although burnout and

compassion fatigue are highly prevalent amongst nurses and insight in SMIs to prevent and reduce these outcomes is warranted, the focus on a limited number of stress-related outcomes does not capture the full potential of SMIs in this setting. For example, some interventions might not be very effective in reducing burnout levels, but are able to reduce milder stress-symptoms such as psychological distress. Finally, none of these reviews used meta-analytic techniques to quantify the effectiveness of SMIs and thus provide little insight regarding *how* effective these interventions are.

As a result, most insight in the effectiveness of SMIs comes from a meta-analysis by Ruotsalainen et al. (2015), which focused on healthcare professionals in general but included a number of studies conducted in the nursing population. Based on 58 publications, published up to and including 2013, they found moderate effects of person-directed interventions on the reduction of stress levels and limited evidence for the effectiveness of organization-directed interventions. Given the rise in popularity of SMIs for the nursing population, and the changing healthcare sector, an up-to-date overview including more recent studies is warranted.

The current study

The current meta-analysis focusses on the following research question: How effective are SMIs in reducing and/or preventing stress-related outcomes in the nursing population and what factors relate to greater effectiveness? It aims to provide an update to previous (systematic) reviews and a better understanding regarding the effectiveness of SMIs for the nursing population by including a wide range of SMIs and stress-related outcomes, using a meta-analytic approach and assessing the potential moderating effects of intervention characteristics and the process by which these are implemented (i.e. a participatory approach). In addition, potential biasing effects regarding the study design and quality will be evaluated. To be able to compare interventions adequately we aim for a homogenous population, including studies with a sample of at least 50% registered nurses working in a hospital setting.

Level of the intervention

As mentioned, the meta-analysis of Ruotsalainen et al. (2015) found more evidence for the effectiveness of person-directed interventions than of organization-directed interventions on stress-related outcomes. The effectiveness of a multilevel approach was however not assessed. Person-directed interventions can be very effective in relieving stress-related outcomes, but if

a highly demanding working environment is not improved, these effects are likely to be of short or medium term only (van Wyk & Pillay-Van Wyk, 2010). In contrast, a solely organization-directed approach works mainly preventative and is unlikely to be sufficient to ameliorate outcomes in nurses experiencing severe stress-related symptoms. This might also explain the limited effects found for these interventions in the meta-analysis of Ruotsalainen et al. (2015). In line with the recommendations of McVicar et al. (2016), we expect that an approach focused on improving the working environment as well as individual coping is most effective in reducing and preventing stress-related outcomes in the nursing population. The following hypothesis will be tested:

Hypothesis 1: Multilevel interventions are more effective in preventing and reducing stress-related outcomes in the nursing population compared to an intervention solely on the organizational level or the individual level.

Identifying moderating factors

Since person-directed interventions and organization-directed interventions are based on different theories and thus different mechanisms are at play, we aim to identify moderating factors for each of these types of interventions separately. For person-directed interventions, we will first assess the effect of the *type of intervention* (e.g. cognitive behavioral versus relaxation). Since cognitive behavioral interventions intervene both on primary as well as secondary appraisals, their effectiveness is expected to be greater than for example relaxation interventions which focus on reducing the stress reaction but do not change the interpretation of the event. In line with this, previous meta-analyses regarding SMIs for the working population in general consistently find higher effects for cognitive behavioral interventions compared to other person-directed interventions (Richardson & Rothstein, 2008; van der Klink et al., 2001). Furthermore, one of the elements that makes nursing a stressful profession is the exposure to high emotional demands, such as suffering in patients, grief and death. According to research on loss and grief, these kind of stressors can change a persons` fundamental idea of the world being a safe place in which they have some control over their own faith (Beder, 2016). Inability to reappraise these events in a more bearable way, can lead to feelings of helplessness and depression (Beder, 2016). As such, cognitive behavioral interventions might be particularly beneficial to nurses.

Second, we will examine the influence of *the length of the intervention* and *exposure* to the sessions (i.e. attending the majority of the planned sessions). Although positive effects have been found for brief stress management interventions (e.g. Gilmartin et al., 2017), there is a lack of studies comparing their effectiveness to those with a longer intervention time period. Person-directed interventions include learning new skills, and as such require changes in thought patterns and/or behavior. For these changes to occur and be integrated in daily working life, repetition and practice is necessary (Lally & Gardner, 2013). As such, it is possible that longer interventions are more effective than shorter interventions and that studies in which participants attended more sessions (i.e. have greater *exposure to the intervention*) will reach greater effects in comparison to those with lower attendance.

Finally, the *target group* of the intervention could be a potential moderator in the effectiveness of person-directed interventions. Secondary interventions (aimed at nurses already experiencing high stress-related symptoms) are likely to reach greater effect sizes compared to primary interventions (aimed to prevent stress and stress-related outcomes), simply as there is more to gain in terms of stress reduction.

For organization-directed interventions, it has been argued that the process through which the intervention is designed and implemented is a crucial factor determining its effectiveness (Nielsen & Noblet, 2018; Nielsen & Randall, 2013). In this meta-analysis we will examine the participatory approach, the involvement of employees in the design and/or implementation of the intervention, as a potential moderating factor. As described by Nielsen et al. (2013) a participatory approach is one of the most important process related factors and may contribute to the success of organization-directed interventions due to four reasons: 1. It can optimize the fit of the intervention to the organizations' culture and context by making use of employees' expertise and knowledge. 2. It can increase exposure of employees to the intervention and create employee commitment and ownership. 3. It can work as an intervention on its own by empowering employees to make changes to their working environment. 4. It can enhance a better understanding between managers and employees as they actively have to work together.

Study design and quality

Finally, we will assess potential biasing effects regarding the study design and quality. For person-directed interventions we will assess the impact of the study sample and the type of control group used. This was done for the following reasons: *Study sample* (only nurses versus a mixed sample of at least 50% registered nurses) will be assessed to ensure that the inclusion criteria regarding a sample did not influence the effects. The *type of control group* will be assessed since the reported effect of an intervention may be smaller when compared to a minimal intervention (e.g. education), than to standard care or a wait-list control group (Karlsson & Bergmark, 2015). Furthermore, for all interventions (person-directed, organization-directed and multilevel) we will assess the potential biasing effect of the study quality (including whether or not participants were randomly allocated to the intervention and control group).

Relevance of the current study

The current meta-analysis adds to the literature in multiple ways. First of all, it is the first meta-analysis focusing on the effectiveness of SMIs in nurses working in the hospital setting including the full range of person- and organization-directed interventions and examining a broad variety of stress-related outcomes. By studying potentially moderating factors (regarding intervention characteristics, the use of a participatory approach, and the study design and quality) it provides a more comprehensive insight in the effectiveness of SMIs for the nursing population compared to previous reviews (Henry, 2014; Mimura & Griffiths, 2003; Wentzel & Brysiewicz, 2017; Westermann et al., 2014). This insight will yield practical recommendations for the design and implementation of effective interventions. Second, in comparison to previous reviews (Henry, 2014; Mimura & Griffiths, 2003; Wentzel & Brysiewicz, 2017; Westermann et al., 2014), the present meta-analysis will not only indicate *whether* SMIs are effective, but by quantifying the effects also indicate *how* effective SMIs are for the nursing population. Third, compared to the meta-analysis of Ruotsalainen et al. (2015) on healthcare professionals, the focus on a specific setting and specific population increases homogeneity of the studies, and as such enables better comparison regarding the effectiveness of the interventions. Finally, this study answers to the plea of researchers to include process variables in evaluating the effectiveness of organization-directed interventions (Nielsen & Noblet, 2018; Nielsen & Randall, 2012; Semmer, 2006). Interventions that have great potential but receive

far less attention in the literature and are often, perhaps unjustified, regarded as the least effective approach (e.g. Richardson & Rothstein, 2008; van der Klink et al., 2001).

Methods

This meta-analysis is performed in accordance with PRISMA guidelines (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009).

Search strategy

A search strategy was developed based on the technique described by van der Ploeg et al. (2017), by starting with a basic search strategy covering the most important subsets (TS=(nurse*) AND TS=(intervention) AND TS=(burnout)) and adding synonyms to each subset (e.g. TS=(nurse*) AND TS=(intervention) AND TS= (burnout OR "emotional exhaustion")). The relevance of each synonym was assessed by subtracting the articles found with the old strategy from the articles found with the new strategy using the NOT function. Relevant search terms were kept in the search string and irrelevant search terms were disposed (see appendix table 1-3 for the final search strategy). Next, the databases PubMed, Web of Science and PsycInfo were systematically searched for articles published between January 2007 up till and including December 2020. PubMed provides access to approximately 7,000 journals in the field of biomedical and life sciences. It includes records from PubMed Central, MEDLINE and other National Library of Medicine resources (e.g. in process citations, citations to articles that are out-of-scope from certain MEDLINE journals, and the National Center for Biotechnology Information (NCBI) bookshelf) and is one of the most popular databases in the field (Williamson & Minter, 2019). Web of Science covers over 8,700 journals in the field of social sciences, health sciences, life sciences, technology, arts and humanities (Falagas et al., 2008). Finally, the American Psychological Associations' PsycInfo was included as a more specialized database. PsycInfo covers 2,300 peer reviewed journals and includes 5 million records (e.g. articles, book chapters, abstracts, dissertations) in the field of behavioral science and mental health (see http://www.apa.org/psycinfo). Although these databases overlap, they complement each other in terms of different disciplinary bases. Reference lists of all included studies and relevant reviews and meta-analyses in the field were screened for additional studies.

Eligibility criteria

Studies were included based on the following inclusion criteria: 1. evaluating the effectiveness of an intervention to reduce and/or prevent stress in comparison to a control group, 2. including a pre- and a post measurement of an outcome representing stress-related outcomes (e.g. stress, burnout symptoms, anxiety, depression, or post-traumatic stress symptoms), 3. including a sample consisting of at least 50 percent registered nurses working in a hospital setting, 4. reporting statistics that can be calculated to effect sizes, and 5. written in English. No criteria about randomization were set, as for studies evaluating the effectiveness of an organization-directed intervention this is often not feasible.

Selection of studies

Duplicates of studies found in Pubmed, Web of Science and PsycInfo were removed. Titles and abstracts were screened for eligibility. Two reviewers independently read the full texts of eligible articles to assess whether they met the inclusion criteria. Interventions that relied on ergonomics or physical processes rather than psychological processes were excluded. Examples of these studies are the use of zinc supplementation (Baradari et al., 2018), aromatherapy (Chen et al., 2015), acupuncture (Kurebayashi & da Silva, 2015) and the use of special glasses during the nightshift (Boivin et al., 2012).

Data extraction and management

Two researchers independently coded the articles by means of a standard coding form. Disagreements were discussed until consensus was found. In case of no consensus the second author of this paper was consulted. For the calculation of the effect sizes, means and standard deviations of the experimental and control group(s) were obtained from the studies. Missing standard deviations were calculated based on the reported standard errors or confidence intervals. In case of any other missing data, authors were contacted via e-mail. Since only a few authors replied to our request, it was chosen to calculate effect sizes for the remaining studies based on the data that was available. For four studies (Moody et al., 2013; Nooryan et al., 2012; Udo et al., 2013; Villani et al., 2013) we calculated the effect size based on the available post-test data, which could be justified as intervention and control group did not differ on the outcome(s) under study at pre-test. For another four studies (Fang & Li, 2015; Ketelaar et al., 2013; Koivu et al., 2012; Mealer et al., 2014), we used the percentage of the study population that scored above the cut-off for high stress levels before and after the intervention to

calculate an effect size. This data is less refined as it includes the change from one group (high stress) to another (low stress) instead of the change in stress-related outcomes on a continuous scale. As a result, only three studies (Duchemin et al., 2015; Leao et al., 2017; Romig et al., 2012) needed to be excluded due to missing data.

Data items

In line with other reviews on SMIs (Richardson & Rothstein, 2008; van der Klink et al., 2001) we first categorized interventions into person-directed, organization-directed and multilevel interventions. Next, in line with Ruotsalainen and colleagues (2015), we further divided the person-directed interventions into two subcategories, the first focusing on cognitive behavioral techniques (changing the way one thinks/interprets stressors and consequently act) and the second focusing on mental and/or physical relaxation (e.g. mindfulness, progressive muscle relaxation). During the coding process some studies did not fit any of the above-mentioned categories or fitted both categories. Therefore, two additional subgroups of person-directed interventions were created. The first included interventions that aim to improve work skills and/or focus on professional development (e.g. assertiveness training, communication training). This category was considered person-directed as it focusses on increasing personal resources to help cope better with the demands at work, whilst no changes were made to the working environment. The second category included programs in which different person-directed interventions were combined (e.g. combining a cognitive behavioral training and relaxation).

For person-directed studies we coded the intervention length (number of weeks of the intervention program), exposure to the intervention (<80% of the sample attended all sessions versus ≥80% of the sample attended all sessions), whether it was a primary (preventative) or secondary (aimed at nurses with high stress levels/stress complaints) intervention, the sample (only nurses versus a mixed sample), and the control group used (minimal intervention, standard care or waitlist control). For organization-directed interventions (both solely and when implemented in combination with a person-directed intervention) we coded the use of a participatory approach.

Solutions for multiplicity

Studies with multiple experimental groups were treated as follows: when the experimental groups received interventions of the same category (e.g. two types of relaxation interventions) we averaged the effect sizes. When interventions of two different categories (e.g. a cognitive behavioral intervention and a relaxation intervention) were reported, we treated them as two independent intervention studies. In that case the *N* of the control group was divided by the number of experimental groups (Higgins et al., 2011). In case of a cross-over design only the results after the implementation of the intervention were used in comparison to the wait-list control.

Outcome measures that were studied belong to one of the following categories: burnout, psychological distress, depression, anxiety, work related stress, fatigue or symptoms of post-traumatic stress (including secondary traumatic stress). Studies focusing on occupational stressors (e.g. role ambiguity, job demands, lack of job control) rather than stress as an outcome, were excluded. For studies reporting stress outcomes of the same category, the effect size of the most reliable instrument or the most comparable to other studies was included (e.g. anxiety measured on the Becks' Anxiety Inventory rather than measured on a visual scale, emotional exhaustion as opposed to the total burnout scale). When both state as well as trait anxiety was reported, only state anxiety was included as this indicates the intensity of anxiety symptoms during a specific period rather than one's general anxiety-proneness (Spielberger et al., 1971). For the main analysis, we averaged effect sizes of studies that reported outcomes in different categories (e.g. anxiety as well as burnout symptoms), to avoid double counting.

When the effectiveness was assessed on multiple time points, we used the first time point available (post-test). In addition, we reported the effect sizes for each stress outcome and time point measured (measured < 1 week post intervention, 1 week - ≤ 1 month post intervention, 1 month - ≤ 6 months post intervention, or > 6 months post intervention) to investigate whether this influenced the effectiveness. Studies that included multiple outcomes and/or measurements were represented more than once in this analysis.

Assessment of risk of bias in included studies

The Cochrane Risk of Bias tool was used to assess the amount of bias in each study (Higgins et al., 2011). RevMan was used to visualize the risk of bias in the included studies (Review Manager (RevMan), Version 5.3., 2014). To examine the presence of potential publication bias a funnel plot was made. Furthermore, Eggers' test of the intercept (Egger et al., 1997) and Duval and Tweedie's trim and fill analysis were conducted (Duval & Tweedie, 2000).

Analyses

We calculated the standardized mean difference (Hedges *g*) for each study including its 95% confidence level. A random effects model was used to assess the overall effect of the included studies, as we did not expect studies to be functionally equivalent (Borenstein et al., 2009). The significance of the effect sizes was determined by the *Q*-test with a *p*-value of below .05 considered a significant effect. The I^2 static was used as an indication of heterogeneity between the studies. In line with the meta-analysis of Ruotsalainen and colleagues (2015) we used an intra-cluster correlation of .10 for studies using a cluster-randomized design, when none was reported in the study.

Moderator analyses were performed for the intervention level (person-directed, organization-directed, or multilevel) and the quality of the studies (lower quality studies versus higher quality studies, based on the risk of bias assessment). For person-directed interventions moderator analyses regarding the type of intervention (cognitive behavioral, relaxation, work skills or a mix of person-directed interventions), the length of the intervention, exposure to the intervention (<80% of the sample attended all sessions versus ≥80% of the sample attended all sessions), the target group (primary versus secondary interventions), the sample (only nurses versus a mixed sample), and the control group used (minimal intervention, standard care, waitlist control). For organization-directed interventions we aimed to perform a moderator analysis on the use of a participatory approach.

All moderator analyses were done using mixed model analyses in which the random effects model was used to combine studies in one subgroup and a fixed effects model was used to compare across subgroups (Borenstein et al., 2009). For the mixed effects model the study-to-study variance (tau-squared) was assumed to be the same for all subgroups. This value was

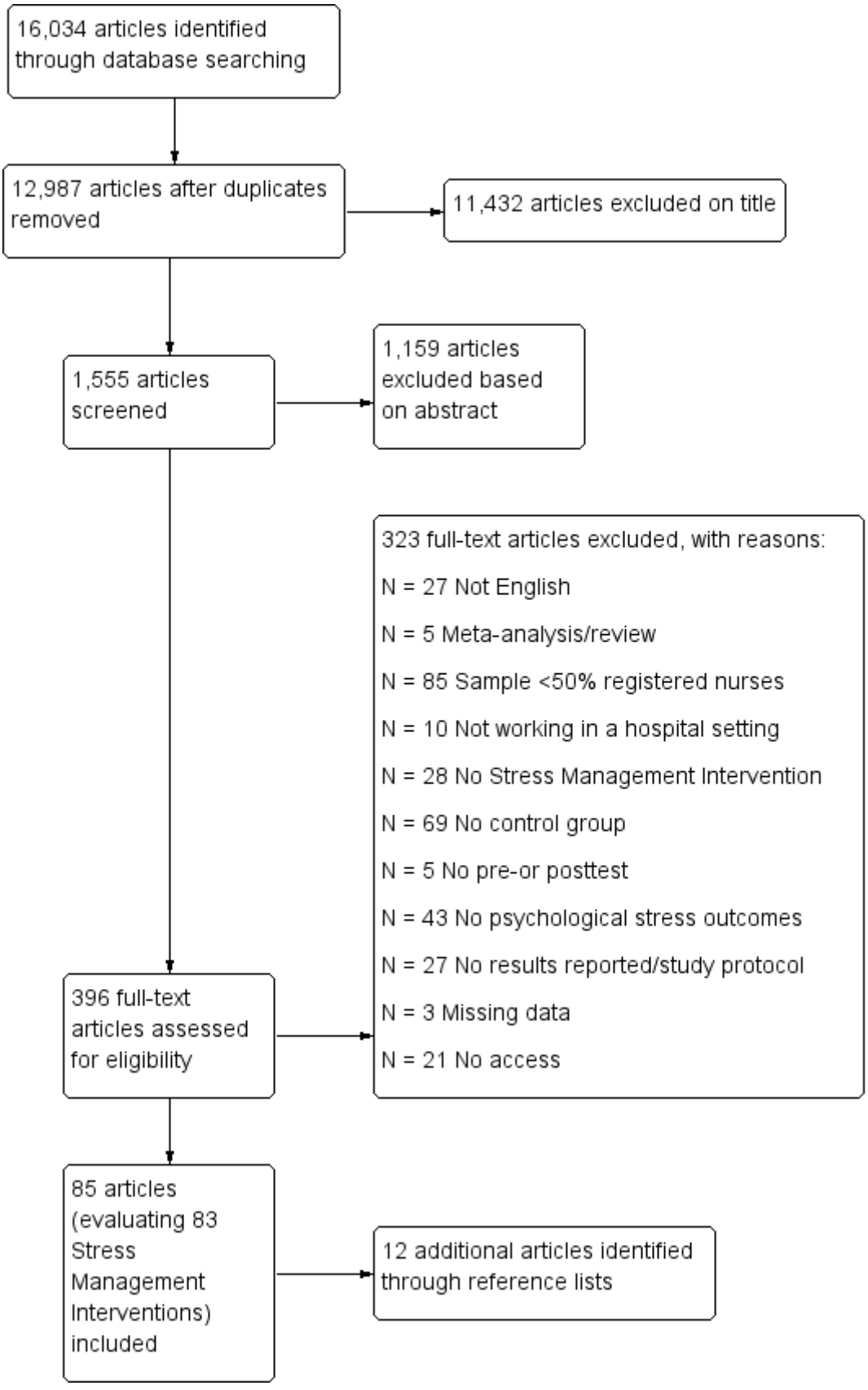

Figure 1. Flowchart of study inclusion and exclusion

computed within subgroups and then pooled across subgroups. All analyses were carried out using Comprehensive Meta-Analysis software v.3 (Borenstein et al., 2013).

Results

Selection of studies

A total of 12,987 unique references were retrieved from the search in the electronic databases. On the basis of title and abstract, 396 publications were selected for potential inclusion. In addition, 12 publications were identified based on screening of relevant reviews and reference lists of the included studies. After full-text examination 85 publications fulfilled all eligibility criteria and were included in the current meta-analysis (see figure 1).

Study characteristics

An overview of all included publications can be found in table 4 of the appendix. Most articles were from Asia (*k* = 42), followed by Europe (*k* = 22), North America (*k* = 19), Australia (*k* = 1) and one study was performed on multiple continents. More than half of the publications (*k* = 56, 65%) included a homogenous sample of only registered nurses the remainder included a mixed sample of at least 50 percent registered nurses. From the 85 publications found, three (Becker et al., 2020; Bourbonnais et al., 2011, Sampson et al., 2020) reported follow-up data of previously published papers (Becker et al., 2017; Bourbonnais et al., 2006; Sampson et al., 2019). To avoid double counting in assessing the effectiveness of the interventions, the data from these publications were combined. In addition, four publications reported studies including multiple experimental groups (Gunusen & Ustun, 2010; Onishi et al., 2016; Poulin et al., 2008; Sajadi et al., 2017). From these studies, one included two experimental groups of two different intervention categories and was therefore included as two separate interventions (Gunusen & Ustun, 2010). As a result, 83 interventions were included. Most comprised relaxation interventions (*k* = 35), followed by a mix of person-directed interventions (*k* = 17), cognitive behavioral interventions (*k* = 12), work skills interventions (*k* = 10), multilevel interventions (*k* = 5), and organization-directed interventions (*k* = 4).

Quality of the included studies

See figure 1 and figure 2 in the appendix for a visualization of the risk of bias assessment. Out of the 83 included interventions, the effectiveness of 58 interventions was assessed by the use of a randomized controlled trial. As for organization-directed interventions, individual

randomization is often not feasible, randomization on the department or hospital level was considered as 'low bias' in the quality assessment. Most articles did not report any information on the allocation process apart from stating that it was performed randomly, leading to an unclear bias for a number of interventions on this criterion. Furthermore, some interventions were labeled 'high bias' as employees were assigned to the intervention and control group based on employees` interest. Concerning selective reporting: Only 10 articles reported that the study was registered and the protocol was available online. For these articles we checked whether all intended measurements and measurement time points were reported. If no protocol was available (or the reported registration number did not work) the intervention received the label 'unclear bias' on selective reporting. For some of these articles, time points or outcomes mentioned in the methods section were not reported in the results section and as such received the label 'high bias' on selective reporting. Finally, blinding is almost impossible for the type of interventions that were assessed, and was therefore not included as quality assessment criterion.

Overall, we found evidence that interventions of low quality (one or more domains at high risk or no domain at low risk) deflated the effect of SMIs. The moderator analysis indicated that interventions of low quality reported lower effect sizes (g = 0.33, 95%CI (0.23-0.43), k = 46) compared to interventions of moderate to high quality (g = 0.54, 95%CI (0.39-0.69), k = 37) (Q = 5.62, p = .018). When comparting the quality of the intervention per intervention level, we found no significant difference between person-directed interventions of low quality (g = 0.39, 95%CI (0.26-0.52), k = 38) compared to person-directed interventions of moderate to high quality (g = 0.55, 95%CI (0.40-0.71), k = 36) (Q = 2.46, p = .117). Similar, we found no difference between low quality organization-directed interventions (g = 0.20, 95%CI (0.04-0.37), k = 4) versus the one publication of moderate to high quality (g = 0.31 95%CI (-0.08-0.69), k = 1) (Q =0.23, p = .635). All five multilevel interventions were coded low quality, which was mainly due to high drop out in these studies and/or a lack of randomization.

Intervention effectiveness

The SMIs had an overall medium effect on stress outcomes in comparison to control (Hedges' g = 0.42, 95%CI (0.34-0.51), p < .001, k = 83) (Cohen, 1992). Most studies included a measurement directly after the intervention (k = 58) and/or between one and six months after the intervention (k = 30). Only seven studies included a measurement more than six months

after the intervention. A calculation of the overall effect size based on the last point of measurement indicating long term effectiveness led to a similar effect size (g = 0.42, 95%CI (0.33-0.50), p < .001).

Table 1 shows the overall effect sizes for each intervention level, and time point of measurement. Organization-directed and multilevel interventions mainly focused on the outcomes burnout and psychological distress. Organization-directed interventions seemed little effective directly after the intervention, but (based on one study) a small significant effect was found in a follow-up measurement of more than six months after implementation. Multilevel interventions reached significant small effects on stress-related outcomes directly after the intervention, but insignificant effects more than one month after implementation. Person-directed interventions yielded large effect sizes on work-related stress (g = 0.89), followed by anxiety (g = 0.53) and smaller effect sizes for burnout symptoms, psychological distress, depression, fatigue and PTSD symptoms (respectively g = 0.30, g = 0.39, g = 0.31, g = 0.22, g = 0.26). Moderate to large effect sizes were found up till one month after the intervention, which seemed to decrease after this and led to an insignificant effect in the few studies (k = 6) measuring the effect six months after the intervention. To gain better understanding regarding the long-term effectiveness of person-directed interventions, we performed the analysis again including only person-directed interventions reporting a follow-up effect (k = 25). This resulted in a post effect of g = 0.38, 95%CI (0.24-0.52), p <.01, (k = 25), a follow-up effect of g = 0.38, 95%CI (0.19-0.58), p <.01, (k = 25) and a second follow-up effect of g = 0.35, (0.16-0.54), p <.01 (k = 6). Although this suggests that the effects of person-directed interventions remain stable over time, the time points of these follow-ups differed largely between studies (from within a month to over a year after the intervention), and thus this finding should be interpreted carefully. In addition, with only one out of three person- the result of publication bias. Studies that already find positive effects on the post-test might directed interventions reporting a follow-up measurement, it is also possible that this effect is be less likely to conduct follow-up measurements.

Moderators for person-directed interventions

Within the group of person-directed studies (k = 75) we found no significant difference between the type of intervention (cognitive behavioral, relaxation, work skills, mix of person-directed interventions) (Q = 3.15, p = .370). Similarly, we found no evidence for a moderation

Table 1. Overall analysis and analysis separately for each intervention level, each outcome, and time point of measurement.

		Overall (*k*=83)	**Person-directed (*k*=74)**	**Organization-directed (*k*= 4)**	**Multilevel (*k*=5)**
		Hedges g, 95%CI	*Hedges g*, 95%CI	*Hedges g*, 95%CI	*Hedges g*, 95%CI
Overall effect		0.42** (0.34-0.51)	0.47** (0.37-0.57)	0.12* (0.02-0.23)	0.22** (0.07-0.37)
	Heterogeneity test	Q=269.21**, I^2=70%	*Q*=230,81**, I^2=68%	*Q*=5.10, I^2=41%	Q=0.94, I^2=0%
Outcome †	Burnout	0.27** (0.18-0.35) (39)	0.30** (0.19-0.41) (33)	0.14 (0.01-0.27) (3)	0.25** (0.07-0.43) (3)
	Psych.Distr.	0.34** (0.24-0.44) (32)	0.39**(0.27-0.49) (28)	0.15 (-0.01-0.31) (1)	0.12 (-0.14-0.37) (3)
	Depression	0.29** (0.13-0.45) (25)	0.31** (0.14-0.47) (24)	0.03 (-0.19-0.25) (1)	*N/A*
	Anxiety	0.53** (0.29-0.76) (24)	0.53** (0.29-0.76) (24)	*N/A*	*N/A*
	Work rel. stress	0.85** (0.49-1.22) (15)	0.89** (0.50-1.29) (14)	*N/A*	0.42* (0.03-0.80) (1)
	Fatigue	0.22** (0.06-0.38) (10)	0.22** (0.06-0.38) (10)	*N/A*	*N/A*
	PTSD symptoms	0.26* (0.01-0.53) (6)	0.26* (0.01-0.52) (6)	*N/A*	*N/A*
Time point of measurement †	< 1 week after int.	0.40** (0.31-0.51) (58)	0.46** (0.35-0.56) (51)	0.09 (-0.06-0.24) (3)	0.20* (0.04-0.36) (4)
	1 week - ≤ 1 month	0.75** (0.50-1.00) (12)	0.75** (0.50-1.00) (12)	*N/A*	*N/A*
	>1 - ≤ 6 months	0.35** (0.20-0.50) (30)	0.37** (0.20-0.53) (28)	*N/A*	0.16 (0.06-0.38) (2)
	> 6 months	0.22* (0.03-0.40) (7)	0.23 (-0.05-0.51) (6)	0.18** (0.06-0.29) (1)	*N/A*

Note. **p < .01, * p < .05, number of studies between parentheses, † studies included multiple times, CI = Confidence Interval, N/A = not applicable, PD = Person-directed, Psych.Distr.= Psychological Distress, Work rel. stress = Work-related stress, PTSD symptoms = post-traumatic stress symptoms.

effect of the length of the intervention, the target group (primary or secondary intervention), or the type of control group used (see table 2). However, interventions in which the sample was exposed to the majority of the planned sessions reached greater effect sizes compared to interventions in which the exposure to the intervention/attendance to the planned sessions was lower (Q = 7.50, p = .006). In addition, interventions implemented in a sample of solely registered nurses reached greater effect sizes compared to interventions conducted in a mixed sample of at least 50% registered nurses (Q = 5.57, p = .018). The latter was mainly the case for cognitive behavioral interventions and work skills interventions, which showed significant effect sizes for studies conducted in a sample of registered nurses and non-significant effect sizes for studies conducted in a mixed sample.

The I^2 suggested moderate to substantial heterogeneity in all subgroups (cognitive behavioral interventions (86%), relaxation interventions (53%), the group of work skills interventions (50%), and the group including a mix of person-directed interventions (71%). To provide further insight, it was decided to repeat the moderator analyses for each type of person-directed intervention (see table 2). This resulted in one significant effect. The exposure to the intervention was a significant moderator in *relaxation interventions*: Interventions in which participants attended 80% or more of the scheduled sessions were more effective than interventions where participants attended less than 80% of the scheduled sessions (Q = 5.43, p = .02). Overall, there was a lot of missing data leading to a small number of studies per subgroup, therefore the results regarding the moderation analyses per type of intervention should be interpreted with caution.

Moderators for organization-directed interventions

There was moderate heterogeneity in the group of organization-directed studies (I^2 = 41%), whereas the group of multilevel interventions suggested an absence of heterogeneity (I^2 = 0%) and therefore an absence of moderators. However, the I^2 can be biased and should be interpreted with care, especially in small meta-analyses (e.g. less than 7 studies) (von Hippel, 2015). In addition, based on the small number of interventions it was decided to use a descriptive method rather than a moderation analysis to provide further insight in the effect of a participative approach. A closer look revealed that all organization-directed interventions (whether or not part of a multilevel approach) included their employees in the design and/or implementation. Three studies were based on participatory action research in which employees were empowered to find potential (psychosocial) stressors in the current working

Table 2. Moderators of intervention effectiveness of person-directed interventions

		All PD interventions (*k*=74)	**Cognitive Behavioral (*k*=12)**	**Relaxation (*k*=35)**	**Work skills (*k*=10)**	**Mix of PD interventions (*k*=17)**
		Hedges g, 95%CI	*Hedges g, 95%CI*	*Hedges g, 95%CI*	*Hedges g, 95%CI*	*Hedges g, 95%CI*
Overall effect		0.47** (0.37-0.57)	0.51** (0.15-0.86)	0.49** (0.37-0.61)	0.27* (0.04-0.50)	0.52** (0.31-0.73)
	Heterogeneity test	Q=230,81, $p < .01$ I^2=68%	$Q = 80.8$, $p < .01$ I^2=86%	$Q = 71.9$, $p < .01$ $I^2 = 53\%$	$Q = 17,82$, $p = .02$ $I^2 = 50\%$	$Q = 54.9$, $p < .01$ $I^2 = 71\%$
Length of intervention	≤ 1 week	0.40** (0.18-0.62) (8)	*N/A*	0.53** (0.16-0.89) (5)	0.25 (-0.02-0.51) (3)	*N/A*
	2-4 weeks	0.48**(0.24-0.71) (11)	0.33 (-0.05-0.72) (2)	0.51** (0.28-0.73) (5)	0.06 (-0.34-0.46) (1)	0.70 (-0.08-1.49) (3)
	5-8 weeks	0.49** (0.32-0.66) (31)	0.42 (-0.10-0.94) (6)	0.53** (0.30-0.75) (16)	0.12 (-0.36-0.60) (1)	0.54** (0.30-0.78) (8)
	9-12 weeks	0.44** (0.17-0.70) (9)	*N/A*	0.34* (0.02-0.67) (2)	0.25 (-0.24-0.75) (3)	0.84** (0.48-0.70) (3)
	>12 weeks	0.62** (0.21-1.03) (9)	1.16 (-0.82-3.13) (2)	0.56* (0.12-1.00) (4)	0.39 (-0.85-1.62) (2)	0.14 (-0.23-0.52) (1)
	Q for difference	$Q = .99$, $p = .910$	$Q = 0.99$, $p = .800$	$Q = 1.07$, $p = .900$	$Q = 0.85$, $p = .930$	$Q = 7.05$, $p = .070$
	Not reported	0.20** (0.06-0.34) (6)	0.40* (0.17-0.63) (2)	0.29 (-0.01-0.58) (3)	*N/A*	0.12 (-0.05-0.29) (2)
Exposure to intervention	High (≥80% sessions attended)	0.39** (0.27-0.52) (24)	0.47 (-0.01-0.95) (1)	0.46** (0.34-0.59) (14)	0.22 (-0.02-0.46) (4)	0.38 (-0.10-0.85) (5)
	Low (<80% sessions attended)	0.15** (0.04-0.27) (12)	0.23 (-0.04-0.51) (4)	0.19 (-0.01-0.38) (5)	0.06 (-0.34-0.46) (1)	0.17 (-0.32-0.66) (2)
	Q for difference	**$Q = 7.50$, $p = .006$**	$Q = 0.74$, $p = .390$	**$Q = 5.43$, $p = .020$**	$Q = 0.780$, $p = .677$	$Q = 0.349$, $p = .555$
	Not reported	0.61** (0.44-0.77) (38)	0.65 (-0.03-1.33) (7)	0.635** (0.40-0.87) (16)	0.33 (-0.17-0.83) (5)	0.631** (0.42-0.84) (10)
Target group	Primary interventions	0.44 (0.33-0.55) (59)	0.61* (0.13-1.09) (9)	0.44** (0.32-0.55) (28)	0.29*(0.03-0.55) (9)	0.45** (0.22-0.68) (13)
	Secondary interventions	0.60 (0.33-0.86) (15)	0.07 (-0.12-0.26) (3)	0.76** (0.33-1.18) (7)	0.12 (-0.36-0.60) (1)	0.77** (0.36-0.72) (4)
	Q for difference	$Q = 1.18$, $p = .277$	$Q = 1.60$, $p = .110$	Q=2.07, $p = .150$	$Q = 0.38$, p=.539	$Q = 1.83$, $p = .175$

Note. ** $p < .01$, * $p < .05$, number of interventions between parentheses, PD = person-directed, N/A = Not applicable

Table 2. *Continued*

		All PD interventions (*k*=74)	**Cognitive Behavioral (*k*=12)**	**Relaxation (*k*=35)**	**Work skills (*k*=10)**	**Mix of PD interventions (*k*=17)**
		Hedges g, 95%CI	*Hedges g, 95%CI*	*Hedges g, 95%CI*	*Hedges g, 95%CI*	*Hedges g, 95%CI*
Sample	Sample 100% RN	0.54** (0.41-0.68) (51)	0.69* (0.04-1.34) (7)	0.55** (0.39-0.71) (23)	0.36** (0.09-0.63) (7)	0.55** (0.30-0.80) (14)
	Mixed sample >50% RN	0.32** (0.19-0.45) (23)	0.24 (-0.01-0.48) (5)	0.39** (0.20-0.57) (12)	0.02 (-0.38-0.42) (3)	0.40* (0.02-0.78) (3)
	Q for difference	**Q = 5.57, *p* = .018**	*Q* = 1.65, *p* = .200	*Q* = 1.70, *p* = .190	*Q* = 1.90, *p* = .170	Q = 0.425, *p* = .514
Control group	Minimal intervention	0.50** (0.34-0.66) (22)	0.61 (-0.18-1.39) (4)	0.45** (0.30-0.61) (11)	0.60 (0.04-1-15) (3)	0.46** (0.18-0.74) (4)
	Standard care	0.49** (0.32-0.66) (36)	0.59 (-0.11-1.28) (5)	0.53** (0.28-0.79) (15)	0.14 (-0.07-0.35) (6)	0.62** (0.27-0.97) (10)
	Waitlist control	0.28** (0.13-0.44) (12)	0.02 (-0.18-0.23) (1)	0.41** (0.23-0.60) (8)	0.19 (-0.24-0.62) (1)	0.19 (-0.12-0.50) (2)
	Q for difference	*Q* = 4.64, *p* = .099	*Q* = 4.067, *p* = .131	*Q* = 0.597, *p* = .740	*Q* = 2.24, *p* = .326	*Q* = 3.41, *p* = .182
	Not reported	0.54** (0.29-0.78) (4)	0.47* (0.09-0.85) (2)	0.60** (0.20-1.00) (1)	*N/A*	0.55 (-0.02-1.13) (1)

Note. **$p < .01$, * $p < .05$, number of interventions between parentheses, PD = person-directed, N/A = Not applicable

situation and develop and initiate solutions for these (Bourbonnais et al., 2011; Le Blanc et al., 2007; Uchiyama et al., 2013). One study included an intervention based upon lean principles (e.g. a process in which the workflow is optimized to reduce waste of resources). This was implemented during a transformational process from a hierarchical hospital setting to one including a participative management style in which decisions were made in consultation with the employees (Van Bogaert et al., 2014). Two other studies included job crafting which is by content an intervention in which the employee is empowered to make changes in his or her work and/or working environment (Gordon et al., 2018; Muller et al., 2015). One study included a web-based SMI in which employees were particularly involved during the developmental phase by the use of focus groups (Hersch et al., 2016). Finally, one study included a team-based civility training for employees. Which, although this was most likely initiated by management considering the content of the intervention, the intervention itself included a participative approach; Nurses identified problems regarding incivility amongst employees, and developed and implemented actions (Leiter et al., 2011).

Publication bias

A visual examination of the funnel plot suggested asymmetry in the found effect sizes which was confirmed by Egger's test of the intercept (intercept 1.69, 95%CI (0.93-2.45), t (81) = 4.43, $p < .001$). Duval and Tweedie's trim and fill analysis indicated a potential lack of 14 studies with higher effect sizes (see appendix figure 3). After statistical imputation of these studies, the adjusted effect size would still include a medium effect (from g = 0.42, 95%CI (0.34-0.51) to g = 0.52, 95%CI (0.42-0.61)). The trim and fill analysis indicated no absence of studies with lower effect sizes. As such, we can conclude that potential publication bias may have resulted in the reported results regarding effectiveness being slightly conservative

Discussion

The current meta-analysis aims to assess the effectiveness of stress management interventions (SMIs) for registered nurses working in a hospital setting and to identify moderating factors concerning interventions characteristics and the use of a participatory approach (i.e. involvement of employees in designing and/or implementing the intervention). In addition, potentially biasing effects regarding the study design and quality were assessed. Based on 85 publications including 83 interventions, an overall medium effect of SMIs on stress-related outcomes was found (Hedges' g = 0.42, 95%CI (0.34-0.51), $p < .001$). This result confirms and

quantifies findings of previous (systematic) reviews that SMIs can effectively prevent and/or reduce stress-related outcomes in the nursing population (Henry, 2014; Mimura & Griffiths, 2003; Wentzel & Brysiewicz, 2017).

Concerning the level of the intervention, the results show that person-directed, organization-directed and multilevel interventions can all effectively reduce stress-related outcomes compared to a control group. However, against our expectations multilevel interventions did not reach greater effect sizes compared to the other approaches. Instead, a solely person-directed approach was significantly more effective in reducing and/or preventing stress-related outcomes than either a solely organization-directed or multilevel approach. Two issues can explain this finding.

First of all, methodological difficulties in assessing the effect of an organization-directed intervention (with or without a person-directed intervention) could have led to an underestimation of their effectiveness (Nielsen & Noblet, 2018). For example, in organization-directed and multilevel studies the effect is often based on whether an intervention was implemented in the department/organization rather than who received the intervention. Since it is unlikely that all employees in the department/organization were equally exposed to the intervention, this might lead to small effect sizes (Nielsen & Noblet, 2018; Randall et al., 2005). It has been suggested that comparing the exposed to the unexposed employees gives a better grasp of the intervention effectiveness in these studies than the comparison of an intervention with a control group (Randall et al., 2005). Furthermore, in contrast to person-directed interventions, studies evaluating an organization-directed or multilevel intervention often use department based or hospital based allocation to create control and intervention groups, which makes it more difficult to control for possible confounding variables (e.g. management style or organizational culture) (Nielsen & Noblet, 2018).

Second, due to differences in follow-up data collection across the studies, we can only conclude that person-directed interventions are more effective directly after the intervention. Yet, organization-directed interventions often work preventative and their effectiveness is more likely to appear over time (Randall et al., 2005). In comparison, person-directed interventions can yield high effect sizes on the short term, but these effects might wear off if the intervention is not practiced regularly and integrated into the daily routine (van Wyk &

Pillay-Van Wyk, 2010). Indeed, we found moderate to large effect sizes for person-directed interventions up till and including one month after the intervention, but the few studies using a follow-up measurement after six months showed no significant effects at all. In comparison, for organization-directed interventions the first significant effect size was reported six months or longer after the intervention. Similar findings, including short term effectiveness for person-directed and long-term effectiveness for organization-directed interventions, have been reported in narrative reviews on burnout interventions (Awa et al., 2010; Westermann et al., 2014). Finally, it must be noted that only a small amount (8%) of the person-directed interventions in the current meta-analysis included a follow-up measurement longer than six months after the intervention. For an adequate comparison of the long-term effectiveness of person-directed and organization-directed interventions, long term follow-up measurements are necessary.

Next to the level of the intervention, the current meta-analysis assessed moderators regarding intervention characteristics, study design for person-directed interventions and the effect of a participatory approach for organization-directed interventions. For person-directed interventions moderating effects were found regarding exposure to the intervention and the sample (registered nurses only versus a mixed sample) but not for the type of intervention (cognitive behavioral, relaxation, work skills or a mix), the length of the intervention, the target group (primary versus secondary) or the control group used. For organization-directed interventions all studies included some form of employee involvement and therefore the effect of a participatory approach could not be assessed. The findings are discussed in more detail below.

In line with previous meta-analyses regarding SMIs for the working population in general (Richardson & Rothstein, 2008; van der Klink et al., 2001), it was expected that cognitive behavioral interventions would yield greater effect sizes than other person-directed interventions. However, no significant moderating effect regarding the type of intervention implemented was found in the current study. This result is similar to the findings of the meta-analysis of Ruotsalainen et al., 2015 regarding SMIs for healthcare professionals, in which cognitive behavioral interventions and relaxation interventions yielded comparable effect sizes. It is possible that the nursing profession (and perhaps healthcare in general) attracts and retains people with better coping and problem-solving skills. In addition, there is increased attention

for the development of "soft skills" (including problem solving skills) in nursing education programs (Ng, 2020). As such, cognitive behavioral interventions might focus on enhancing skills that are (at least up to a certain level) present in this population and thus not necessarily lead to greater effects on stress levels than other person-directed interventions.

Second, as person-directed interventions include learning new skills, and as such require changes in thought patterns and/or behavior, we expected that the effects of these interventions would be stronger in case of longer interventions and when nurses attended the majority of the planned sessions (i.e. had greater exposure to the intervention). Although the results showed no moderating effect for the length of the intervention, exposure to the sessions (i.e. interventions in which the sample attended the majority of the planned sessions) was related to greater effect sizes. This may also explain why previous meta-analyses regarding SMIs for the general working population have found limited evidence that the length of the intervention mattered in the overall effect (Richardson & Rothstein, 2008; van der Klink et al., 2001), and suggests that brief interventions may be just as effective as longer interventions as long as participants attend the sessions. These findings are important in terms of practical implications. For example, considering the busy schedules of nurses, brief person-directed interventions can be considered to (at least on the short term) relieve stress-related symptoms. In addition, when conducting person-directed interventions, special care should be taken to increase adherence. This could for example be achieved by implementing the intervention at work and/or during worktime. Nevertheless, it must be noted that many studies (k = 38) did not evaluate attendance to the sessions and thus this finding should be interpreted carefully.

Another moderating effect was found for the sample; person-directed interventions were more effective in a sample including solely registered nurses compared to a mixed sample in which the majority were registered nurses. This seemed mainly the case for cognitive behavioral interventions and work skills interventions. A potential explanation is that these interventions are more occupation specific including discussing cases, and practicing coping and/or work skills to deal more effectively with these situations in the future. As such, it is possible that the content of these interventions was fitted to the majority of the sample (i.e. the nursing population) and thus appealed less to other healthcare professionals also joining the intervention. In comparison, relaxation interventions are less likely to include the content

of work and rather focus on reducing the stress response. This finding may also indicate that tailoring the content of the cognitive behavioral or work skills intervention to different target populations could increase the effectiveness of person-directed interventions. Nevertheless, to understand if tailoring indeed played a role in the current effect found, better reporting is necessary regarding the content by which the interventions were designed and implemented.

Finally, the current results suggest a possible moderation effect of the type of outcome used in the study. For example, we found the largest effect size on work-related stress, followed by anxiety, whereas effect sizes for burnout symptoms, psychological distress, symptoms of depression, fatigue and post-traumatic stress symptoms were smaller. A potential explanation is that work-related stress and to a certain level anxiety, indicate levels of experienced stress rather than stress-related outcomes or strain and thus may be more sensitive to change. For example, work-related stress was mainly measured with the Nursing Stress Scale, which asks nurses to indicate how stressful they experience certain work situations. In addition, anxiety in the current study mainly reflects "state anxiety" (i.e. reactions directly related to certain situations) rather than more stable levels of anxiety. Overall, it is possible that person-directed interventions are very effective in reducing stress levels, whereas more intensive interventions (e.g. therapy sessions with a psychologist) are necessary to reduce the more severe stress reactions (e.g. symptoms of burnout and post-traumatic stress). Another possibility is that it takes more time until effects of SMIs are reflected in stress reactions that are less sensitive to change. To understand the effectiveness of SMIs on different stress-related outcomes over different time frames, as mentioned previously, more long-term follow-up measurements are necessary in intervention evaluation studies.

Concerning organization-directed interventions (with or without a person-directed intervention) we mainly focused on one success factor: The use of a participatory approach in the design and implementation of the intervention (Nielsen & Randall, 2012). However, only a few studies including an organization-directed intervention were found and all studies involved their employees in the design and/or implementation of the intervention, at least to a certain extend. This indicates that the importance of employee involvement is not only recognized by scholars in the field but also seems to have become the norm in organization-directed interventions. Yet, the overall effect sizes for these types of interventions were rather small and few studies reported on other success factors (readiness for change, management

support) or barriers encountered (budget cuts, other interventions implemented during the study period). In fact, only one of the included studies performed and reported the effects of a process evaluation (Uchiyama et al., 2013), which led to an informative list of obstacles and success factors that might have influenced the intervention effectiveness. Standard incorporation of process evaluations is warranted to fully understand and improve the effectiveness of these types of interventions. Further guidance on how to pursue such evaluations can be found in publications by Abildgaard et al. (2016) and Nielsen and Noblet (2018).

Limitations

As with all meta-analyses, publication bias might have affected the current findings. However, the statistical techniques used indicated that in case of any publication bias, the current results are more likely to be conservative rather than an overestimation of the effect. Second, we could only include a small number of organization-directed and multilevel interventions. This seems to be a common problem of meta-analyses on SMIs and can be explained in various ways. First, studies including organization-directed interventions might be performed less often as it is far more difficult for researchers to convince organizations to take part in an intervention that would involve changes to work processes or the working environment. Second, some studies might have been excluded from the current meta-analysis as the criterion of a control group is more difficult to meet for these types of studies (Nielsen et al., 2016). Although there is no strict rule regarding the minimum number of studies within a meta-analysis (Sterne et al., 2000), our results concerning the effectiveness of organization-directed and multilevel interventions might be less reliable.

Finally, the current meta-analysis was limited by suboptimal reporting in the intervention studies. First of all, some studies could not be included as important statistical information was missing. Second, incomplete reporting in the included studies made it difficult to assess the quality of the study and adequately examine moderating factors. A number of possible moderators were considered but had to be omitted due to limited reporting: the place of intervening (in the work setting, an external setting or at home), when the intervention took place (during work time, during leisure time), the qualification of the instructor (qualified, not qualified, self-instructed), the delivery of the intervention (group based, individual based), and the involvement of employees in the design and implementation of person-directed

interventions. Third, it is possible that cultural values moderated the uptake of SMIs (Kotera, van Laethem, & Ohshima, 2020). However, cultural values are hardly reported in SMI studies and determining cultural values (e.g. collectivistic versus individualistic cultures) based on the country of study is strongly discouraged (Sawang et al., 2016). It was therefore decided not to perform such an analysis. Finally, future meta-analyses might consider the possible moderating effects of other contextual factors including starting conditions of the intervention (e.g. intervention fatigue among employees, informal social norms), changes during the intervention (e.g. downsizing, budget cuts, restructuring of the organization) (Nytro, 2000, Nielsen et al. 2017) and whether or not the implemented intervention fits the current causes of work stress (e.g. was the intervention based on a risk assessment) (Nielsen & Randall, 2013). Nevertheless, to conduct these moderation analyses, improved reporting is necessary. We therefore strongly encourage the use of reporting guidelines such as the 'template for intervention description and replication (TIDieR)' checklist (Hoffmann et al., 2014) and the incorporation of process evaluations (Nielsen et al., 2018; Abildgaard et al., 2016) in future studies.

Finally, as the current study also includes interventions aimed at improving the working environment, it was decided to focus on one specific setting, namely the hospital setting. As such, we cannot be certain about the generalizability of the current findings to other care contexts (e.g. nursing homes, mental health institutions, ambulatory care). Still, as there are some similarities regarding the tasks of nurses working in different settings (e.g. in all settings nurses face emotional demands), this is mainly a concern regarding the results of organization-directed and multilevel interventions and less for the results of person-directed interventions.

Concluding remarks

In conclusion, the current meta-analysis shows that SMIs for nurses working in a hospital setting can effectively reduce and/or prevent stress-related outcomes. Although person-directed interventions were more effective than organization-directed and multilevel interventions, we can only conclude this in terms of short-term effectiveness. Concerning person-directed interventions, the results indicate that interventions conducted in a sample of solely registered nurses, in which attendance was high and the effect was measured on stress-related outcomes that are more sensitive to change, are more likely to yield larger (short term) effects. Concerning organization-directed interventions, the importance of involving employees in the development and/or implementation of interventions seems highly

recognized. Still effect sizes for these interventions remain rather low. To further understand factors that contribute to the effectiveness of SMIs for the nursing population, better reporting on intervention characteristics, and the process of design and implementation is necessary. Furthermore, to determine the longevity of their effects, long term measurements especially for person-directed interventions are needed.

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Appendix

Table 1. Search strategy for Web of Science

(((TS =(nurs* OR "health personnel" OR "healthcare provider*" OR "health care provider*" OR "healthcare professional*" OR "health care professional*" OR "healthcare worker*" OR "health care worker*" OR "hospital staff" OR "medical staff" OR "medical personnel" **OR caregiver* OR care-giver***) AND TS=(burnout OR burn-out OR exhaustion OR "compassion fatigue" OR depersonali?ation OR cynic* OR sleep* OR PTSD OR "Traumatic Stress" OR depress* OR anxie* OR anxious*) AND (TS=("stress manag*" OR "stress reduc*" OR interven* OR prevent* OR redesign OR mindful* OR yoga OR relax* OR meditati* OR training* OR educat* OR program* OR participatory OR participative OR *therapy)) AND TS=(random* OR control* OR experiment*) NOT TS=("informal caregiver*" OR "family caregiver*" OR "care-giving spouse*" OR "care-giving relative*")))) *AND* LANGUAGE: (English)
Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=2007-2020

Note: As *"OR caregiver* OR care-giver*"* led to a great number of irrelevant articles (i.e. not focused on nurses), these words have been omitted when searching WoS for articles published in 2019 and 2020.

Table 2. Search strategy for PubMed

(((random* OR control* OR experiment* OR randomized controlled trial [MeSH Terms] OR random allocation [MeSH Terms]) AND ("nurses"[MeSH Terms] OR "nursing staff"[MeSH Terms] OR Nurs* [Title/Abstract])) AND ("Stress, Psychological"[Mesh] OR depress*[tw] OR "Burnout, Professional"[Mesh] OR Burnout [tw] OR "Anxiety"[Mesh] OR anxie*[tw] OR anxious*[tw] OR PTSD OR Post Traumatic Stress OR Secondary traumatic stress OR sleep [MeSH Terms])) AND ("Psychotherapy" [MeSH Terms] OR "Complementary Therapies" [MeSH Terms] OR "Personnel Management" [MeSH Terms] OR stress manag*[Title/Abstract] OR stress reduc*[Title/Abstract] OR interven*[Title/Abstract] OR prevent*[Title/Abstract] OR Redesign*[Title/Abstract] OR mindful*[Title/Abstract] OR yoga[Title/Abstract] OR relax*[Title/Abstract] OR Meditat*[Title/Abstract] OR training*[Title/Abstract] OR educat*[Title/Abstract] OR program*[Title] OR Participatory[Title/Abstract] OR participative[Title/Abstract]) Filters: from 2007/1/1 - 2020/12/1

Table 3. Search strategy for PsychInfo

S4	S1 OR S2 OR S3	
S3	SU (nurs* OR "health personnel" OR "healthcare provider*" OR "health care provider*" OR "healthcare professional*" OR "health care professional*" OR "healthcare worker*" OR "health care worker*" OR "hospital staff" OR "medical staff" OR "medical personnel") AND SU (burnout OR burn-out OR exhaustion OR "compassion fatigue" OR depersonali?ation OR cynic* OR sleep* OR PTSD OR "Traumatic Stress" OR depress* OR anxie* OR anxious* OR "occupational stress" OR "occupational health" OR "job stress" OR "work* stress" OR "Nursing Stress Scale" OR "Perceived Stress Scale" OR "psychological *stress" OR "mental health outcome*" OR well-being OR wellbeing) AND SU ("stress manag*" OR "stress reduc*" OR interven* OR prevent* OR redesign OR mindful* OR yoga OR relax* OR meditati* OR training* OR educat* OR program* OR participatory OR participative OR *therapy) AND SU (random* OR control* OR experiment*) NOT SU ("informal caregiver*" OR "family caregiver*" OR "care-giving spouse*" OR "care-giving relative*")	Limiters - Published Date: 20070101-20201231; Peer Reviewed; Publication Type: All Journals; English; Population Group: Human; Methodology: CLINICAL TRIAL, EMPIRICAL STUDY, FIELD STUDY, QUANTITATIVE STUDY, TREATMENT OUTCOME; Exclude Dissertations
S2	AB (nurs* OR "health personnel" OR "healthcare provider*" OR "health care provider*" OR "healthcare professional*" OR "health care professional*" OR "healthcare worker*" OR "health care worker*" OR "hospital staff" OR "medical staff" OR "medical personnel") AND AB (burnout OR burn-out OR exhaustion OR "compassion fatigue" OR depersonali?ation OR cynic* OR sleep* OR PTSD OR "Traumatic Stress" OR depress* OR anxie* OR anxious* OR "occupational stress" OR "occupational health" OR "job stress" OR "work* stress" OR "Nursing Stress Scale" OR "Perceived Stress Scale" OR "psychological *stress" OR "mental health outcome*" OR well-being OR wellbeing) AND AB ("stress manag*" OR "stress reduc*" OR interven* OR prevent* OR redesign OR mindful* OR yoga OR relax* OR meditati* OR training* OR educat* OR program* OR participatory OR participative OR *therapy) AND AB (random* OR control* OR experiment*) NOT AB ("informal caregiver*" OR "family caregiver*" OR "care-giving spouse*" OR "care-giving relative*")	Limiters - Published Date: 20070101-20201231; Peer Reviewed; Publication Type: All Journals; English; Population Group: Human; Methodology: CLINICAL TRIAL, EMPIRICAL STUDY, FIELD STUDY, QUANTITATIVE STUDY, TREATMENT OUTCOME; Exclude Dissertations
S1	TI (nurs* OR "health personnel" OR "healthcare provider*" OR "health care provider*" OR "healthcare professional*" OR "health care professional*" OR "healthcare worker*" OR "health care worker*" OR "hospital staff" OR "medical staff" OR "medical personnel") AND TI (burnout OR burn-out OR exhaustion OR "compassion fatigue" OR depersonali?ation OR cynic* OR sleep* OR PTSD OR "Traumatic Stress" OR depress* OR anxie* OR anxious* OR "occupational stress" OR "occupational health" OR "job stress" OR "work* stress" OR "Nursing Stress Scale" OR "Perceived Stress Scale" OR "psychological *stress" OR "mental health outcome*" OR well-being OR wellbeing) AND TI ("stress manag*" OR "stress reduc*" OR interven* OR prevent* OR redesign OR mindful* OR yoga OR relax* OR meditati* OR training* OR educat* OR program* OR participatory OR participative OR *therapy) AND TI(random* OR control* OR experiment*) NOT TI("informal caregiver*" OR "family caregiver*" OR "care-giving spouse*" OR "care-giving relative*")	Limiters - Published Date: 20070101-20201231; Peer Reviewed; Publication Type: All Journals; English; Population Group: Human; Methodology: CLINICAL TRIAL, EMPIRICAL STUDY, FIELD STUDY, QUANTITATIVE STUDY, TREATMENT OUTCOME; Exclude Dissertations

Table 4. Overview of the included studies

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
1.	Akyurek et al., 2020	Hospital nurses	registered nurses	I=15 C=15	Workplace Health Promotion Program including sessions consisting of 5 minutes of breathing exercises, 20 minutes progressive muscle relaxation and 10 minutes posture exercises.	PD: relaxation techniques	5 weeks
2.	Alexander et al., 2015	Hospital nurses	registered nurses	I=20 C=20	Yoga	PD: relaxation techniques	8 weeks
3.	Barattucci et al., 2019	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=295 C=202	IARA training encompassing mindfulness, psycho-synthesis, and counseling principles using emotional education, role-play, relaxation and breathing techniques, guided imagery, inter-personal and self-management skill improvement.	PD: mix	4 sessions (not reported in what time frame
4.	Becker et al., 2017	Hospital nurses	registered nurses	I=33 C=32	Work-related psychosocial coaching intervention	PD: work skills	5 weeks
5.	Becker et al., 2020 (Follow-up Becker et al., 2017)	Hospital nurses	registered nurses	I=33 C=32	Work-related psychosocial coaching intervention	PD: work skills	5 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
6.	Bolier et al., 2014	Hospital nurses	registered nurses	I=188 C=178	E-health intervention "Mental Vitality @ Work": individual feedback on work functioning and mental well-being followed by a tailored choice of online interventions (mainly based on cognitive behavioral therapy).	PD: cognitive behavioral component	12 weeks (post-test) and 24 weeks (follow-up)
7.	Bourbonnais et al., 2006	Nurses working general and specialized short-term care	mixed sample of ≥ 50% registered nurses	I=302 C=310	A number of interventions aiming to improve teamwork, staffing, work organization, communication and ergonomics	Organization-directed	16 weeks
8.	Bourbonnais et al., 2010 (Follow-up Bourbonnais et al., 2006)	Nurses working general and specialized short-term care	mixed sample of ≥ 50% registered nurses	I=247 C=220	A number of interventions aiming to improve teamwork, staffing, work organization, communication and ergonomics	Organization-directed	16 weeks
9.	Brooks et al., 2010	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=26 C=26	Music-Imagery	PD: relaxation techniques	3 to 6 weeks
10.	Calisi et al., 2017	Cardiac nurses	registered nurses	I=24 C=22	Bensons Relaxation Response: practicing diaphragmatic breathing and repetitive mental focus to break the train of everyday thought	PD: relaxation techniques	8 weeks
11.	Chen et al., 2016	Emergency department and Intensive care nurses	registered nurses	I=50 C=49	Releasing Exercise Program (REP) consisting of a warm up, tension-releasing exercises and mood adjustment (i.e. meditation).	PD: relaxation techniques	24 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
12.	Chen et al., 2017	Hospital nurses (newly qualified nurses	registered nurses	I=16 C=15	Interactive Situated and Simulated Teaching program (ISST) for newly qualified nurses including interactive face-to-face support sessions with experienced nurse practitioners to reinforce learning incentives, promote understanding of care-related concepts and improve clinical communication through participation in situated and simulated nursing activities.	PD: work skills	12 weeks
13.	Cheng et al., 2015	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=34 C=34	Gratitude diary intervention	PD: cognitive behavioral component	4 weeks
14.	Chesak et al., 2015	Hospital nurses (new to the institution, transitioning to a new unit/new role or undergoing nurse orientation)	registered nurses	I=19 C=21	Stress Management and Resiliency Training (SMART) developing intentional attention and practicing gratitude, compassion, acceptance, forgiveness and higher meaning	PD: cognitive behavioral component	1 week
15.	Daigle at al., 2018	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=37 C=33	Mindfulness	PD: relaxation techniques	8 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
16.	Darban et al., 2016	Hospital nurses	registered nurses	I=30 C=30	Communication skills training	PD: work skills	1 week
17.	Duarte et al., 2016	Oncology nurses	registered nurses	I=29 C=19	Mindfulness	PD: relaxation techniques	6 weeks
18.	Dunne et al., 2019	Emergency department nurses	mixed sample of ≥ 50% registered nurses	I=17 C=25	Attention Based Training (ABT) involving repeatedly focusing one's attention on a chosen non-English phrase (maranatha) for 20 minutes twice a day	PD: relaxation techniques	7 weeks
19.	Fang et al., 2015	Hospital nurses	registered nurses	I=54 C=51	Yoga workshop	PD: relaxation techniques	26 weeks
20.	Geary et al., 2011	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=59 C=49	Mindfulness	PD: relaxation techniques	8 weeks
21.	Ghawadra et al., 2020	Nurses working in the Critical Care Units, medical department, surgical department, pediatric department, obstetrics and gynecology departments	registered nurses	I=118 C=106	MINDFULGym: A mindfulness-based stress reduction program consisting of one workshop followed by four weeks of self-practice at home.	PD: relaxation techniques	5 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
22.	Ghazavi et al., 2016	Hospital nurses	registered nurses	I=26 C=26	Happiness training including discarding concerns, lowering the degrees of expectations and ideals, and practicing positive and optimistic thinking	PD: cognitive behavioral component	6 weeks
23.	Gholizadeh et al., 2017	Intensive Care Unit nurses	registered nurses	I=30 C=30	Mindfulness including mindful eating, mindful walking and different kinds of mediation exercises	PD: relaxation techniques	8 weeks
24.	Gordon et al, 2017	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=32 C=26	Job crafting	Multilevel	3 weeks
25.	Grabbe et al., 2019	Hospital nurses	registered nurses	I=40 C=37	Community Resiliency Model (CRM), a non-cognitive variant of mindfulness using sensory awareness techniques to improve emotional balance	PD: relaxation techniques	1 session of 3 hours
26.	Gunusen et al., 2010	Hospital nurses	registered nurses	I=30 I=31 C=28	Exp. group 1: Training in coping skills Exp. group 2: Taking part in a support group intervention	Exp. group 1: PD: cognitive behavioral component Exp. group 2: PD: work skills	7 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
27.	Habibian et al., 2018	Pediatric oncology and special diseases nurses	registered nurses	I=30 C=30	Acceptance and Commitment Therapy (ACT)	PD: mix	Not reported
28.	HemmatiMaslakpak et al., 2016	Nurses working in the Critical Care Units	registered nurses	I=30 C=30	Neurolinguistic programming (NLP), which focusses on reactions towards stressful events and provides practical strategies to increase individual adaptation capacity and coping	PD: cognitive behavioral component	24 weeks
29.	Hersch et al., 2016	Hospital nurses	registered nurses	I=52 C=52	BREATHE: providing a number of person-directed stress management strategies and information for managers on identifying workplace stressors and reducing stress through positive management practices	Multilevel	12 weeks
30.	Horner et al., 2014	Medical surgical nurses	mixed sample of ≥ 50% registered nurses	I=31 C=12	Mindfulness	PD: relaxation techniques	10 weeks
31.	Inoue et al., 2011	Psychiatric nurses	registered nurses	I=25 C=25	Group intervention approach for nurses exposed to violence: psychotherapy-based discussion including stress management (progressive muscle relaxation and image therapy as well as behavioral therapy)	PD: mix	6 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
32.	Jakel et al., 2016	Oncology nurses	registered nurses	I=16 C=9	Providers Resilience mobile application: mobile app that tracks stress-related symptoms and gives reminders for self-care/brief interventions including psychoeducation.	PD: mix	6 weeks
33.	Karpaviciute et al., 2016	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=56 C=55	Arts activities	PD: relaxation techniques	10 weeks
34.	Kersten et al., 2019	Dialysis nurses	registered nurses	I=33 C=44	An intervention program mainly consisting of 1. a workshop for managers to create awareness for employee well-being and to train managers in conducting interviews with employees to set goals during the intervention program, and 2. three group sessions for nurses including education on stress and the stress response, group discussions on stressful situations at work, ways of coping, and to identify (missing) job resources, the development of an individual stress management program and a relaxation exercise	Multilevel	16 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
35.	Ketelaar et al., 2013	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=188 C=178	E-health intervention "Mental Vitality @ Work": individual feedback on work functioning and mental well-being followed by a tailored choice of online interventions (mainly based on cognitive behavioral therapy)	PD: cognitive behavioral component	12 weeks (post-test) and 24 weeks (follow-up)
36.	Kharatzadeh et al., 2019	Critical care nurses	Registered nurses	I=30 C=30	Emotion regulation training including psychoeducation, progressive muscle relaxation, nonjudgmental awareness, acceptance and tolerance of emotional responses, modification of attention, cognitive reappraisal, problem solving, and interpersonal skills	PD: mix	6 sessions, unclear over what period.
37.	Kim et al., 2013	Hospital nurses	registered nurses	I=11 C=11	Mindfulness-based stretching and deep breathing exercise	PD: relaxation techniques	8 weeks
38.	Koivu et al., 2012	Medical surgical nurses	mixed sample of ≥ 50% registered nurses	I=41 I=43 C=82	Clinical Supervision	PD: work skills	1 year
39.	Kubota et al., 2016	Oncology nurses	registered nurses	I=50 C=46	Training program aimed at enhancing the ability to assess and manage common psychological problems in cancer patients	PD: work skills	2 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
40.	Lary et al., 2019	Neonatal Intensive Care Unit nurses	registered nurses	I=35 C=35	Program including education on stress and the stress response, problem-and emotion-focused coping mechanisms, physical methods for coping with stress and information on the importance of a healthy lifestyle	PD: mix	6 weeks
41.	le Blanc et al., 2007	Palliative care nurses	mixed sample of ≥ 50% registered nurses	I=208 C=96	A participatory intervention in which teams identify the most prominent stressors at work and design and implement interventions to reduce these, supplemented by individual stress counseling	Multilevel	24 weeks
42.	Leiter et al., 2011	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=181 C=726	Civility, Respect, and Engagement at Work (CREW), a program aimed to enhance civility among colleagues. The program included an assessment of the units' baseline level of civility followed by employees setting agendas and priorities for addressing these issues directly (including establishing the ground rules for conversations around civility; treating people with respect, etc.)	Organization-directed	24 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
43.	Lin et al., 2019	Hospital nurses	Registered nurses	I=44 C=46	Mindfulness-based group intervention sessions and at home practice facilitated by a group app in which information and experiences were shared and participants could ask questions to the instructors	PD: relaxation techniques	8 weeks
44.	Luo et al., 2019	Hospital nurses	Registered nurses	I=43 C=46	Writing down three good things at the end of the workday using the mobile application WeChat	PD: cognitive behavioral component	24 weeks
45.	Maatouk et al., 2018	Older nurses (≥ 49 years working in a hospital setting)	registered nurses	I=52 C=55	Mix of person-directed interventions with the topic 'healthy aging at work'	PD: mix	13 weeks
46.	Mealer et al., 2014	Intensive Care Unit nurses	registered nurses	I=14 C=13	Resilience Training Program including cognitive behavioral based training, mindfulness, and expressive writing	PD: mix	12 weeks
47.	Melo et al., 2015	Palliative care nurses	mixed sample of ≥ 50% registered nurses	I=65 C=26	Communication training on offering emotional and spiritual support to patients	PD: work skills	6 days
48.	Moeini et al., 2011	Hospital nurses	registered nurses	I=29 C=29	Cognitive behavioral stress management training program including progressive muscle relaxation, aerobic exercises, creative problem solving and time management	PD: mix	3 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
49.	Moody et al., 2013	Pediatric oncology nurses	mixed sample of ≥ 50% registered nurses	I=21 C=24	Mindfulness	PD: relaxation techniques	8 weeks
50.	Morita et al., 2014	Palliative care nurses	registered nurses	I=40 C=43	Interactive education program focusing on addressing patients' feelings of meaninglessness including education on the use of an assessment tool, and creating nursing care plans through group work and group discussions	PD: work skills	2 days
51.	Motlagh et al., 2016	Hospital nurses	registered nurses	I=15 C=15	Cognitive behavioral therapy	PD: cognitive behavioral component	8 weeks
52.	Muller et al., 2015	Hospital nurses	Registered nurses	I=19 C=31	Intervention based on the theoretical model of selection, optimization and compensation (SOC). Participants individually developed and implemented a personal plan for coping better with job demands and for activating job resources	Multilevel	9 months

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
53.	Nooryan et al., 2011	Intensive Care Unit nurses	mixed sample of ≥ 50% registered nurses	I=53 C=53	Emotional intelligence intervention including training on empathy, problem solving, thought control and methods to replace negative thoughts by positive thoughts, practicing relaxation and implementing techniques to control anxiety	PD: mix	5 weeks
54.	Nooryan et al., 2012	Intensive Care Unit nurses	mixed sample of ≥ 50% registered nurses	I=75 C=75	Emotional intelligence intervention including training on empathy, problem solving, thought control and methods to replace negative thoughts by positive thoughts, practicing relaxation and implementing techniques to control anxiety	PD: mix	5 weeks
55.	Norouzinia et al., 2017	Hospital nurses	registered nurses	I=30 C=30	Mindfulness	PD: relaxation techniques	Not reported
56.	Onishi et al., 2016	Hospital nurses	registered nurses	I=19 I=20 C=19	Complementary/alternative therapy including Exp. group 1: listening to relaxing music Exp. group 2: progressive muscle relaxation	PD: relaxation techniques	3 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
57.	Orly et al., 2012	Hospital nurses	registered nurses	I=20 C=16	Behavioral interventions including breathing techniques and progressive muscle training, psychoeducation, identification of irrational ways of thinking, training to modifying negative ways of thinking, and acquiring problem-solving skills	PD: mix	8 weeks
58.	Ozbas et al., 2016	Oncology nurses	registered nurses	I=38 C=44	Psychodrama-based psychological empowerment program including discussions on stress, learning relaxation techniques, problem solving, self-recognition, empathy, dispute resolution, assertiveness training and discussions on death.	PD: mix	10 weeks
59.	Ozgundondu et al., 2019	Intensive Care Unit nurses	registered nurses	I=28 C=28	Progressive Muscle Relaxation combined with music	PD: relaxation techniques	8 weeks
60.	Ploukou et al., 2018	Oncology nurses	mixed sample of ≥ 50% registered nurses	I=22 C=26	Music class	PD: relaxation techniques	4 weeks
61.	Poulin et al., 2008	Nurses working with elderly	mixed sample of ≥ 50% registered nurses	I=10 I=16 C=14	Exp. group 1: Brief mindfulness training Exp. group 2: Brief relaxation training	PD: relaxation techniques	Not reported

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
62.	Ricou et al., 2018	Intensive care unit nurses	mixed sample of ≥ 50% registered nurses	I=41 C=42	Team meetings in which nurses discussed solutions concerning the prevention and reduction of burnout at the workplace, followed by psychoeducation by a psychologist, with the aim "to help changing employees' perceptions and coping with difficulties related to the job"	PD: cognitive behavioral component	Not reported
63.	Sabanciogullari et al., 2015	Hospital nurses	registered nurses	I=33 C=30	Professional identity development program: including perception to nursing profession, attitudes, communication and assertiveness	PD: work skills	10 weeks
64.	Saedpanah et al., 2016	Intensive Care Unit and Critical Care Unit nurses	registered nurses	I=30 C=30	Emotion regulation training including eight educational sessions on emotions and their effects, interpersonal skills (communication, expression and solving conflict), expanding/shifting attention and stopping mental rumination, cognitive assessment and on changing the behavioral and physical outcomes of emotions	PD: mix	3 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
65.	Saeedi et al., 2019	Intensive Care Unit nurses	registered nurses	I=55 C=51	Narrative writing on traumatic experiences	PD: cognitive behavioral component	8 weeks
66.	Sajadi et al., 2017	Hospital nurses	registered nurses	I=24 I=24 C=24	Exp. group 1: Systematic desensitization. Exp. group 2: Bensons Relaxation Response: practicing diaphragmatic breathing and repetitive mental focus to break the train of everyday thought	PD: relaxation techniques	4 weeks
67.	Sallon et al., 2017	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=81 C=65	Caring for the Caregivers program including mindfulness, relaxation, mindful movement and postural alignment, interactive dance, laughter, qigong practice, drawing and writing	PD: relaxation techniques	30 weeks
68.	Sampson et al., 2019	Newly licensed hospital nurses	registered nurses	I=47 C=42	MINDBODYSTRONG program, a cognitive behavioral skill building program incorporating strategies to improve mental and physical health	PD: cognitive behavioral component	8 weeks
69.	Sampson et al., 2020 (Follow-up Sampson et al., 2019)	Newly licensed hospital nurses	registered nurses	I=47 C=42	MINDBODYSTRONG program, a cognitive behavioral skill building program incorporating strategies to improve mental and physical health	PD: cognitive behavioral component	8 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
70.	Singh et al., 2017	Hospital nurses	registered nurses	I=20 C= 20	Self-help interventions including education on environment/ personal stressors, relaxation training, breathing and muscular exercise, practicing techniques to help cognitively reappraising stressful situations, time management and building good social relationships	PD: mix	5-6 weeks
71.	Slatyer et al., 2018	Hospital nurses	registered nurses	I=60 C=16	Brief mindful self-care and resilience intervention	PD: relaxation techniques	4 weeks
72.	Taniguchi et al., 2007	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=38 C=41	10-minute relaxation training consisted of progressive muscle relaxation, abdominal respiration, mediation and stretching	PD: relaxation techniques	1 day
73.	Uchiyama et al., 2013	Hospital nurses	registered nurses	I=149 C=170	Participatory intervention in which teams identified the most prominent stressors at work and designed and implemented interventions to reduce these	Organization-directed	24 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
74.	Udo et al., 2013	Medical surgical nurses	mixed sample of ≥ 50% registered nurses	I=12 C=12	Education program to develop reflective strategies to handle and communicate on existential issues when providing care for severely ill patients including patients dying of cancer	PD: work skills	10 weeks
75.	Val Palumbo et al., 2012	Older nurses (≥ 49 years working in a hospital setting	Registered nurses	I=5 C=6	Tai Chi	PD: relaxation	15 weeks
76.	Van Bogaert et al., 2014	Nurses working in the medical units, surgical units, Intensive Care Units, pediatric care units and maternal care units.	mixed sample of ≥ 50% registered nurses	I=198 C=179	The Productive Ward Releasing time to Care program, a quality improvement program designed to provide staff with more time for direct patient care. The program offers 15 modules based on lean methodology to systematically enhance the delivery of safe, high-quality patient care by eliminate activities that add no value to patients (i.e. eliminating waste)	Organization directed	7 years

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
77.	Villani et al., 2013	Oncology nurses	registered nurses	I=15 C=15	Mobile Stress Inoculation Training (M-SIT) including a conceptual phase to raise awareness of the transactional nature of stress and a skill acquisition and rehearsal stage (consisting of Progressive Muscular Relaxation and Autogenic Training)	PD: relaxation techniques	4 weeks
78.	Watanabe et al., 2019	Junior nurses working in a hospital setting	registered nurses	I=40 C=40	Happy Nurse Project: Brief mindfulness-based stress management program including education on the cognitive behavioral model of stress and emotion, conducting a body scan and breathing exercises, promoting awareness of patients' cognitions and providing suggestions about increasing pleasant behaviors and planning a strategy to manage future stress	PD: mix	4 weeks
79.	Waters et al., 2018	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=17 C=18	Acceptance and commitment therapy (ACT)	PD: mix	1 day

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
80.	Wei et al., 2017	Emergency Department nurses	registered nurses	I=51 C=51	An active intervention including classes pertaining to communication skills, approaches to conflict, efficacy elevation, and emotion control as well as working skills	PD: work skills	26 weeks
81.	Xie et al., 2020	Intensive Care Unit nurses	registered nurses	I=53 C=53	Mindfulness	PD: relaxation techniques	8 weeks
82.	Yamagishi et al., 2008	Hospital nurses	mixed sample of ≥ 50% registered nurses	I=16 C=10	Career identity (defined as the cognitive representation of self, derived from past work experiences, beliefs, values, attributes, and motives that define individuals in terms of their work roles) training for stress management	PD: cognitive behavioral component	3 weeks
83.	Yang et al., 2018	Psychiatric nurses	registered nurses	I=48 C=47	Mindfulness	PD: relaxation techniques	8 weeks

Table 4. *Continued*

	Author	Type of nurses	Sample	N	Short description of the intervention	Intervention type	Intervention period
84.	Yektatalab et al., 2020	Hospital nurses	registered nurses	I=52 C=52	Life skill training in which every week a new skill was trained including self-awareness, empathy, decision-making, problem-solving, creative thinking, critical thinking, effective communication, interpersonal relationship skills, coping with emotions, and coping with stress	PD: mix	10 weeks
85.	Zamanifar et al., 2020	Hospital nurses	Registered nurses	I=30 C=30	Music therapy: listening to a selection of conventional and favorite music according to the interest of the sample during the work break	PD: relaxation techniques	3 consecutive shifts

Note. PD = Person-directed, I = Intervention group, C = Control group

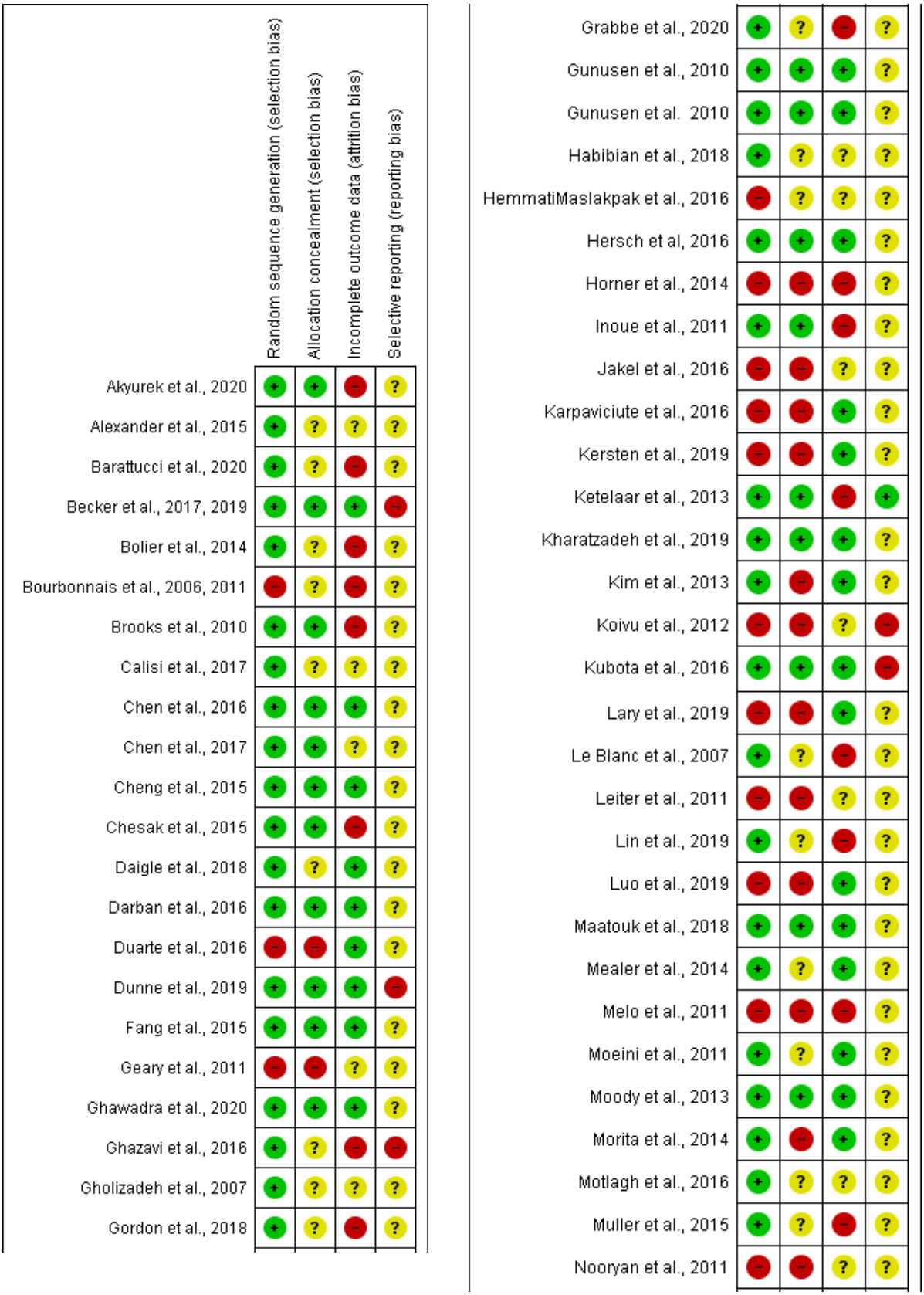
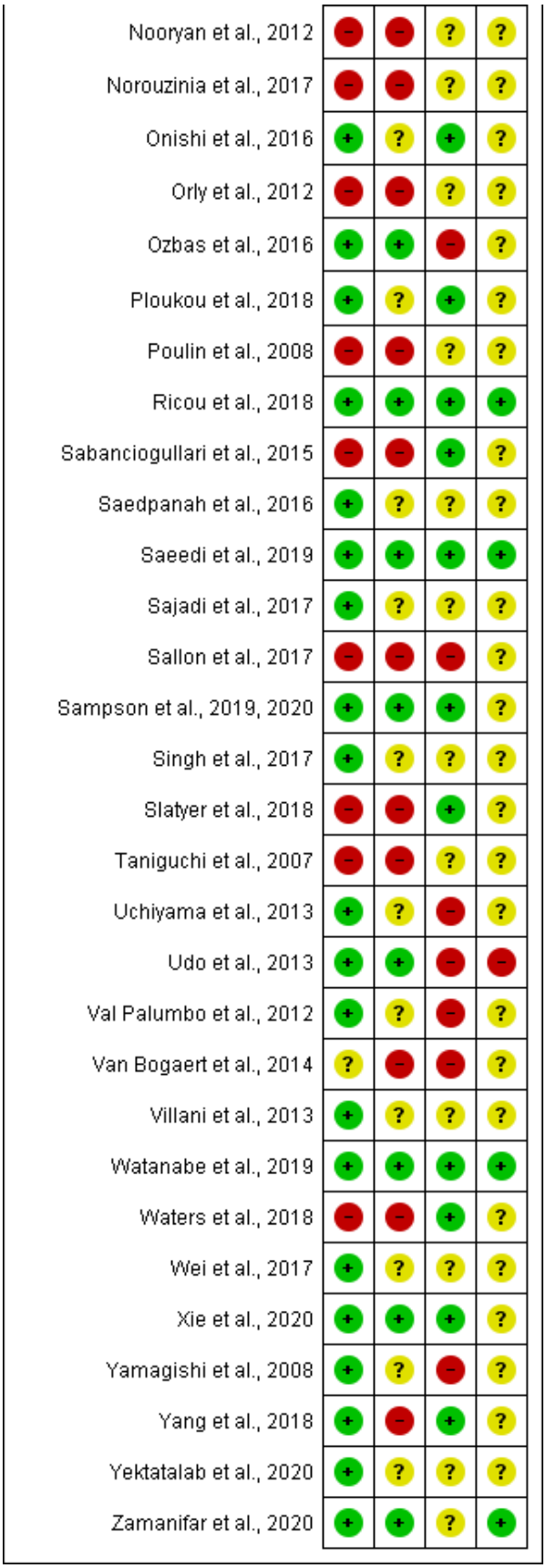


Figure 1. Risk of bias summary: review authors' judgements about each risk of bias item for each included intervention based on The Cochrane Risk of Bias tool



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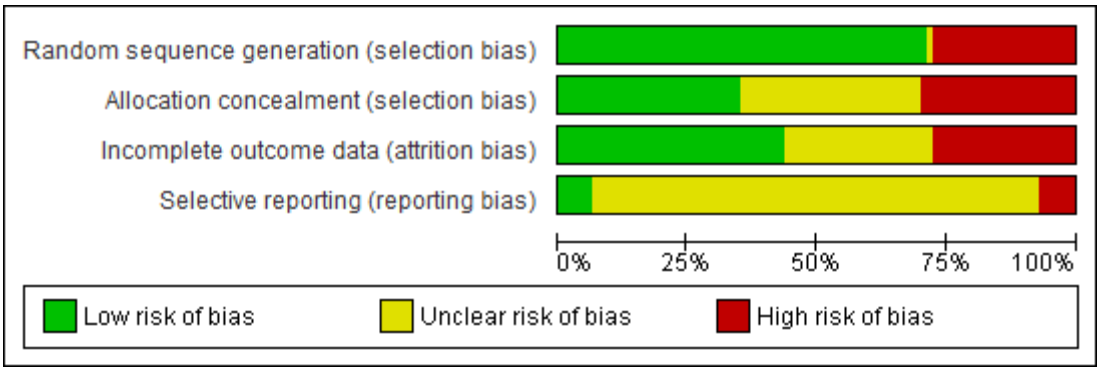

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included interventions based on The Cochrane Risk of Bias tool

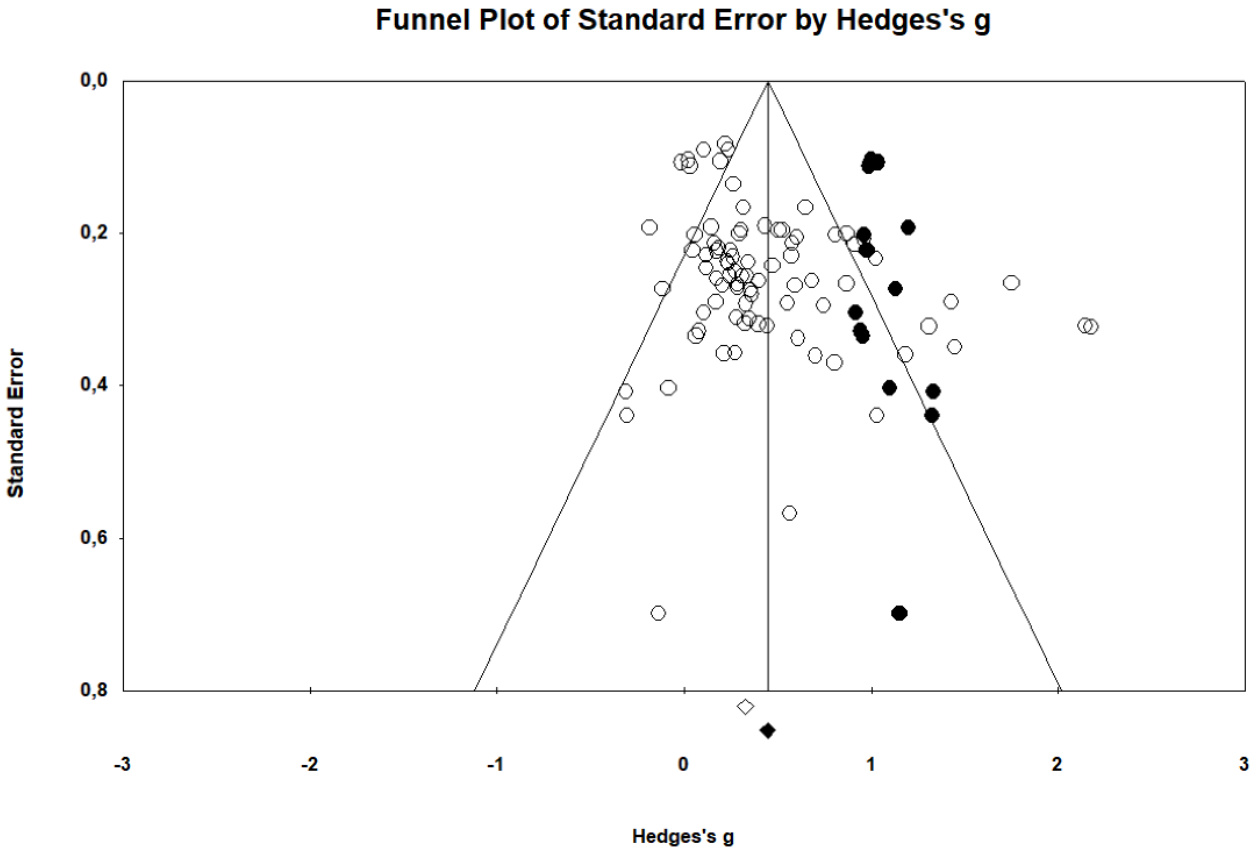

Figure 3. Funnel plot showing the effect of stress management interventions on stress-related outcomes.

Study name	Subgroup within study	Outcome category	Time point	Hedges's g	Lower limit	Upper limit	Standard error	p-Value
Bolier et al., 2014	A	Combined	2.POST p2	0,02	-0,18	0,22	0,10	0,85
Cheng et al. 2015	Gratitude	Combined	0.POST p0	0,47	-0,00	0,95	0,24	0,05
Ghazavi et al., 2016	A	Combined	0.POST p0	0,36	-0,18	0,90	0,28	0,20
Gunusen et al. 2010	Coping	Combined	0.POST p0	0,45	-0,18	1,08	0,32	0,17
HemmatiMaslakpak et al., 2015	A	Work related stress	1.POST p1	2,18	1,55	2,81	0,32	0,00
Ketelaar et al., 2013	A	Combined	2.POST p2	0,21	-0,32	0,73	0,27	0,44
Luo et al., 2019	A	Combined	2.POST p2	0,16	-0,26	0,58	0,21	0,45
Motlagh et al., 2016	A	Combined	0.POST p0	0,21	-0,49	0,91	0,36	0,55
Ricou et al. 2018	A	Combined	0.POST p0	0,57	0,12	1,02	0,23	0,01
Saeedi et al., 2019	A	Work related stress	0.POST p0	-0,18	-0,56	0,20	0,19	0,35
Sampson et al., 2019, 2020	A	Combined	0.POST p0	1,75	1,23	2,27	0,27	0,00
Yamagishi et al., 2008	A	Combined	0.POST p0	0,08	-0,56	0,72	0,33	0,81
				0,50	0,15	0,86	0,18	0,01

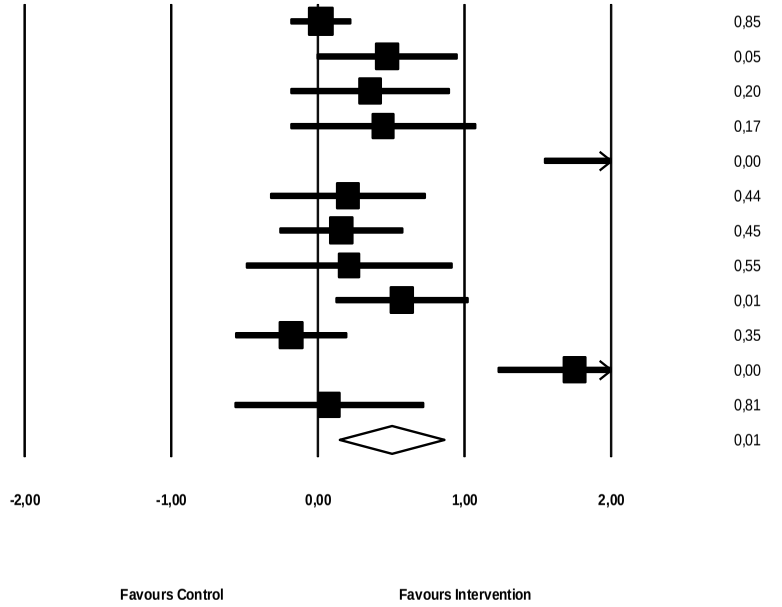

Figure 4. Forest plot of the effect sizes of person-directed interventions: cognitive behavioral

Study name	Subgroup within study	Outcome category	Time point	Hedges's g	Lower limit	Upper limit	Standard error	p-Value
Akyurek et al., 2020	A	Combined	0.POST p0	0,27	-0,43	0,98	0,36	0,44
Alexander et al., 2015	A	Combined	0.POST p0	0,35	-0,26	0,96	0,31	0,26
Brooks et al., 2010	A	Combined	0.POST p0	-0,11	-0,65	0,42	0,27	0,68
Calisi et al., 2017	A	Combined	0.POST p0	0,33	-0,25	0,90	0,29	0,26
Chen et al. 2016	A	Anxiety	0.POST p0	0,30	-0,10	0,69	0,20	0,14
Chesak et al. 2015	A	Combined	2.POST p2	0,40	-0,23	1,02	0,32	0,21
Daigle at al., 2018	A	Psychological distress	0.POST p0	0,35	-0,12	0,81	0,24	0,15
Duarte et al., 2016	A	Combined	0.POST p0	0,17	-0,40	0,74	0,29	0,56
Dunne et al., 2019	A	Combined	1.POST p1	0,28	-0,33	0,89	0,31	0,37
Fang et al. 2015	A	Work related stress	0.POST p0	1,31	0,68	1,94	0,32	0,00
Geary et al., 2011	A	Psychological distress	0.POST p0	0,87	0,48	1,26	0,20	0,00
Ghawadra et al., 2020	A	Combined	2.POST p2	0,26	-0,00	0,53	0,14	0,05
Gholizadeh et al., 2017	A	Work related stress	0.POST p0	2,15	1,52	2,78	0,32	0,00
Grabbe et al., 2019	A	Combined	1.POST p1	0,24	-0,23	0,70	0,24	0,33
Habibian et al. 2018	A	Combined	0.POST p0	0,24	-0,26	0,75	0,26	0,34
Horner et al. 2014	A	Combined	0.POST p0	0,06	-0,59	0,72	0,33	0,85
Karpaviciute et al., 2016	A	Combined	0.POST p0	0,43	0,06	0,81	0,19	0,02
Kim et al., 2013	A	PTSD symptoms	2.POST p2	1,03	0,17	1,89	0,44	0,02
Lin et al., 2019	A	Psychological distress	0.POST p0	0,58	0,16	0,99	0,21	0,01
Moody et al. 2013	A	Combined	0.POST p0	0,10	-0,50	0,70	0,30	0,74
Norouzinia et al. 2017	A	Combined	0.POST p0	0,34	-0,17	0,84	0,26	0,19
Onishi et al., 2016	Combined	Combined	0.POST p0	0,25	-0,19	0,68	0,22	0,27
Ozgundondu et al., 2019	A	Combined	0.POST p0	0,59	0,07	1,12	0,27	0,03
Ploukou et al. 2018	A	Combined	0.POST p0	0,75	0,17	1,33	0,30	0,01
Poulin et al. 2008	Combined	Combined	0.POST p0	0,28	-0,24	0,81	0,27	0,29
Sajadi et al., 2017	Combined	Anxiety	0.POST p0	0,60	0,20	1,00	0,21	0,00
Sallon et al. 2017	A	Combined	0.POST p0	0,32	-0,01	0,64	0,17	0,06
Slatyer et al. 2018	A	Combined	0.POST p0	0,36	-0,19	0,91	0,28	0,20
Taniguchi et al. 2007	A	Combined	0.POST p0	0,17	-0,27	0,61	0,22	0,44
Val Palumbo et al., 2012	A	Combined	0.POST p0	0,56	-0,55	1,67	0,57	0,32
Villani et al. 2013	A	Anxiety	0.POST p0	0,81	0,08	1,53	0,37	0,03
Waters, 2018	A	Psychological distress	2.POST p2	1,19	0,48	1,89	0,36	0,00
Xie et al., 2020	A	Combined	1.POST p1	0,50	0,12	0,89	0,20	0,01
Yang et al. 2018	A	Combined	1.POST p1	0,91	0,49	1,33	0,21	0,00
Zamanifar et al., 2020	A	Anxiety	0.POST p0	0,87	0,35	1,39	0,27	0,00
				0,49	0,37	0,61	0,06	0,00

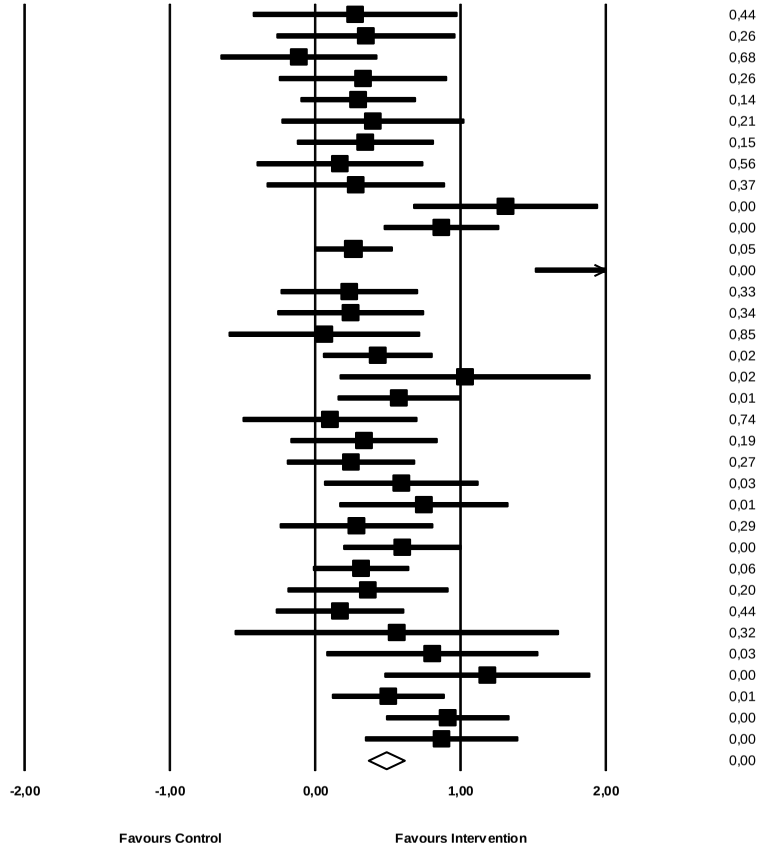

Figure 5. Forest plot of the effect sizes of person-directed interventions: relaxation

Study name	Subgroup within study	Outcome category	Time point	Hedges's g	Lower limit	Upper limit	Standard error	p-Value
Becker et al., 2017, 2020	A	Combined	0.POST p0	0,12	-0,36	0,60	0,25	0,63
Chen et al. 2017	A	Work related stress	0.POST p0	0,70	-0,01	1,41	0,36	0,05
Darban et al. 2016	A	Combined	0.POST p0	0,31	-0,19	0,82	0,26	0,22
Koivu et al., 2012	Combined	Emotional Exhaustion	3.POST p3	-0,31	-1,17	0,55	0,44	0,48
Kubota et al., 2016	A	Combined	2.POST p2	0,06	-0,34	0,45	0,20	0,78
Melo et al. 2015	A	Combined	2.POST p2	0,26	-0,19	0,72	0,23	0,26
Morita et al. 2014	A	Combined	2.POST p2	0,19	-0,24	0,62	0,22	0,40
Sabanciogullari et al., 2015	A	Combined	0.POST p0	0,27	-0,22	0,76	0,25	0,28
Udo et al., 2013	A	Work related stress	0.POST p0	-0,31	-1,11	0,49	0,41	0,44
Wei et al. 2017	A	Combined	0.POST p0	0,96	0,55	1,37	0,21	0,00
				0,27	0,04	0,50	0,12	0,02

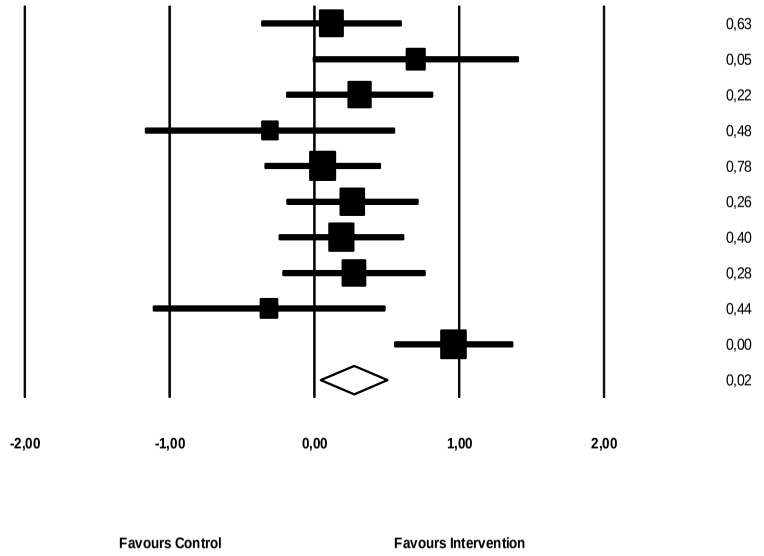

Figure 6. Forest plot of the effect sizes of person-directed interventions: work skills

Study name	Subgroup within study	Outcome category	Time point	Hedges's g	Lower limit	Upper limit	Standard error	p-Value
Barraccutti et al., 2020	A	Psychological distress	2.POST p2	0,10	-0,08	0,28	0,09	0,26
Gunusen et al., 2010	Support	Combined	0.POST p0	0,33	-0,30	0,95	0,32	0,31
Inoue et al., 2011	A	Combined	0.POST p0	0,55	-0,02	1,13	0,29	0,06
Jakel et al. 2016	A	Combined	0.POST p0	-0,08	-0,87	0,71	0,40	0,84
Kharatzadeh et al., 2019	A	Combined	0.POST p0	0,29	-0,25	0,82	0,27	0,29
Lary et al., 2019	A	Combined	0.POST p0	0,23	-0,23	0,70	0,24	0,33
Maatouk et al. 2018	A	Combined	0.POST p0	0,14	-0,23	0,52	0,19	0,46
Mealer et al. 2014	A	Combined	1.POST p1	-0,13	-1,50	1,24	0,70	0,85
Moeini et al. 2011	A	Work related stress	2.POST p2	1,43	0,86	2,00	0,29	0,00
Nooryan et al., 2011	A	Anxiety	0.POST p0	0,52	0,14	0,91	0,20	0,01
Nooryan et al., 2012	A	Anxiety	1.POST p1	0,65	0,32	0,98	0,17	0,00
Orly et al. 2012	A	Combined	0.POST p0	0,61	-0,05	1,27	0,34	0,07
Ozbas & Tel, 2016	A	Combined	1.POST p1	1,03	0,57	1,48	0,23	0,00
Saedpanah et al., 2016	A	Work related stress	0.POST p0	0,68	0,17	1,20	0,26	0,01
Singh et al., 2017	A	Work related stress	0.POST p0	1,45	0,76	2,13	0,35	0,00
Watanabe et al., 2019	A	Combined	2.POST p2	0,04	-0,39	0,48	0,22	0,85
Yektatalab et al., 2020	A	Combined	1.POST p1	0,81	0,41	1,20	0,20	0,00
				0,52	0,31	0,73	0,11	0,00

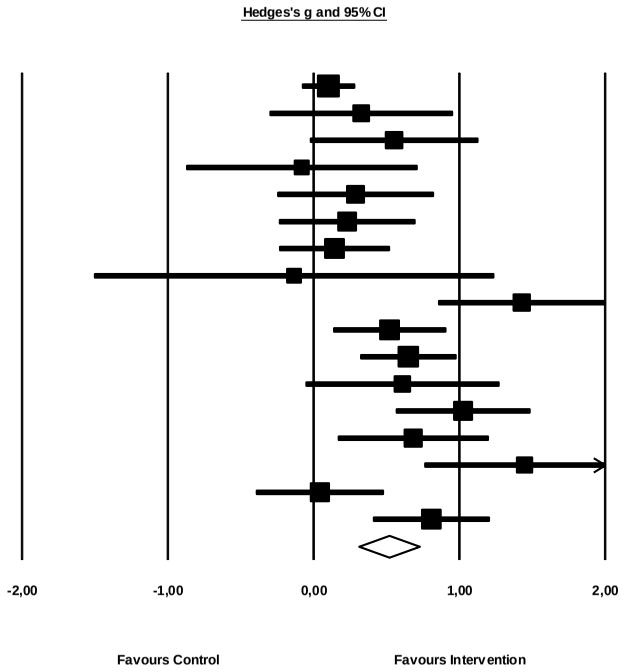

Figure 7. Forest plot of the effect sizes of person-directed interventions: mix

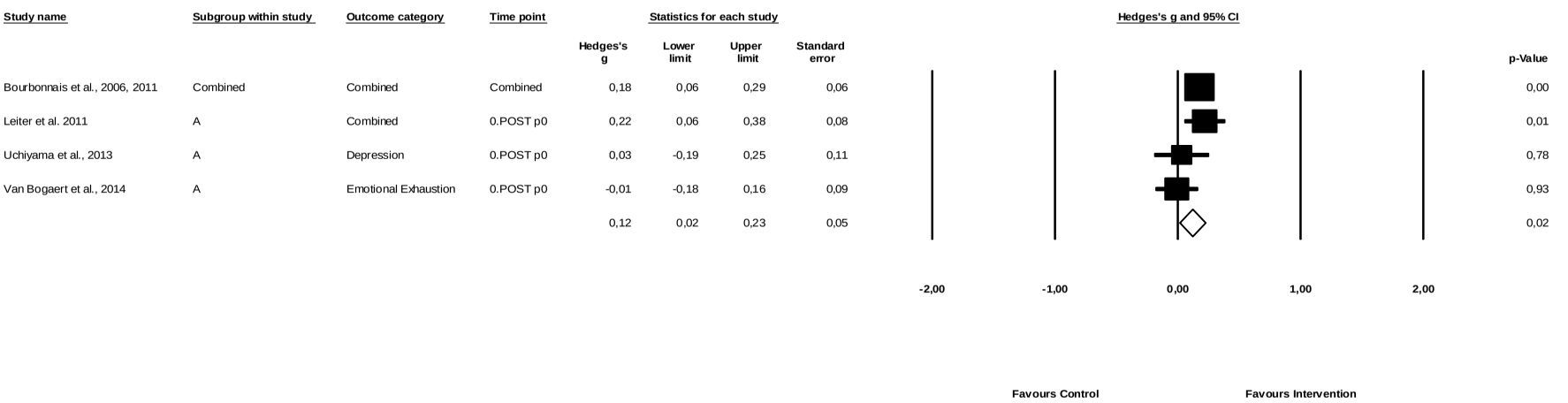

Figure 8. Forest plot of the effect sizes of organization directed interventions

Study name	Subgroup within study	Outcome category	Time point	Statistics for each study				Hedges's g and 95%CI
				Hedges's g	Lower limit	Upper limit	Standard error	p-Value
Gordon et al. 2017	A	Emotional Exhaustion	2.POST p2	0,40	-0,12	0,91	0,26	0,13
Hersch et al. 2016	A	Combined	0.POST p0	0,30	-0,08	0,69	0,20	0,12
Kersten et al., 2019	A	Combined	0.POST p0	0,12	-0,33	0,56	0,23	0,61
le Blanc et al. 2007	A	Combined	0.POST p0	0,20	-0,01	0,40	0,11	0,07
Muller et al., 2015	A	Psychological distress	0.POST p0	0,17	-0,34	0,68	0,26	0,51
				0,22	0,07	0,37	0,08	0,01

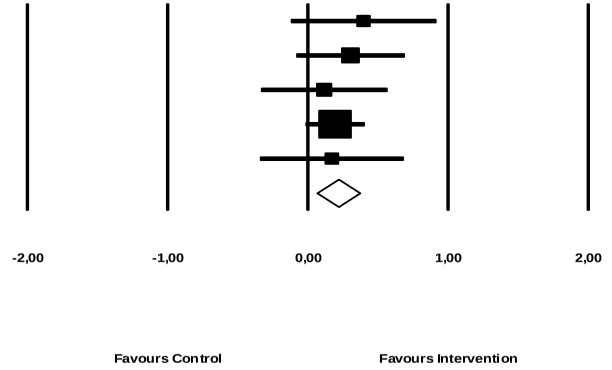

Figure 9. Forest plot of the effect sizes of multilevel interventions

“Het is een zwakte om aan te geven als je ergens mee zit. Of het nu gaat om een heftige gebeurtenis of omdat je gewoon te veel werk hebt.”

- SEH-verpleegkundige, juli 2017 -

“Er lopen hier ook wel mensen rond die heel cynisch zijn, en dan denk ik wel dat er te weinig aandacht is voor wat het werk met de medewerker doet.”

- SEH-verpleegkundige, juli 2017 -

“Wij hebben geen peer support of enige opvang. Medewerkers gaan gewoon door. Dat gaat me echt aan het hart. Er wordt nu wel naar gekeken. Tot nu toe is dat niet gebeurd omdat de cultuur gewoon zo is.”

- SEH-verpleegkundige, juni 2018 -

“Als senior management waren we erg ontdaan van de uitslagen. Met name burnout. Voor het personeel leek het minder een verassing. We hebben het gevoel dat we niet goed hebben geluisterd en proberen nu meer in gesprek te gaan hierover. Er is een dagstart en dagevaluatie ingevoerd en we zijn meer alert op het evalueren van heftige casuïstiek.”

- Manager spoedeisende hulp, juli 2018 -

“Het direct management probeert van alles
maar loopt daarboven ook tegen een muur aan.
Veel dingen lijken op hoger niveau niet mogelijk.”

- SEH-verpleegkundige, augustus 2019 -

“We worden op zich wel betrokken bij veranderingen.
Hoe vaak we hier wel niet post-its hebben geplakt en hoeveel
werkgroepen er wel niet waren met allemaal goede ideeën.
Maar uiteindelijk wordt er niets uitgevoerd of is er niets
mogelijk. Het wordt gewoon niet gedragen door de
organisatie. Dat werkt echt frustrerend.”

- SEH-verpleegkundige, augustus 2019 -

“Hogerhand zou langer mee moeten lopen op de afdeling.
Twee uur is niet voldoende om een goed beeld te krijgen van
de drukte hier. Er zou meer aandacht moeten komen vanuit
hoger management voor de arbeidsbelasting.”

- SEH-verpleegkundige, augustus 2019 -

CHAPTER 5

Psychosocial Safety Climate as predictor for the implementation process of a large-scale stress management intervention project in the Netherlands

Manuscript under review
de Wijn, A. N. & van der Doef, M. P. Psychosocial Safety Climate as predictor for the implementation process of a large-scale stress management intervention project in the Netherlands.

Abstract

Psychosocial Safety Climate (PSC) refers to a climate in which all levels of the organization are committed to employee well-being. The current study investigates whether PSC predicts the number and fit of actions, information provision, employee involvement, and positive appraisals in a stress management intervention project in 15 Emergency Departments in the Netherlands. Employee surveys were conducted at T1 (January/February 2017), T2 (June/July 2018), and T3 (June/July 2019) to assess PSC, information provision, employee involvement and positive appraisals. A standard form and follow-up telephone interviews were used to inventory the number and fit of actions taken by each ED. Multilevel analyses showed that PSC at T1 was positively related to information provision and employee participation, but not to positive appraisals at T2. Neither PSC at T1 nor a change in PSC between T1 and T2 predicted the number or fit of actions in the following year. This is one of the first studies assessing PSC as prerequisite for successful intervention implementation and shows its importance with respect to information provision and employee involvement. Future research in other settings and integrating other contextual factors (e.g. financial resources, staffing levels, mental resources) next to PSC, is warranted.

Background

Stress management interventions (SMIs), especially organization-directed interventions focusing on improving the working environment and/or work processes, often show little to no effect on employee well-being (Richardson & Rothstein, 2008; Ruotsalainen et al., 2015). In an attempt to understand and increase the effectiveness of these interventions, several researchers strongly suggest adopting a realist approach in SMI research, not only assessing the outcome but also investigating how the intervention was implemented (i.e. processes or mechanisms) and under what circumstances (i.e. the context) (Biron & Karanika-Murray, 2014; Nielsen & Miraglia, 2016). An important proposition of this approach is that the outcome of an intervention depends upon the activation of important mechanisms which can be hindered or facilitated by the organizational context, also referred to as the Context-Mechanism-Outcome (CMO) framework (Hewitt et al., 2012).

Up till now, research on SMI studies provides quite some evidence regarding what mechanisms need to be activated for intervention success, including the design of fitting interventions to the context and current risk factors (Albertsen et al., 2014; Nielsen & Randall, 2015), senior and direct management support for the intervention project (Jenny et al., 2015; Nielsen, 2017; Nielsen & Noblet, 2018), clear communication about the intervention activities (Nielsen & Randall, 2013; Nielsen & Noblet, 2018; Saksvik et al., 2015), employee participation in designing and implementing interventions (Abildgaard et al., 2018; Nielsen & Randall, 2012) and positive attitudes towards and perceptions of the intervention project (Jenny et al., 2015; Nielsen & Randall, 2013; NytrØ et al., 2000). However, our understanding is far more limited regarding the organizational context necessary to trigger these mechanisms. Up till now, contextual factors are often reported in the discussion sections in terms of disturbing factors or noise, but hypotheses regarding their influence are rarely formulated and tested (Nielsen & Miraglia, 2016; Nielsen & Noblet, 2018). Based upon a review of the literature, Nielsen and Noblet (2018) concluded that in order to develop, test and revise CMO-configurations in SMI research, more research on contextual factors is needed. To address this gap, the current study explores the role of Psychosocial Safety Climate (PSC), in activating mechanisms in a two-and-a-half year (2017-2019) stress management intervention project among multiple emergency departments (EDs) in the Netherlands.

Psychosocial Safety Climate

Psychosocial Safety Climate (PSC) is an organizational climate factor and concerns the policies and practices regarding psychosocial safety which is reflected in four domains, 1. management prioritizes psychosocial safety, 2. management is committed and supportive in reducing psychosocial risks at work, 3. there is upwards (from employees to management) and downwards (from management to employees) communication regarding psychosocial risks, and 4. all parties (management, employees or their representatives, human resources, occupational safety representatives) are involved in reducing psychological risks at work (Hall et al., 2010). More recently, a favorable group norm towards psychosocial safety has been added as a fifth dimension (Bronkhorst, 2015; Bronkhorst & Vermeeren, 2016). In organizations with a favorable PSC, management values and consequently prioritizes employee well-being above other competitive (often productivity related) goals. According to the theory of PSC, this in turn leads to the instalment of manageable job demands, adequate job resources, and safe socio-relational aspects of work, which has a positive effect on employee well-being (Dollard & Bakker, 2010). Indeed, multiple studies have found evidence for this theory (Bronkhorst & Vermeeren, 2016; Dollard & McTernan, 2011; Zadow et al., 2017), and as such, PSC is often referred to as "cause of causes" (Loh et al., 2020).

PSC as a predictor of mechanisms in an intervention project

In line with the notion of PSC as "cause of causes", there is reason to believe that a favorable PSC is an important prerequisite for a successful SMI project by activating mechanisms related to greater intervention success.

First of all, a key aspect of a favorable PSC is the priority given by and commitment of management towards psychosocial safety over other competitive goals (Dollard & Bakker, 2010). As such, it is to be expected that organizations with a more favorable PSC are more likely to allocate time, budget and support to an intervention project aimed to reduce stress and increase employee well-being. These resources are crucial in the translation of identified risk factors into concrete intervention plans, and the development and implementation of actions during the SMI project (Biron & Karanika-Murray, 2014). Indeed, management is regarded the main driver of the implementation phase in SMI projects and studies show that a lack of management support can lead to limited, or even a reversal of, implemented intervention activities (Nielsen & Noblet, 2018).

Second, in organizations with a favorable PSC there is open communication and commitment on all layers of the organization to reduce psychosocial risks at work. As a result, employees in these organizations feel safe to discuss psychosocial risks with their supervisor, whereas employees in organizations with a less favorable PSC have found to be more hesitant due to the fear or repercussions (McLinton et al., 2018). With regards to intervention implementation, a safe and open environment is seen as crucial condition for the development of fitting actions to psychosocial risk factors (Biron & Karanika-Murray, 2014). In contrast, in a context where management and/or employees feel uncomfortable to discuss stress-related issues, the process of finding appropriate solutions is much more difficult and more likely to be unsuccessful (Biron & Karanika-Murray, 2014; Gemzøe Mikkelsen et al., 2011).

Apart from the number and fit of actions, it is to be expected that a favorable PSC has a positive impact on how the actions are implemented, including factors such as information provision and employee involvement. First of all, previous research shows that management that is concerned by and committed to psychosocial safety is more likely to provide employees with the time necessary to participate in intervention projects as well as motivate employees to make changes to their working conditions (Gray et al., 2019; Tafvelin et al., 2019), and employees in these organizations are more likely to be involved in intervention projects (Greasley & Edwards, 2014). Furthermore, in a study by Mikkelsen and Saksvik (1998), the same intervention triggered employee participation in an organization with a culture based upon co-operation, common interest and continuous improvement, but not in an organization where employees believed that it was the job of management to solve their problems. In line with these results, it has been found that the participatory process was more difficult to trigger in organizations in which employees were not used express their concerns regarding psychosocial risks (Mikkelsen et al., 2000) or be included in problem solving (Aust et al., 2010; Mikkelsen et al., 2000).

Finally, PSC is likely to be of influence on the attitudes and appraisals of employees towards an SMI project. Although the influence of contextual factors like organizational climate on mental models has received little attention in SMI research, the relationship has been well studied and acknowledged in the field of organizational management (Weiner, 2009). For example, in organizations where innovation is an important part of the culture, employees are more positive towards change (Weiner, 2009). Since employees are more likely to accept and

support activities when they perceive that these originate from shared norms, values and beliefs, (Hogg, 2001), it is to be expected that in organizations with a more favorable PSC, employees will be more positive towards activities to reduce stress and improve well-being. In comparison, conducting such projects in settings where health and well-being are less prioritized, may lead to skepticism and even negative appraisals of the project (NytrØ et al., 2000).

Previous research on the influence of PSC in activating mechanisms

According to our knowledge, only one previous attempt has been made to study the influence of PSC on activating important mechanisms in an SMI project. In 2012, Dollard conducted a pilot study to assess whether PSC could be considered an important starting condition in a participative intervention in two governmental organizations. The results indicated that PSC at the workgroup level was positively related to the number of intervention sessions attended, the intervention quality (i.e. the extent to which employees felt they had been listened to), and the intervention progress (i.e. the extent to which actions of the action plan had been implemented). The latter is in line with the expectation that a positive PSC facilitates resources and thus action taking in an intervention project. However, PSC was measured 6 weeks after the initial intervention workshops had taken place, which makes it difficult to draw conclusions regarding a cause-response relationship; the participatory intervention may have already resulted in a better PSC. Furthermore, no validated questionnaire for PSC was used, as such a questionnaire was first developed and introduced after publication of the study. On another note, Dollard (2012) measured PSC at the beginning of the project. However, PSC as an organizational climate factor, represents a momentary state which is likely to fluctuate over time (Cox & Flin, 1998). As such, it is possible that PSC is not only an important starting condition as concluded by Dollard (2012), but also a dynamic factor triggering or hindering mechanisms depending on the direction of change during the intervention project.

Current study

The current study aims to test the first proposition of the CMO framework and builds upon the work of Dollard (2012) by assessing whether PSC activated mechanisms in a 2.5-year intervention implementation project among multiple Emergency Departments (EDs) in the Netherlands. The project consisted of a risk assessment, yearly feedback regarding (changes in) psychosocial risks and employee well-being, and inspiration sessions to support and

stimulate EDs in designing and implementing actions. Data was collected in three waves (T1: January/February 2017, T2: June/July 2018; T3: June/July 2019) with respectively 18 and 12 months in between. In this study, we specifically focused on the number and fit of actions, information provision, employee involvement, and positive appraisals, as we expect that these mechanisms will most likely be activated by a favorable PSC context and play an important role in the effectiveness of the current project. Although we are aware that "management support" is also widely recognized as an important mechanism in the success of SMI projects, given its overlap with PSC (i.e. management commitment and priority to reduce psychosocial risks at work), this process variable was not included in the current study. In comparison to the study by Dollard (2012), PSC was assessed at the start of (T1), and halfway through the intervention project (T2). As such, the design rules out possible reciprocal effects of the intervention project influencing PSC and enables the exploration of changes in PSC over time. Furthermore, PSC was measured based upon the PSC-12, a well validated questionnaire (Loh et al., 2020). The following hypotheses will be tested:

> *Hypothesis 1*. PSC at T1 is positively related to information provision and employee involvement as experienced by the employees, and more positive appraisals of the (planned) actions at T2.

> *Hypothesis 2*. PSC at T1 is positively related to the number of actions taken between T1 and T2 and the fit of these actions to the psychosocial risks identified at T1.

In addition to the influence of PSC at baseline we will examine whether changes in PSC between T1 and T2 relate to the number and fit of actions taken in the project. However, at T2 EDs were strongly advised to improve the process by which interventions were implemented including information provision regarding and employee participation in the project, and pay special attention to how the project was perceived by employees. As such, we could not assess the effect of a change in PSC on information provision, employee involvement and positive appraisals between T2 and T3.

> *Hypothesis 3*. An increase in PSC between T1 and T2 is positively related to the number of actions taken between T2 and T3 and the fit of these actions to the psychosocial risks identified at T1.

If PSC proves to be an important contextual factor for a successful intervention project by activating mechanisms, this will have implications for the way psychosocial risk factors can be successfully reduced and well-being promoted. Confirmation of our hypotheses suggests that organizations with low to suboptimal levels of PSC should focus on enhancing PSC before starting (or at the start of) an intervention implementation project to reduce psychosocial risks at work.

Methods

The study design

The current study is part of a larger study on a 2.5-year (2017-2019) intervention implementation project among multiple EDs in the Netherlands, and concerns a field study without control group. Within this project EDs were free to decide upon the number and type of actions to reduce psychosocial risks at work and how these were implemented. They were supported by a thorough risk assessment at the start of the project (T1), regular feedback regarding their progress (based upon employee surveys at T2 and T3) and nine inspiration sessions to exchange best practices and gain knowledge on stress management from experts in the field. A project leader (often the ED manager) was appointed in each ED to increase response rates on the surveys and to serve as point of contact for the researchers. The project leaders also kept track of the actions taken in their ED to reduce psychosocial risks and/or increase well-being. These actions were listed on a standard form including a short description of the action, the start date of the action, the end date of the action (if relevant) and the goal of the action. These forms were collected every three to four months by the first author, followed by a short telephone interview to ensure the list was complete, and to ask for details and additional information regarding the actions taken. The study was approved by the ethical committee review board of the university.

Setting and sample

From the 19 hospitals participating in the project, EDs of 15 hospitals took part in the T1 and T2 measurements and were included in the current study. The number of nurses per ED varied between 18 and 101 with an average of 52 (SD = 20.7). All registered ED nurses and ED nurses in training enlisted during the time of the study received an invitation via their work e-mail address to participate in the surveys. Response rates on the questionnaires varied from 72% (N= 561) at T1 to 60% (N = 498) at T2. More than half of the nurses from T1 (61%) completed both surveys and were included in the analyses.

Materials

Risk assessment

Based upon recommendations (Nielsen & Randall, 2013) a thorough risk assessment was conducted at the start of the project. The risk assessment consisted of multiple (occupational specific) questionnaires administered to the ED nurses and ED nurses in training assessing job demands (e.g. aggression, emotional demands, work-time demands), job resources (e.g. social support, autonomy) and well-being indicators (e.g. burnout, work engagement, sleep problems). Psychosocial risk factors were identified in two ways. First, the average baseline scores of all EDs together were compared to available data of a similar study among emergency nurses of 15 EDs in Belgium (Adriaenssens et al., 2015) and data of nurses working in a large hospital in the Netherlands (Gelsema et al., 2005) using independent *t*-tests. Scores on job demands, job resources and well-being that were significantly ($p < .05$) more unfavorable were considered psychosocial risk factors for all EDs. Second, the scores of each ED were compared to the overall mean of all EDs in the intervention project. Significant unfavorable deviations from the grand mean were considered ED specific psychosocial risk factors. The results of the risk assessment (including the identified psychosocial risks) were fed back to the EDs in the form of an advice report.

Psychosocial Safety Climate

Psychosocial Safety Climate was measured at T1 and T2 using a survey incorporating the PSC-12 scale, a validated scale developed by Hall et al. (2010). The PSC-12 includes four subscales: 1) the priority of and 2) the commitment to psychosocial safety climate by management, 3) communication about, and 4) participation of all parties within the organization (e.g. employees, human resources) in providing a positive psychosocial safety climate. In line with Bronkhorst and Vermeeren (2016) we added a fifth factor measuring the group norm concerning psychosocial safety climate. This five-factor version has been confirmed by exploratory and confirmatory factor analyses (Bronkhorst, 2015; Bronkhorst & Vermeeren, 2016). Furthermore, in line with Bronkhorst and Vermeeren (2016), we differentiated between management layers by changing the questions concerning management priority to "top level" management priority and the questions concerning management commitment to "direct" management commitment. Each subscale included three items which were answered on a five-point Likert scale from totally disagree (1) to totally agree (5). All subscales have good internal

consistency (α = .79-.89). The overall Cronbach's Alpha was .93, which is comparable to other studies using this scale (Bronkhorst, 2015; Bronkhorst & Vermeeren, 2016).

Intervention activity

Activity in the intervention project was assessed as a count of actions taken between T1 and T3 as reported by the project leaders. The reported start dates and (if relevant) end dates on the form were used to determine which actions could be considered (i.e. were implemented during the time frame of the study). Information from the telephone interviews with the project leaders was used to assess whether these listed actions had indeed been implemented. Next, only actions that fitted the definition "… any activity, or program, or opportunity initiated by an organization, which focuses on reducing the presence of work-related stressors or on assisting individuals to minimize the negative outcomes of exposure to these stressors" (Ivancevich et al., 1990, p. 252) were included. Goals (e.g. "we aim to improve well-being") or outcomes of actions taken rather than the activity itself (e.g. "employees seem happier") were omitted. Furthermore, to avoid double counting, preparations (e.g. further research regarding psychosocial risk factors or setting up a workgroup) rather than the actions arising from these preparations, were excluded. Some examples of the final list of actions include: dividing the department in a high care and a low care unit to optimize patient flow, implementing security measures (e.g. appointing security, doors that can only be opened by staff, introduction of a no tolerance policy), the deployment of volunteers, hiring extra trainees and supporting staff, increasing opportunities for career development (e.g. rotation with the intensive care or ambulance, opportunity to become a physician assistant), introduction of self-rostering, training to improve communication within the team, psychoeducation on burnout, and sessions with a licensed professional (e.g. coach, psychologist).

An adjusted activity index was assessed to account for the possibility that the number of actions taken might depend on the number of psychosocial risk factors identified in the ED at T1 (see risk assessment). This index was calculated by dividing the number of actions by the number of psychosocial risk factors. A score of less than 100% indicates that less actions were taken than the number of risk factors identified. A score above 100% indicates that more actions were taken in the ED than the number of risk factors.

Intervention fit

Fit of actions reflects the extent to which the actions taken during the intervention project fitted general and ED-specific psychosocial risk factors identified at T1 (see risk assessment). In line with recommendations of Nielsen and Randall (2013) we aimed to assess the fit by comparing the list of actions to the goals stated for these actions. However, on most forms a distal goal (to improve employee well-being) or no goal was reported and as such this provided little information regarding the fit of the action taken. It was therefore decided to calculate an indication of fit by checking the list of actions for each psychosocial risk factor and determine whether the ED had taken any actions that addressed this risk factor; i.e. could be considered a fitting action. The assessment of fit was further optimized based upon the information given by the project leaders during the telephone interviews. In case it remained unclear whether a psychosocial risk factor was addressed during the intervention project by the ED, this was discussed with the second author of this paper until consensus was found. The total fit of actions was calculated by dividing the number of risk factors for which actions were implemented, by the total number of identified risk factors. Therefore, the fit has a potential range from no action taken for any of the risk factors (0%) to actions taken for all risk factors (100%).

Implementation process and positive appraisals

Information provision about the (progress of) the intervention project, employee involvement in designing and implementing actions and positive appraisals regarding the actions taken were measured in the employee survey at T2. All statements were based on the process evaluation checklist (Nielsen & Randall, 2013) and the intervention process measure (IPM) (Randall et al., 2009). First a description was given including some examples of possible actions that might have been taken in the past year. Next, information provision was measured with one item: "I am informed on the progress of such actions/interventions", employee involvement was measured with three items: 1. "I am involved in developing / implementing such actions", 2. "As an employee, I feel (partly) responsible for the implementation of such actions", and 3. "I have the opportunity to comment on such actions before they are implemented", and positive appraisals was measured with three items: 1. I trust that I can use the (scheduled) actions/interventions to reduce my psychosocial demands, 2. I expect that the (scheduled) actions/intervention will reduce my psychosocial demands, 3. I look forward to the change that (scheduled) interventions will bring. All statements were answered on a seven-point

Likert scale from `not at all` (1) to `to a very high degree` (7). The employee involvement scale and the positive appraisals scale had good internal consistency (α = .82, α = .82).

Statistical analysis

To account for the different levels on which variables were measured (i.e. employee level versus department level) and the nested structure of the data, a series of multilevel analyses were conducted. First, we assessed whether PSC at T1 was predictive of information provision, employee involvement and positive appraisals at T2 (hypothesis 1). PSC scores were aggregated to the department level. The Rwg(j) of PSC varied from 0.67 to 0.80 depending on the ED, with an average of 0.74, indicating moderate to strong agreement between employees PSC in each department (James et al., 1984). A one-way ANOVA showed that there was significant between-group variance ($F (15, 579) = 5.17$, $p < .01$), with 10% of the variance in PSC due to the ED level effect (ICC (1)). This can be considered a medium effect (Murphy & Myors, 1998, p. 47). The reliability of the group mean (ICC(2)) was .82, which is above the commonly used threshold of .70 (Nunnally, 1978, p. 245) and can be interpreted as "excellent" (Fleiss, 1986). Together, these results justified the aggregation of PSC to the ED level.

Multilevel linear modelling (MLM) was used to conduct three separate multilevel analyses with PSC at T1 as the independent variable and information provision, employee involvement and positive appraisals at T2 as the dependent variables. The analyses were performed in IBM SPSS statistics version 25 (IBM, 2017).

Next, we assessed whether PSC at T1 was predictive of (adjusted) activity and fit of actions taken between T1 and T2 (hypothesis 2). Since the outcomes (activity and fit) were measured at the department level and PSC on the employee level, micro-macro analyses were performed (Croon & van Veldhoven, 2007). Employees scores on PSC were aggregated to the department level by using the best linear unbiased predictors (BLUPs) of the group means (Croon & van Veldhoven, 2007). The analyses were repeated to assess whether the change score of PSC between T1 and T2 was predictive for activity and fit of actions taken between T2 and T3 (hypothesis 3). The R package for micro-macro multilevel modelling (Lu et al., 2017) was used to calculate the BLUPs and perform the analyses. For all analyses, a p-value of .05 was used to indicate statistical significance.

Results

See Table 1 for an overview of the variables under study. Over the whole project (T1-T3) EDs implemented a total of 230 actions, with 129 actions between T1 and T2 (with an average of 8.6 actions per ED) and 101 actions between T2 and T3 (with an average of 6.7 actions per ED). The number of actions adjusted for the number of psychosocial risk factors at T1 (the adjusted activity index) varied between 29 and 160 percent between T1 and T2, and from 11 to 225 percent between T2 and T3. Finally, the fit of actions per ED varied between 0 and 89 percent (with an average of 53 percent) between T1 and T2 and from 0 to 75 percent (with an average of 40 percent) between T2 and T3. EDs had an average PSC score of 2.83 (SD = 0.23) at T1 and of 2.89 (SD = 0.29) at T2. Using the questions related to the original four-dimension version of the PSC scale (Hall et al., 2010) and the cut-offs reported by Bailey et al. (2015), PSC sum scores ranged from 26.2 to 37.3 at T1 and from 29.4 to 39.2 at T2, which are indicative of an unfavorable PSC (<41) in all EDs at both time points. Between T1 and T2, PSC decreased in three EDs, remained stable in two EDs, and increased in the rest of the EDs.

PSC as predictor for information provision, employee involvement, and positive appraisals

To test hypothesis 1, regarding PSC as predictor for information provision, employee involvement and positive appraisals, a null model was created for each of the outcome variables with ED as random intercept (see Table 2). Next, PSC at T1 was added to the model. The improvement of the model including PSC, over the null model was assessed by testing the difference of the log likelihood by a chi-square test. Overall, PSC at T1 was significantly related to employee involvement and information provision at T2 but not to positive appraisals.

PSC as predictor for intervention activity and fit

With respect to hypothesis 2, three models were tested with PSC as predictor and activity, the adjusted activity index and the fit of actions to the psychosocial risks at T1 as outcomes variables (see Table 3). The results show that PSC at T1 did not significantly predict activity, the adjusted activity index, or the fit of actions taken between T1 and T2.

With respect to hypothesis 3, three models were tested with PSC at T1 and the change score of PSC between T1 and T2 as predictors and activity, the adjusted activity index and the fit of actions between T2 and T3 as outcome variables (see Table 4). The results show that the change in PSC scores between T1 and T2 adjusted for baseline PSC did not significantly predict activity, the adjusted activity index or the fit of actions taken between T2 and T3. However, a negative trend was found indicating that the more PSC improved, the less actions were implemented between T2 and T3 (b=-30.1, p =.072).

Table 1. Descriptives for psychosocial risk factors, Psychosocial Safety Climate (PSC), intervention activity and fit, the implementation process and positive appraisals.

Variables	Scale	*M*	*SD*	*Min-max*
Nr. Psychosocial risk factors per ED at T1	0 -19	8.8	1.45	7-11
PSC at the department level				
PSC T1	1-5	2.83	.23	2.36 - 3.33
PSC T2	1-5	2.89	.29	2.41 - 3.36
Intervention activities				
Intervention activity (count) T1-T2	0 ->	8.6	3.81	2 - 16
Intervention activity adjusted (%) T1-T2 [a]	0 ->	99	40.1	29 - 160
Intervention fit (%) T1-T2	0 - 100	53	22.0	0 - 89
Intervention activity (count) T2-T3	0 ->	6.7	5.0	1 - 18
Intervention activity adjusted (%) T2-T3 [a]	0 ->	79	62.0	11 - 225
Intervention fit (%) T2-T3	0 - 100	40	23.0	0 - 75
Implementation process				
Information provision T2	1-7	3.70	1.49	1-7
Employee involvement T2	1-7	3.69	1.34	1-7
Positive appraisals				
Positive appraisals T2	1-7	3.64	1.23	1-7

*Note. N(*departments) = 15, *N(*employees) = 343, ED= Emergency Department, PSC= psychosocial safety climate, [a] score of <100 indicates no actions implemented for one or more risk factors, T1=January/February 2017, T2=June/July 2018

Table 2. Multilevel analyses with Psychosocial Safety Climate (PSC) at T1 as predictor of employee involvement, information provision, and positive appraisals between T1 and T2

		Information provision T1-T2		Employee involvement T1-T2		Positive appraisals T1-T2	
Model	Independent variable	*b*	*p-value*	*b*	*p-value*	*b*	*p-value*
Null model	Intercept	3.747	.000	3.713	.000	3.674	.000
	-2 Log likelihood	1227.98		1168.64		1106.39	
Model 1	Intercept	-0.056	.969	.731	.468	2.924	.031
	PSC at T1	1.345	.017	1.049	.010	0.265	.550
	-2 Log Likelihood	1222.14		1161.48		1106.03	
	ΔChi-square M0 and M1	5.84	<.01	7.14	<.01	0.36	*n.s.*
	ΔDf	1		1		1	

*Note. N(*departments) = 15, *N(*employees) = 343, ΔChi-square = chi-square change with the null model, PSC = Psychosocial Safety Climate aggregated to the hospital level. n.s. = not significant at $p < .05$

Table 3. Results of micro-macro level analyses with PSC at T1 a as predictor for intervention activity and intervention fit between T1 and T2.

Independent variable	Intervention Activity T1-T2			Adjusted Activity Index T1-T2			Intervention Fit T1-T2		
	b	*p-value*	*β*	*b*	*p-value*	*β*	*b*	*p-value*	*β*
Intercept	0.77	.959		-0.21	.889		-0.02	.977	
PSC T1	2.78	.599	.10	0.42	.427	.19	0.92	.373	.76

*Note. N(*departments) = 15, *N(*employees) = 343. Adjusted Activity Index = intervention activity adjusted for the number of psychosocial risk factors at T1.

Table 4. Results of micro-macro level analyses with the change score of PSC between T1 and T2 corrected for PSC at T1 as predictor for intervention activity and intervention fit between T2 and T3.

Model	Independent variable	Intervention Activity T2-T3			Adjusted Activity Index T2-T3			Intervention Fit T2-T3		
		b	*p-value*	*β*	*b*	*p-value*	*β*	*b*	*p-value*	*β*
1	Intercept	0.15	.993		0.09	.963		0.45	<.001	
	PSC T1	2.34	.695	.09	0.25	.704	.07	-0.87	.344	-.70
2	Intercept	4.53	.713		0.56	.699		-0.06	.938	
	PSC T1	1.43	.743	.05	0.15	.763	.04	0.18	.516	.14
	Δ PSC T1-T2	-30.10	.072	-.40	-3.28	.162	-.35	-0.82	.384	-.24

*N(*organizations) = 15, *N(*employees) = 343. Adjusted Activity Index = intervention activity adjusted for the number of psychosocial risk factors at T2.

Discussion

In the current study, we assessed the role of Psychosocial Safety Climate (PSC) in a 2.5-year intervention implementation project involving multiple emergency departments (EDs) in the Netherlands. According to our knowledge, with the exception of the pilot study from Dollard (2012), this is the first study to assess PSC as prerequisite for successful intervention implementation. The results show that a more favorable PSC was related to better information provision and more employee involvement in the intervention project. However, PSC did not predict more positive appraisals from employees towards the actions taken. In addition, PSC nor a change in PSC predicted the number or fit of the actions implemented in the following year. The findings will be discussed in more detail below.

First of all, our finding that a more a favorable PSC predicted better information provision and more employee involvement during the project, is in line with the Context-Mechanism-Outcome (CMO) framework of the realist approach proposing that certain mechanisms are only activated under certain circumstances. In addition, this finding supports the notion of PSC as "cause of causes" (Dollard & McTernan, 2011). In organizations where psychosocial safety is often discussed between management and employees, it is more likely that employees will be informed about the goals and process of an intervention project to reduce psychosocial risks at work. Similar, in organizations where all parties are involved in issues regarding psychosocial safety, it is more likely that employees will be provided the time and resources needed to participate in a stress management intervention (SMI) project.

Against our expectations, neither a more favorable PSC at baseline nor an increase in PSC was significantly related to the number or fit of actions implemented during the project. These findings are in contrast to the pilot study by Dollard (2012) in which a more favorable PSC related to greater intervention progress (i.e. the extent to which action plans were executed). One explanation for this difference is that the study of Dollard was performed in two governmental organizations, which most likely includes a stable setting with a reasonable number of resources (time and financial resources) to implement actions. In contrast, the ED concerns a setting pressurized by budget cuts, reorganizations and mergers, high workload and high turnover of staff. To illustrate: during the SMI project three out of the fifteen hospitals closed one or more ED locations, in about half of the hospitals a change in project and/or ED management occurred, and one third of the nurses had left the ED by the end of the study.

Independent of the level of PSC, these changes can take attention away from the intervention project (Nielsen & Noblet, 2018), and may lead to discontinuity and delays in implementing actions (Andersen & Westgaard, 2013; Geerligs et al., 2018). Furthermore, limited resources (e.g. financial and staffing) might have forced EDs to focus on the most prominent risk factors: the reduction of work-time demands and solving staffing issues, which in turn may explain the absence of a relationship between PSC and action fit. Overall, this suggest that although PSC may predict how actions were implemented (i.e. information provision and employee involvement), other contextual factors (i.e. financial resources, staffing levels and a stable working environment) might play a larger role in the number and fit of actions taken. Still, it must be mentioned that the low levels of PSC found in the EDs could have also led to an underestimation regarding the impact of PSC on intervention activity and fit in the current study.

In addition, it must be noted that a negative trend was found indicating that the more PSC increased in the ED, the less actions were implemented. A logical explanation would be that EDs with an increase in PSC started to change their approach from taking many smaller actions to a few larger ones in an attempt to reduce psychosocial risks at work. However, an inspection of the list of actions rather suggested that the trend was the result of a "catch up" of ED's that had deteriorated in the first period of the project (reduced PSC, more unfavorable working conditions and an increase in stress-related outcomes) at T2, and started taking many actions during the second half of the project.

Finally, PSC at baseline was not predictive of employees` positive appraisals regarding the actions taken. It is possible that even in organizations with stronger prioritization of employee health, positive appraisals of the project were reduced due to the limited ability of EDs to resolve the most important issues. For example, many prominent problems the emergency departments faced (e.g. overcrowding, staffing problems) were partly beyond the control of the EDs. Solving these problems required the collaboration with parties inside (other departments) and outside (e.g. ambulance, general practitioners, government) the hospital, thus involving a complex and lengthy process. In addition, previous unsuccessful efforts of management to instigate change, may have led to pessimism about successful implementation of future changes in the ED (Bordia et al., 2011; NytrØ et al., 2000). Finally, the prevalence of stress-related outcomes in the current study population was high, with one out of three nurses

reporting burnout complaints and one out of five symptoms of post-traumatic stress (de Wijn & van der Doef, 2021). This indicates that employees had limited mental resources available to deal with any changes due to a SMI project, which may in turn affected positive appraisals of the (planned) actions, even in EDs with more favorable PSC. For example, in a study by Kirrane et al. (2016), the positive relationship between management support for a program to instigate change in an organization and employees' positive appraisals towards the program was partly mediated by employees' psychological resources. Overall, this suggests that environmental as well as psychological resources are necessary for employees to welcome and embrace change and have positive appraisals of a SMI project (Kirrane et al., 2016).

Theoretical implications

Interventions to reduce psychosocial risks and increase employee well-being are complex interventions, and as recommended by Nielsen and Miraglia (2016) best understood using a realist approach testing CMO propositions. Although a considerable body or research exists regarding mechanisms that are related to greater intervention effectiveness, insight into the necessary context to trigger these mechanisms is limited. The current study adds to the literature by assessing the effect of a contextual variable, Psychosocial Safety Climate, on mechanisms (the number and fit of actions taken, information provision, employee involvement and positive appraisals) in a large-scale intervention project. The findings are in line with the proposition of the realist approach stating that mechanisms can be activated or hindered depending on the context (Hewitt et al., 2012). In addition, the relationship between PSC and the implementation process in the current study suggests that PSC is an important contextual variable to consider when testing CMO configurations in SMI research. Finally, the results have important implications regarding the theory of PSC as "cause of causes", as they suggest an alternative route by which PSC predicts working conditions partly through the way (i.e. information provision and employee involvement) these organizations tackle psychosocial risk factors at work.

Practical implications

In line with Dollard (2012), the current study suggests that PSC should be measured, considered, and if unfavorable improved before or at the start of an intervention project to reduce risk factors and enhance employee well-being. In addition, PSC in the current study was not stable across time and in some EDs even decreased during the project. As such, it is

recommended to assess PSC with regular intervals to ensure the context does not obstruct the activation of important mechanisms (e.g. employee involvement) related to greater intervention success. Regarding ways to stimulate PSC in an organization, there are a limited number of successful studies available which are listed in the review by Loh et al. (2020). Examples include the introduction of a customized occupational safety website for police officers (Rasdi et al., 2018), and an intervention including transformational leadership training and meetings between employees and (senior) management to talk about health and safety related issues (Bronkhorst et al., 2018).

Directions for future research

Although the current study provides support for PSC as an important contextual variable in SMI projects, more research is warranted. First of all, all EDs had low PSC scores at baseline indicative of an unfavorable context, which might have led to an underestimation of its relationship with mechanisms in the current project. In addition, limited resources to implement interventions and the continuous occurrence of ad hoc problems in this setting might have overshadowed the influence of PSC on activity and fit of actions taken during the intervention project. It is therefore recommended to replicate the current study in a context where there is more variation in PSC between organizations, and a more favorable situation regarding resources (e.g. financial, staffing). Finally, although the impact of process variables has received increased attention in SMI projects, more research on contextual factors is necessary to understand the circumstances under which these mechanisms are triggered. Future intervention research might profit from studying other contextual factors alongside PSC including mental and organizational resources at the start of an intervention project and changes during the intervention project (e.g. reorganizations and change in management).

Strengths

The current study has some important strengths. First of all, in comparison to the pilot study of Dollard (2012), the longitudinal design including multiple measurements made it possible to study the effects of baseline PSC as well as effects of changes in PSC. Second, there was a realistic time frame between measurements for the EDs to develop and implement actions, which enabled the possibility to study the effect of PSC on the number and fit of actions. Third, multilevel analyses were used taking individual variation within the EDs into account as opposed to simple aggregation. Finally, the telephone interviews led to continuous contact

with the project managers and gave insight in the barriers they experienced during the intervention project. Although it was not meant to inventory these barriers, insight in the contextual factors helped to interpret the results of the study.

Limitations

The current study is also subject to some limitations. First of all, the assessment of the number of actions taken and the fit of these actions to identified risk factors were dependent on the reporting by the project managers. The rather unrestrictive format for reporting the actions taken have led some managers reporting multiple actions as one, whether others reported one action in multiple parts. Although the reliability of the list was improved by conducting follow-up telephone interviews, future studies might benefit from a more structured approach with more directive questions concerning actions taken during the intervention project. In addition, we are aware that the number does not equal the quality of the actions, and as such is likely to be a limited predictor of intervention success. For example, no difference was made between many smaller actions (e.g. increasing the financial reward to fill open shifts; psychoeducation on burnout symptoms) and a few larger actions (e.g. dividing the department in low care and high care to optimize patient flows). Still, as it proved to be difficult for EDs to take any action at all, independent whether it could be considered small or large, we believe that the number of actions still gives a good indication of activity in the intervention project. In line with this, we are aware that the fit of actions implemented is only a crude indicator of the fit to psychosocial risk factors. Although reliability of the fit was maximized using information from the telephone interviews with project leaders, future studies could improve this measure by conducting surveys and interviews amongst employees to collect their views regarding the appropriateness of the implemented actions (Nielsen & Randall, 2013).

Finally, the number of departments included in the current study may have limited the power to find statistically significant results. The minimum recommended sample size and number of groups for multilevel analysis has been a topic of debate (Scherbaum & Ferreter, 2008) and recommendations fluctuate from 30 groups with 30 individuals (Kreft, 1996) to 100 groups with at least ten individuals (Hox, 2002). Simulation studies show that for group level relationships, mainly the number of groups is important for acceptable power. Although other studies including a small number of groups have found significant results (e.g. 18 schools in

Dollard and Bakker (2010), 18 teams in Zadow et al. (2017), future studies testing CMO configurations should aim to include a larger number of organizations.

Conclusion

In the current study it was examined whether a favorable context in terms of Psychosocial Safety Climate triggers mechanisms (e.g. number of actions taken, fit of action taken, employee involvement, information provision and positive appraisals) in a 2.5-year intervention project aimed at reducing psychosocial risk factors and improving employee well-being among multiple emergency departments. Overall, the findings suggest that PSC is an important predictor of better information provision and more employee involvement during the intervention project. No evidence was found for a relationship between PSC and the number of actions taken, the fit of these actions to current psychosocial risk factors, and employees' positive appraisals. It is possible that these factors are more strongly determined by available organizational and personal resources. This study adds to the growing literature on PSC and supports the notion of PSC as important contextual starting point for successful intervention implementation. Furthermore, the results emphasize the importance of studying the impact of contextual factors in intervention projects, to enhance our understanding on how to effectively reduce psychosocial risks and enhance well-being in the working population.

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“We zijn ons veel meer bewust van de arbeidsbelasting. Dat je bijvoorbeeld tijdens het opruimen van een reanimatie deze nog even doorspreekt met elkaar. Of dat je een collega aanspreekt, of het wel gaat.”

- SEH-verpleegkundige, juni 2018 -

“We hebben nu kamertoewijzing. Dat betekent dat je met zijn tweeën verantwoordelijk bent voor een bepaald aantal kamers. Dat scheelt een hoop lopen, en daarnaast sta je met een gediplomeerde. Dit zorgt voor een veel veiliger leerklimaat.”

- SEH-verpleegkundige in opleiding, augustus 2019 -

“Het zijn goede interventies die zeker zinvol en nodig zijn. Maar omdat de werkdruk in patiënten toeneemt, merk je de effecten hier nog niet echt.”

- SEH-verpleegkundige, augustus 2018 -

“Wij weten niet wat er beschikbaar is voor medewerkers met klachten. Het zou goed zijn als dit gecommuniceerd wordt. Ook denk ik dat de drempel hoog is. Medewerkers geven niet zomaar aan als ze ergens last van hebben.”

- SEH-verpleegkundige, augustus 2019 -

“Goede ideeën maar in de uitvoering gaat het vaak mis. Dan wordt er niet goed over nagedacht, of doet het hoger management dingen zonder overleg. Er wordt weinig gecommuniceerd over veranderingen.”

- SEH-verpleegkundige, juni 2018 -

“Wat ik merk is dat medewerkers erg behoefte hebben aan vrijheid en aan transparantie. Ik ben heel erg aan het zoeken naar de juiste mate van vrijheid daarin.”

- Manager spoedeisende hulp, juli 2019 -

“Ik weet welke ziekenhuizen het beter doen. Vervolgens stuur ik medewerkers op pad om daar een kijkje te nemen en te zien hoe wij hiervan kunnen leren.”

- Manager spoedeisende hulp, augustus 2019 -

“Het duurt lang. Want tja, we nemen wel maatregelen maar die hebben tijd nodig voor ze effectief zijn.”

- Manager spoedeisende hulp, juli 2018 -

CHAPTER 6

Reducing psychosocial risk factors and improving employee well-being in emergency departments

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Abstract

This study reports the findings of a 2.5-year intervention project to reduce psychosocial risks and increase employee well-being in 15 emergency departments in the Netherlands. The project uses the psychosocial risk management approach `PRIMA` which includes cycles of risk assessment, designing and implementing changes, evaluating changes and adapting the approach if necessary. In addition, principles of participative action research were used to empower the departments in designing and implementing their own actions during the project. Next to determining overall effects, the study aims to assess potential moderators including the level of intervening (organization-directed or multilevel), process variables (the number and fit of actions to risk factors, communication and employee participation) and partaking in a Psychosocial Safety Climate intervention offered during the second half of the project. The results of linear mixed-model analyses showed that all job factors improved with the exception of autonomy, which did increase halfway the project but not when considering the entire timeframe. In addition, work engagement decreased and symptoms of burnout remained stable. Emergency departments that implemented more fitting actions, communicated better and involved their employees more in the process, had more favorable changes in job factors and more stable well-being. More activity (based on the number of actions implemented) and a multilevel approach regarding stress management did not lead to greater improvements. The Psychosocial Safety Climate intervention was effective in improving Psychosocial Safety Climate, but a longer follow-up period seems required to evaluate its effect on job factors and well-being. Overall, the project resulted in positive changes in most job factors, and its findings emphasize the importance of process variables in stress management interventions. Longer follow-up and higher quality multilevel interventions (including professional support for employees with stress-related complaints) seem essential to also improve well-being.

High levels of work-related stress have been related to mental and physical problems (Colligan & Higgins, 2006), reduced productivity (Letvak & Buck, 2008), more absenteeism (Schmidt et al., 2019) and higher turnover intentions (Mosadeghrad et al., 2011; Nei et al., 2015). According to a review on studies performed in Western Europe, Australia, Canada, and the United States, the estimated costs of work-related stress for society ranges between 221.13 million up to 187 billion USD (Hassard et al., 2018). As such, it is important to understand how we can effectively reduce and prevent high stress levels in employees. The current study reports the findings of a field experiment including a 2.5-year intervention implementation project among emergency departments (EDs) in the Netherlands. Next to determining its overall effects, it aims to explore potential moderators related to greater effectiveness.

What is known about stress management interventions?

Stress management interventions, programs implemented by organizations to prevent and/or reduce stress and increase employee well-being, are commonly divided in organization-directed (aimed to change the way the work is organized, designed and/or managed) and person-directed (aimed to increase employees` coping resources) (Holman et al., 2018). The first approach is often preventative and targets the organization as generator of psychosocial hazards (Leka & Cox, 2010). Theoretical background for this type of interventions can be found in the Job-Demands Resources (JD-R) model (Bakker & Demerouti, 2017). The JD-R model states that all job factors can be categorized into either job demands or job resources. Job demands refer to "…those physical, social or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs (e.g. exhaustion)" (Demerouti et al., 2001, p. 501). Job resources refer to "those physical, psychological, social, or organizational aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands at the associated physiological and psychological costs; (c) stimulate personal growth and development" (Demerouti et al., 2001, p. 501). In addition, the model explains the relationship between the working environment and employee well-being by two processes. The health-impairment process states that enduring exposure to high job demands can lead to a depletion of employees` physical and mental resources and eventually the development of stress-related outcomes (e.g. symptoms of burnout). This energy depletion process is strengthened in the absence and buffered in the presence of adequate job resources (e.g. autonomy and social support). The second process, the motivational process, states that adequate job resources

have a motivational role and as such relate to positive outcomes including work engagement and job satisfaction (Bakker & Demerouti, 2017). An organization-directed approach aims to (re)install the balance between job demands and resources, thus preventing stress-related outcomes and increasing employee well-being. The second approach, the person-directed approach, does not aim to change the working environment but instead focusses directly on the (most vulnerable) employees. This approach often includes programs aimed to increase employees' coping resources (e.g. learning relaxation techniques, enhancing problem solving skills), or providing treatment/rehabilitation for those already experiencing stress-related outcomes (Leka & Cox, 2010).

Regarding successful stress management in organizations, there is general consensus that a multilevel approach including both an organization- and a person-directed intervention, is most effective in reducing as well as preventing stress-related outcomes (Holman et al., 2018; Lamontagne et al., 2007; McVicar, 2016; Roberts & Grubb, 2014; Semmer, 2006). First of all, by targeting the problem at both levels, this approach can reduce the causes of stress whilst at the same time increases employees ability to cope with a demanding working environment (Holman et al., 2018; Leka & Cox, 2010). Furthermore, whilst the person-directed part of the intervention can have an important curative effect (i.e. relieving existing stress-related complaints), the organizational part can work preventative and may also benefit those employees with average well-being (Leka & Cox, 2010). Finally, it has been suggested that within a multilevel approach the person-directed intervention can complement the organization-directed intervention leaving individuals better equipped to deal with changes in the working environment (Lamontagne et al., 2007).

Nevertheless, meta-analyses report moderate to large effects for the person-directed approach whereas the limited number of studies evaluating the organization-directed approach (including multilevel studies) reach little to no effects at all (Richardson & Rothstein, 2008; Ruotsalainen et al., 2015; Van der Klink et al., 2001). Critics argue that the focus on well-being in these studies does not capture the full effect of organization-directed interventions, which primary aim is to optimize the working environment (Semmer, 2006). To understand the effectiveness of these interventions, proximal (job demands and resources) as well as distal effects (well-being) should be studied (Semmer, 2006). Furthermore, the often strict inclusion criterium of a (randomized) controlled design in meta-analyses is not always feasible or even

desired to evaluate the effectiveness of the organization-directed approach (Nielsen & Miraglia, 2016; Nielsen & Noblet, 2018). Organizations are dynamic and complex systems and the use of randomized controlled trials to study these type of interventions leads to little external validity; what might work in one organization might not work in another organization (Nielsen & Miraglia, 2016). Instead, scholars advocate the use of a realist approach focussing on how outcomes were achieved (mechanisms or process variables) and under what circumstances (contextual factors) (Nielsen & Miraglia, 2016). The emphasis of this approach lies upon understanding the patterns, in terms of contexts and processes, that are related to greater intervention effectiveness (Greenhalgh et al., 2015).

In line with the realist approach, previous research shows that the process by which actions are designed and implemented during an intervention project plays an important role in its overall effectiveness. For example, organizations that design and implement actions that focus on the psychosocial risk factors at hand, are more likely to reach positive results (Di Tecco et al., 2020; Nielsen & Randall, 2013). As such, an effective intervention project includes taking actions that are "fit for purpose" (Leka & Cox, 2010). In addition, clear communication, and employee involvement in determining what kind of actions should be implemented are well known success factors. These processes lead to better understanding in employees on why and how the intervention is supposed to work, increase ownership, and stimulate more positive appraisals towards change (Nielsen & Randall, 2013). In addition, communication and employee involvement results in overall support and active participation of employees in the intervention activities (Nielsen et al., 2013; Nielsen et al., 2010). Finally, involvement in the project can also have a direct positive impact on employees, including increased job control, social support, role clarity, perceptions of meaningful work and affective well-being (feeling happy and energetic) and feeling less disconnected from work and the organization (Huijs et al., 2019; Nielsen & Randall, 2009, 2012; Schneider et al., 2019).

The current intervention project

Between 2017 and 2019, a number of emergency departments (EDs) in the Netherlands participated in an intervention implementation project with the aim to reduce psychosocial risk factors at work and improve employee well-being. This project provided a unique opportunity to gain further understanding regarding the effectiveness of stress management interventions over time and to test hypotheses regarding moderating factors that may lead to

greater intervention success. Building on lessons learned from previous research, we aim to capture the effect of the intervention project on proximal (job demands and job resources) as well as distal outcomes (well-being). Furthermore, a realist approach was used by not only assessing the outcome of the intervention but also how positive changes during the project occurred including the level of intervening (organization-directed versus multilevel) and the process by which actions were implemented (e.g. communication and employee participation).

The intervention implementation project uses the `psychosocial risk management approach` (PRIMA) (Leka and Cox, 2010). This tool is developed to help organizations to effectively tackle psychosocial risks in their organizations and includes four steps (see Figure 1). The first step, the risk assessment, is meant to determine the most prominent risks within an organization and facilitates the development of fitting actions. In step 2 action plans are developed stating what will be targeted, by whom and within what time frame, and in step 3 these plans are executed. Finally, in step 4, the outcomes of the actions and the process by which they were implemented are evaluated. The last step is important to understand whether the actions reduced psychosocial risks in the organization, and to identify if any new risks appeared. In addition, it creates organizational learning by assessing what worked and what not and if the current approach needs to be adapted.

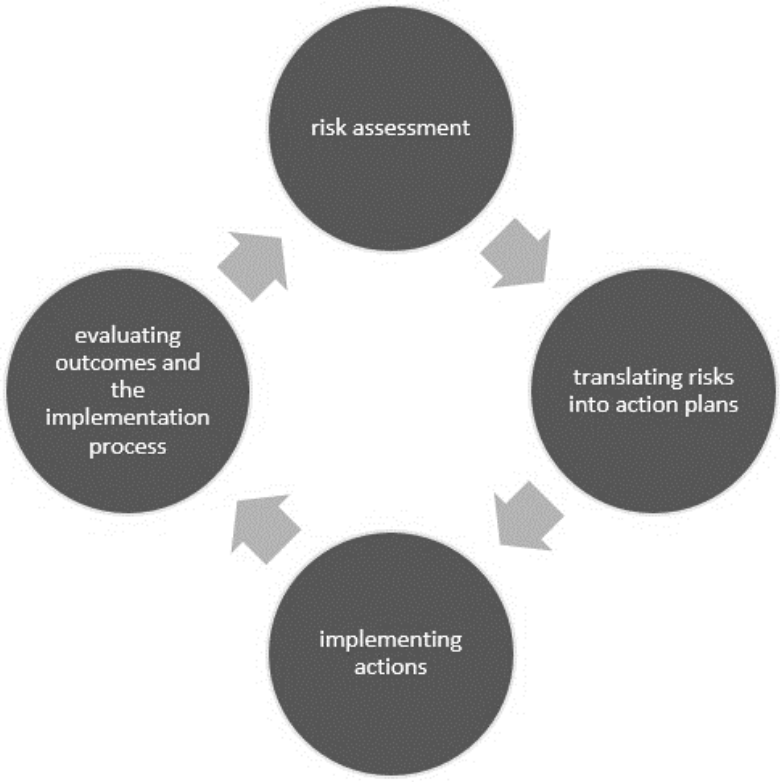

Figure 1. Overview of the main steps in the psychosocial risk management approach `PRIMA`

Although the PRIMA has been applied in various organizations and industries and even translated into interventional frameworks such as the PRIMA-EF (European framework) and the World Health Organization Healthy Workplace Framework, the use of this tool in organizations is still limited (Bergh et al., 2018; Leka et al., 2015). There are a number of potential reasons, including limited understanding of what psychosocial risks entail, and a lack of expertise within the organization to conduct this process (Leka et al., 2015). To overcome this, principles of Participative Action Research (PAR) were integrated. PAR is a type of action research in which researchers and research participants work together to solve practical problems. The approach includes five main principles (Dollard et al., 2008): 1) Important stakeholders are involved in all stages of the project, 2) there is collaboration between researchers and participants in the study, 3) there is empowerment of the research participants to solve self-identified problems, 4) the approach leads to increased local knowledge and 5) a stronger consensus among employees and management regarding necessary change is developed.

Below the different steps of the intervention implementation project are described. A more detailed overview can be found in the Appendix.

Preparatory steps

A multidisciplinary project group was established consisting of two researchers, two project managers from `Stichting IZZ` (a member collective of healthcare workers) and one ED manager. The project group was responsible for the design and execution of the intervention project, and met every 2-3 months to evaluate the process and prepare next steps in the project. As a second preparatory step the scientific literature on psychosocial risks in the ED setting was reviewed. This information was used to develop an occupation-specific questionnaire to measure psychosocial risks and relevant well-being outcomes in the ED setting. Next, the project was presented to EDs in the Netherlands and all EDs were invited to participate. In addition, we aimed to gain management support, an important prerequisite for effective interventions (McVicar et al., 2013; Nielsen & Noblet, 2018; Nielsen & Randall, 2013), by informing ED management about the importance of their commitment to the project and taking actions based on the findings of the risk assessment. Finally, each ED assigned a project manager (often the ED manager) to function as a primary point of contact during the study.

Step 1: Conducting a risk assessment

At the beginning of the project a risk assessment was conducted to pinpoint the most prominent psychosocial risks to focus on and thus stimulate the development of fitting actions (Leka & Cox, 2010; McVicar et al., 2013; Nielsen & Randall, 2013). In line with recommendations (Leka & Cox, 2010), the risk assessment was performed using a mixed method approach. First, a survey was conducted in January/February 2017 (T1) among the employees of the participating EDs measuring job factors and employee well-being. Participation in the survey was voluntary and upon agreement with the informed consent. Second, semi-structured one-on-one interviews were held with ED employees (five to six employees per ED, randomly chosen) and ED management to gain further understanding of current psychosocial risks. Based upon the risk assessment, each ED received tailored feedback, including an overview of their most prominent psychosocial risks, how to interpret them and a short advice regarding the main points to focus on. Risk factors for all EDs included three job demands: high worktime demands, a high frequency of emotionally demanding situations, and a high frequency of aggression/conflict situations with patients and/or their accompanies, three job resources namely, limited autonomy, staffing problems and limited recovery opportunities during work time (e.g. breaks), and overall low levels of well-being (e.g. symptoms of burnout).

Step 2: translating risks into action plans

To support and encourage the EDs to take action, a total of nine inspiration sessions were organized by Stichting IZZ throughout the project. The aim of these inspiration sessions was to enhance the knowledge on stress management and organizational change, and stimulate EDs to exchange ideas and best practices. The sessions were open for ED management as well as employees to attend. Each inspiration session was organized around common problems experienced by the EDs (e.g. "how can I recognize burnout in employees?", "how can we get psychosocial problems in the ED on the agenda of top management?", "how can we facilitate regular breaks and stimulate employees to take them?"). In line with PAR principles (Baum et al., 2006; Dollard et al., 2008), the goal of the inspiration sessions was to empower the EDs in designing and implementing their own actions and thus keep control over the intervention project.

Step 3: Implementing interventions

In the current project, EDs were free to choose their own approach in terms of the number and type of actions and how these were implemented. To keep track of what was implemented during the project, project leaders listed all actions taken in their ED to improve job factors and/or employee well-being on a standard form. The form included a description of the action, the start date, the end date (if relevant), the goal, and any comments regarding the action taken. This list was inventoried every 3 to 4 months by the first author followed by a telephone interview to ensure the list was complete and to obtain a better understanding of the actions taken and how the intervention project was evolving (see methods section for examples of implemented actions).

Step 4. evaluating outcomes and process variables

The outcomes and process variables were evaluated half-way the project in June/July 2018 (T2) and at the end of the project in June/July 2019 (T3). For the evaluation a similar mixed-method approach was used as during the risk assessment. First of all, the T1 survey with additional questions regarding how actions were implemented in the ED (e.g. communication and employee participation) was repeated amongst the employees. In addition, we conducted 5-6 interviews with employees in each ED and with ED management. Each ED received an advice report describing any changes in job factors and well-being, and feedback regarding the process by which interventions were implemented. In addition, the overall results were presented to all EDs on one of the inspiration sessions including an advice regarding how to proceed. Based on the results of the T2 survey and the interviews, EDs were strongly advised to improve the process by which the actions were taken (in particular improve communication on, and enhance employee participation in the intervention project) and to also implement person-directed interventions to support employees with severe stress-related complaints. EDs that scored more positively on communication and employee participation during the project (based upon the T2 measurement) and/or had successfully implemented a person-directed intervention were asked to share their approach by means of a presentation, to serve as an inspiration for other EDs.

Psychosocial Safety Climate intervention

During the first year of the project, it became clear that many EDs experienced barriers in implementing actions. Some of these barriers seemed to origin from the limited awareness of

hospital top management for the problems experienced by the EDs (mainly regarding the workload, understaffing and consequently overcrowding). As a result, EDs felt they had limited resources (time and financial resources) to make important changes. This was congruent with the suboptimal rating of Psychosocial Safety Climate (PSC) at the baseline risk assessment (T1). PSC concerns an organizational climate referring to prioritization and commitment of all parties within the organization ((top) management, employees, health and safety representatives) to employee well-being (Dollard et al., 2012). Although, up till now, the effects of climate factors on the success of intervention projects have received little research attention, a more favorable PSC has been related to better job factors and employee well-being (Loh, Zadow & Dollard, 2020). Furthermore, in a pilot study by Dollard (2012) regarding a participative intervention, it was found that in teams with a more favorable PSC, employees attended more workshop sessions, rated the quality of these workshops higher (e.g. ability to discuss issues openly, ability to determine actions to address stress factors) and indicated more progress in the intervention project (e.g. "to what extent are actions from your workgroup action plans being addressed"). Overall, there is good reason to believe that an improvement in PSC will increase the effectiveness of an intervention project. On this basis, all EDs were offered an intervention aimed to optimize PSC within their organization. Eventually, half of the EDs (k = 8) participated in this PSC intervention but due to high workload, the intervention was first implemented half-way through the project, around T2. Its effects could therefore only be assessed in the final year of the study.

The PSC intervention consisted of three steps. In the first step opinions of employees concerning the most prominent psychosocial risk factors at work were inventoried using a short online questionnaire. As the second step the team discussed the results of this poll to open a dialogue on psychosocial risks at work. In a third step, the main points from this dialogue were discussed in a meeting between employees and top management of the hospital. All steps were repeated at least three times. This intervention has been studied in various healthcare settings and found to positively impact the overall PSC (Bronkhorst et al., 2018). See Bronkhorst et al. (2018) for a full description of this intervention.

The current project based on PRIMA and PAR principles as described above has a number of assets. First of all, instead of implementing a predefined intervention based upon theoretical problems, PRIMA considers current psychosocial risk factors in the organization. As such, in

combination with employee participation and a PAR approach, more fitting interventions can be developed. In addition, organizations are changing entities and new psychosocial risk factors may arise over time. PRIMA is flexible and leaves room to reflect and adjust the current approach if necessary. Furthermore, by giving the EDs an active role in the project, they were empowered to develop their own actions towards stress management. As such, it aims to provide a sustainable solution with regards to effective psychosocial stress management. Finally, from a research perspective it offered the opportunity to test hypotheses in a real-life setting and learn from practical barriers when implementing interventions in an organization.

Current study

The research questions addressed by this study are as follows:

1. Is the current intervention project effective in eliciting positive changes in job factors and well-being?
2. What are possible moderators related to more positive changes in job factors and well-being during the intervention project?

As it would be incorrect to keep EDs from taking action to reduce existing psychosocial risk factors during the 2.5-year time frame, it was not feasible to include a suitable control group in the current study. Instead, potential moderators were assessed by comparing the participating EDs retrospectively based upon their approach during the project (multilevel or solely organization-directed) and the process by which they implemented actions (activity during the project, fit of actions to psychosocial risk factors, communication and employee participation). In addition, we compared EDs implementing the PSC intervention during the second half of the project to a self-selected control group (e.g. those EDs not implementing the PSC intervention).

The following hypotheses will be tested:

> Hypothesis 1: There is an overall favorable change in job demands, job resources, and employee well-being between T1 and T3.

> Hypothesis 2: EDs using a multilevel approach have a more favorable change in employee well-being of employees between T1 and T3, compared to EDs with a solely organization-directed approach.

Hypothesis 3: EDs that are more active (i.e. take more actions during the intervention project) have a more favorable change in job demands, job resources and employee well-being between T1 and T3, compared to EDs that are less active during the project.

Hypothesis 4: EDs that have a greater fit of the actions taken to the identified psychosocial risk factors have a more favorable change in job demands, job resources and employee well-being between T1 and T3, compared to EDs with lower fit of the actions taken.

Hypothesis 5: EDs that score higher on communication about (the process of) actions taken, have a more favorable change in job demands, job resources and employee well-being between T1 and T3, compared to EDs that score lower on communication.

Hypothesis 6: EDs that score higher on employee participation have a more favorable change in job demands, job resources and employee well-being between T1 and T3, compared to EDs that score lower on employee participation.

Hypothesis 7: EDs participating in the PSC intervention around T2 show more positive changes in job demands, job resources and well-being between T2 and T3, compared to EDs not participating in the PSC intervention.

The present study contributes to the literature in multiple ways. First of all, it includes a longitudinal 2.5-year study design examining the effectiveness of an intervention project on proximal (job demands and resources) as well as distal outcomes (employee well-being). It therefore answers to a call by Holman et al. (2018) to gain more insight in the long term effects of stress management interventions. In addition, it adds to the limited number of studies evaluating an organization-directed or multilevel approach (Richardson & Rothstein, 2008; Ruotsalainen et al., 2015). An approach that theoretically has a lot of potential but still receives limited research attention due to the high amount of necessary (organizational) resources to conduct and evaluate (Heaney & Van Ryn, 1990). Thirdly, it includes a thorough evaluation of potentially moderating factors in the effectiveness of stress management interventions studied in a large group of homogenous organizations and adds to a small body of studies applying the realist approach (Nielsen & Noblet, 2018). Fourth, it concerns a field study and thereby gives

a realistic view of stress management approaches used in practice and their effectiveness. Finally, by evaluating the effect of a PSC intervention on job demands, job resources and well-being, it adds to the limited literature on PSC and explores the effect of intervening at the level of the organizational context.

Methods

Setting and participants

In the fall of 2016, all EDs in the Netherlands were informed about the project. A total of 19 EDs decided to take part, of which 15 EDs participated in all three waves and were included in the current study. This group represented 21% of all EDs in the Netherlands, including four academic hospitals (representing 50% of all academic hospitals in the Netherlands) and four trauma centers (representing 36% of all trauma centers in the Netherlands). Staff demographics and work email addresses were obtained through the Human Resources department of each hospital. Although all employees enlisted in the ED were allowed to participate in the project, for comparison reasons, the current study focused solely on nurses (registered or in training). ED nurses are by far the largest occupational group in the ED. In addition, not all EDs in the Netherlands had physicians enlisted. At baseline (T1) 782 ED nurses were invited to participate (response: *N* = 578, 74%). Due to turnover and hiring of new employees, 831 nurses at T2 (response *N* = 511, 62%) and 861 nurses at T3 (response *N* = 533, 62%) were invited at follow-up surveys. Chi² tests and independent samples *t*-tests showed that respondents at T1 (*N* = 578) worked more hours a week compared to non-responders (*M* = 29.4, *SD* = 6.6 versus *M* = 27.0, *SD* = 10.1). No differences were found in terms of gender, age, occupational role (ED nurse or ED nurse in training), number of years working experience in the ED and whether or not having a supervisory role.

Measures

Employee well being

Well-being was assessed by using a positive (work engagement) as well as a negative (burnout complaints) indicator. This way we would capture both the effect of actions taken to diminishing stress-related complaints and to improve employee well-being. To reduce the length of the questionnaire, work engagement was measured with the 3-item version of the Utrecht Work Engagement Scale (UWES-3), which has shown to be a valid and reliable instrument (Schaufeli et al., 2019). Burnout symptoms were measured on its two key

dimensions namely emotional exhaustion (8 items) and depersonalization (5 items) (Schaufeli, 2003) with the Dutch version of the Maslach Burnout Inventory-Human Services Survey (MBI-HSS), which is also a reliable and valid questionnaire (Schaufeli & Van Dierendonck, 2000). In both surveys, the items were rated on a 7-point Likert scale from "never" (0) to "daily" (6). The scales had adequate to good internal consistency at each measurement point (ω = .77, .57, .75 for work engagement, ω = .89, .92, .90 for emotional exhaustion and ω = .75, .82, .76 for depersonalization).

Job demands and resources

A total of five job demands and 11 job resources were assessed which are described in a previous publication on this project (see de Wijn & van der Doef, 2021). In the current study we examined job demands and resources that were considered risk factors for all participating EDs based on the risk assessment (T1 survey). Risk factors were identified by comparing the aggregated survey data to available data of nurses from 15 EDs in Belgium (Adriaenssens et al., 2015) and Dutch hospital nurses (Gelsema et al., 2005). Scores on job demands and job resources that were significantly more unfavorable, were identified as risk factors for all EDs. These included three job demands: high worktime demands, a high frequency of emotionally demanding situations, and a high frequency of aggression/conflict situations with patients and/or their accompanies, and three job resources namely, limited autonomy, staffing problems and limited recovery opportunities during work time (e.g. breaks). The questionnaires by which these job demands and resources were assessed, are described in more detail below.

The frequency of *emotionally demanding* (4 items, ω = 79, .76, .78) and *aggression/conflict situations* (7 items, ω = .89, .88, .89) were measured using an inventory of stressful situations from a study on staff working in organizations providing care for mentally and physically disabled individuals (Bolhuis et al., 2004). An example statement for emotionally demanding situations includes "In my work I am confronted with patients in a hopeless situation". An example item for aggression/conflict situations includes "In my work I am confronted with patients and/or accompanies who are physically aggressive". All statements were answered on a 7-point Likert scale from "never" (1) to "daily" (7).

Worktime demands, *autonomy* and *staffing* were measured with the nurse version of the Leiden Quality of Work Questionnaire (LQWQ-n) (Gelsema et al., 2005; Maes et al., 1999). The LQWQ-n is an occupation specific questionnaire which has shown to be a reliable instrument in several studies (Adriaenssens et al., 2012; Van Bogaert et al., 2014). An example item for worktime demands includes "I must care for too many patients at once", for autonomy "I have the opportunity to make my own decisions at work" and for staffing "There are enough nurses on my ward to provide good care". Statements were answered on a 4-point Likert scale from "entirely disagree" (1) to "entirely agree" (4). Worktime demands (5 items, ω = .72, .71, .76), and staffing (4 items, ω = .79, .76, .78) had good internal consistency. The internal consistency of autonomy was modest (ω = .61, .60, .67). Removing one item for autonomy did not lead to greater internal consistency and thus the original 4-item scale was used. In addition, it has been argued that for small scales (e.g. less than ten items) it is more appropriate to assess the internal consistency of the scale by the mean of the inter-item correlations (Pallant, 2011, p. 97). The average of the inter-item correlations was .268 which is within the suggested optimal range (.20 to .40) (Briggs & Cheek, 1986).

Recovery opportunities during worktime was measured using a self-developed questionnaire consisting of four statements 1. "If I want to, I can leave my workplace for a short while", 2. "I can have a chat during my work", 3. "During my shift, I regularly have to skip breaks" (reversed), 4. "During my breaks, I must remain available for urgent cases" (reversed), which were answered on a 4-point Likert scale from "never" (1) to "always" (4). Regarding face validity, all items concerned opportunities to mentally or physically distance from work during worktime (or the opposite in the reversed items). The internal consistency was modest (ω = .61, .58, .57). Removing one item from the scale did not lead to higher internal consistency. As such, the original 4-item scale was used. The average of the inter-item correlations was .262, which is within recommendations (.20 to .40) (Briggs & Cheek, 1986; Pallant, 2011, p. 97).

Psychosocial Safety Climate

Psychosocial Safety Climate (PSC) was measured using the adapted version of the PSC-12 scale (Bronkhorst, 2015; Hall et al., 2010). This scale consists of five factors, 1. Priority by top management for psychosocial health and safety, 2. commitment by direct management to maintain/increase psychosocial health and safety, 3. participation of all stakeholders (e.g. (top) management, employees, human resources, occupational health representatives) within the

organization to reduce psychosocial risks at work, 4. communication within the organization on psychosocial health and safety and 5. the group norm towards psychosocial health and safety. Each factor consisted of three statements answered on a 5-point Likert scale from "totally disagree" (1) to "totally agree" (5). The full scale had excellent internal consistency (ω = .93, .93, .93).

Moderators

The level of intervening was based upon the list of actions as provided by the project leaders. EDs were divided into two groups: one group using a solely organization-directed approach (k = 5) and one group including an organization-directed as well as a person-directed approach (i.e. a multilevel approach) (k = 10). None of the EDs had a solely person-directed approach.

Activity reflects the number of actions by the ED during the intervention project also based upon the list of actions. Only actions that were taken between T1 and T3 and fitted the definition of a stress management intervention "… any activity, or program, or opportunity initiated by an organization, which focuses on reducing the presence of work-related stressors or on assisting individuals to minimize the negative outcomes of exposure to these stressors" (Ivancevich et al., 1990, p. 252), were included. To avoid double counting, preparatory actions (e.g. setting up a workgroup) were omitted. Some examples of actions taken during the intervention project included: expanding the number of ED nurse trainees and supporting staff, having medical specialists working shifts on the ED during peak hours, optimizing patient flow by dividing the department in a low care and high care unit, taking security measures (e.g. doors that can only be opened by staff), psychoeducation on burnout symptoms, coaching to improve communication within the team, changing work shifts to ensure the possibility of taking breaks, and the introduction of self-rostering. Based upon the follow up telephone interviews with project managers, it became clear that although the assessment of activity provided a good estimate, it was not a perfect count of the actual activity in the EDs. As such, it was decided to use a median split to differentiate between EDs with lower activity (< 17 actions taken, k = 7) and EDs with higher activity (≥ 17 actions taken, k = 8).

Fit of actions was also based upon the inventory. In line with recommendations (Nielsen & Randall, 2013) we aimed to assess the fit by comparing the identified risks on the risk assessment to the goals of the actions listed. However, it appeared that project leaders had

difficulties stating the goals for the actions taken in de ED, leaving it either blank or reporting distal goals (e.g. to improve employee well-being). Therefore, an alternative approach was used. For each of the six identified psychosocial risk factors at T1 (three job demands and three job resources), the first author screened the list of actions to evaluate whether any of the actions taken by the ED targeted this risk factor (e.g. a fitting action). Due to the high prevalence of stress-related outcomes (e.g. burnout complaints) as identified on the T1 measurement, we also labelled actions directly focused on employee well-being (e.g. coaching or meetings with a psychologist) as fitting actions. In case it was unclear whether an action could be regarded as "fitting" to any of these risk factors, it was discussed with the second author of this paper until consensus was reached. Fit was calculated for each ED by dividing the number of risk factors taken action upon by the total number of risk factors. As such, a 100% fit indicates that actions had been taken for all of the seven risk factors (six demands and resources, and employee well-being in general). In line with activity, a median split was used to differentiate between EDs with lower (< 71%, k = 7) and higher (≥ 71%, k = 8) fit.

Communication and *employee participation* were measured on the T2 and T3 surveys. The items were based on the Intervention Process Measure (Nielsen & Randall, 2009). The scale was introduced by giving a general description on actions that might have been taken in the ED in the past year. Next, *communication* was measured with one item; "I am informed on the progress of such actions/interventions" and *employee participation* was measured with three items: 1. "I am involved in developing/implementing such actions", 2. "As an employee, I feel (partly) responsible for the implementation of such actions", and 3. "I have the opportunity to comment on such actions before they are implemented". All statements were answered on a 7-point Likert scale from "not at all" (1) to "a very high degree" (7). Participation had good internal consistency (ω = .82, .86). The average on communication and on employee participation from the T2 and T3 measurements, was used to indicate an overall score on communication and participation during the whole project. The data was aggregated to the ED level and a medium split was used to divide between EDs that scored lower (< 3.95, k = 7) and higher on communication (≥ 3.95, k = 8), and EDs that scored lower (< 3.68, k = 8) and higher on employee participation (≥ 3.69, k = 7). A median split was used as we expected that the moderating effect of communication and participation would reflect a threshold effect, rather than a dose response relationship. Thus, we expected a different effect over time between EDs that communicated more versus those that communicate less and between EDs

that involved their employees more in the process versus those that did so less.

Psychosocial Safety Climate Intervention. For the moderation analyses we distinguished EDs that implemented the PSC intervention around T2 (k = 8) and EDs that did not (k = 7).

Statistical analyses

The data had a three-level hierarchical structure: Time points (level 1) were nested within employees (level 2) and employees were nested within EDs (level 3). To account for the nested structure we performed linear mixed-model analyses using the lme4 package in *R* (version 1.1-26; Bates et al., 2015). For all analyses, a p-value of .05 was used to indicate significant differences. First, we aimed to assess the effect of the intervention implementation project over time. Nine linear mixed models were fitted (one for each of the dependent variables) with a random intercept for ED and a random intercept for nurse, and time as a fixed effect. Time was coded as a categorical variable, with T1 as the reference category, because we did not expect change would necessarily follow a linear pattern over time. In case a significant effect of time was found, post-hoc pairwise comparisons were performed using the Tukey Method to adjust for multiple testing. This way we could identify between what time points (T1, T2, and T3) there was a significant change in the dependent variable over time.

Next, it was assessed whether the change over time differed for EDs depending on the level of intervening (multilevel or organization-directed), implementation process (activity, fit, communication, employee participation) and whether or not partaking in a PSC intervention between T2 and T3. To study this, a series of linear mixed models were fitted, one for each combination of potential moderator and dependent variable. Again, we included a random intercept for ED and nurse to adjust for the nested structure. We included the interaction between time and the potential moderator under study as a fixed effect. In case of a significant interaction effect, post-hoc pairwise comparisons using the Tukey Method were performed for each level of the moderator to test which time points differed significantly. In addition, significant interaction effects were plotted to support interpretation of the effect. An advantage of mixed-model analyses (compared to for example MANOVA) is that each level 2 unit is allowed to have a different number of observations at level 1. Thus, all nurses with data on at least one time point can be included in the analyses. However, because we are interested in change over time, we opted to include only nurses with data on at least two out of the

three time points. Because some nurses completed only a subset of assessments at some time points, the analyses include 483 to 521 nurses depending on the dependent variable under study.

Results

Preliminary analyses

All assumptions of performing linear mixed-model analyses were met with the exception of the homogeneity of variances assumption. Histograms showed that aggression/conflict situations, emotional exhaustion and depersonalization were skewed to the left, whereas work engagement was skewed to the right. We performed a log(x) transformation for aggression/conflict situations, a log (x+1) transformation for emotional exhaustion and depersonalization, and a x^2 transformation for work engagement resulting in increased normality of the residuals and improved homogeneity. Next, we calculated the intraclass correlation coefficient (ICC) for each of the dependent variables to assess how much of the variability in the dependent variable was due the ED level. This resulted in an ICC(1) of 0.17 for worktime demands, 0.07 for aggression/conflict situations, 0.04 for emotional demanding situations, 0.02 for autonomy, 0.19 for staffing, 0.13 for within worktime recovery, 0.08 for work engagement, 0.07 for emotional exhaustion and 0.06 for depersonalization. As shown by Musca et al. 2011 an ICC of .01 can already lead to increased Type I error. As such, these results confirm the decision of performing linear mixed-model analyses to correct for the nested structure of the data.

Changes in job demands, resources and well-being over time

First of all, we assessed whether the project resulted in overall improvements in job demands, job resources and employee well-being over time (hypothesis 1). The results of these analyses are presented in Table 1. We found significant changes in all job demands and all job resources, with the largest effects for staffing (η^2=0.07) and worktime demands (η^2=0.06). Post hoc comparisons showed that between T1 and T3 worktime demands, aggression/conflict situations and emotionally demanding situations decreased, whilst staffing levels and within worktime recovery increased. Autonomy only improved in the second half of the project (T2-T3), but not overall (T1-T3). In addition, the results showed that most of the positive changes in job factors occurred during the second half of the project (between T2-T3), with the exception of aggression/conflict situations. Finally, significant changes over time were found

Table 1. Changes over Time in Job Demands, Job Resources and Well-Being During the Intervention Project

						95%CI			Post hoc pairwise comparisons					
Dependent variable	*F*	Numdf	Dendf	*p-value*	Eta2	low	high	*N*	timepoint	EM	SE	df	*t*	*p-value*
Job demands														
Worktime demands	26.14	2	837	0.00	0.06	0.03	1.00	521	T1-T2	-0.01	0.02	834	-0.35	.935
									T2-T3	-0.13	0.02	841	-6.22	<.001
									T1-T3	-0.14	0.02	856	-6.40	<.001
Aggression [a]	6.07	2	762	0.00	0.02	0.00	1.00	483	T1-T2	-0.04	0.01	757	-3.35	.003
									T2-T3	0.01	0.01	764	0.71	.757
									T1-T3	-0.04	0.01	771	-2.51	.033
Emotional demands	13.10	2	770	0.00	0.03	0.01	1.00	483	T1-T2	-0.09	0.05	761	-1.89	.144
									T2-T3	-0.17	0.05	768	-3.33	.003
									T1-T3	-0.26	0.05	776	-5.06	<.001
Job resources														
Autonomy	4.03	2	835	0.02	0.01	0.00	1.00	521	T1-T2	-0.03	0.02	830	-1.67	.216
									T2-T3	0.05	0.02	837	2.81	.014
									T1-T3	0.02	0.02	851	1.13	.496
Staffing	33.17	2	828	0.00	0.07	0.05	1.00	503	T1-T2	-0.11	0.03	824	-4.03	<.001
									T2-T3	0.23	0.03	833	8.14	<.001
									T1-T3	0.12	0.03	849	4.06	<.001
Within worktime recovery	21.94	2	844	0.00	0.05	0.03	1.00	521	T1-T2	0.02	0.02	837	0.85	.671
									T2-T3	0.11	0.02	845	5.41	<.001
									T1-T3	0.13	0.02	860	6.10	<.001

Note. T1=2017, T2=2018, T3=2019, EM=estimated mean difference, post hoc pairwise comparisons *p*-value adjustment: Tukey method for comparing a family of 3 estimates

[a] transformed variable: log(x)

[b] transformed variable: (x^2)

[c] transformed variable: log(x+1)

Table 1. Continued

						95%CI			Post hoc pairwise comparisons					
Dependent variable	*F*	Numdf	Dendf	*p-value*	Eta2	low	high	*N*	timepoint	EM	SE	df	*t*	*p-value*
Well-being														
Work engagement [b]	56.33	2	790	0.00	0.12	0.09	1.00	494	T1-T2	-4.11	0.42	784	-9.70	<.001
									T2-T3	0.31	0.43	790	0.72	.751
									T1-T3	-3.80	0.44	801	-8.61	<.001
Emotional exhaustion [c]	4.09	2	780	0.02	0.01	0.00	1.00	495	T1-T2	-0.02	0.02	776	-0.94	.613
									T2-T3	0.05	0.02	781	2.83	.013
									T1-T3	0.03	0.02	789	1.85	.153
Depersonalization [c]	7.37	2	778	0.00	0.02	0.01	1.00	495	T1-T2	-0.06	0.02	776	-3.49	.002
									T2-T3	0.05	0.02	781	3.04	.007
									T1-T3	-0.01	0.02	789	-0.38	.925

Note. T1=2017, T2=2018, T3=2019, EM=estimated mean difference, post hoc pairwise comparisons *p*-value adjustment: Tukey method for comparing a family of 3 estimates

[a] transformed variable: log(x)

[b] transformed variable: (x^2)

[c] transformed variable: log(x+1)

for all indicators of well-being (work engagement, emotional exhaustion and depersonalization). However, post hoc comparisons showed that work engagement decreased over the course of the project (T1-T3). Indicators of burnout (emotional exhaustion and depersonalization) showed a small but significant increase during the second half of the project (T2-T3) but remained stable when considering the whole timeframe (T1-T3).

Influence of the level of intervening

The results of the moderation analyses and post hoc pairwise comparisons for significant group*time interactions effects are displayed in Table 2 and 3.

First, we assessed whether EDs with a multilevel approach towards stress management yielded greater improvements in employee well-being (work engagement, emotional exhaustion and depersonalization) compared to EDs using a solely organization-directed approach (hypothesis 2). The findings indicated a moderating effect of the level of intervening on burnout symptoms (emotional exhaustion and depersonalization) over time (see Table 2). Nevertheless, post hoc pairwise comparisons showed that the moderating effect was the result of differential changes during the project (i.e. changes between T1-T2 or T2-T3), but not when considering the whole timeframe (T1-T3) (see Figure 2 and 3).

Table 2. Changes over Time in Job Demands, Job Resources and Well-being Depending on the Intervention Level (Multilevel or Organization-Directed), Activity (Lower versus Higher), Fit of Actions (Lower versus Higher), Communication (Less versus More) and Employee Participation (Less versus More) in the Intervention Project.

	Intervention level Multi (*k*=10) vs OD (*k*=5) group*time				**Activity Lower (*k*=7) vs higher (*k*=8)** group*time				**Fit Lower (*k*=7) vs higher (*k*=8)** group*time				**Communication Less (*k*=7) vs more (*k*=8)** group*time				**Employee participation Less (*k*=8) vs more (*k*=7)** group*time			
	F	num DF	den DF	*p-value*	*F*	num DF	den DF	*p-value*	*F*	num DF	den DF	*p-value*	*F*	num DF	den DF	*p-value*	*F*	num DF	den DF	*p-value*
Job Demands																				
WTD	*NA*	*NA*	*NA*	*NA*	0.03	2	834	.968	0.45	2	836	.639	3.14	2	835	.044	2.36	2	835	.095
AGGR †	*NA*	*NA*	*NA*	*NA*	0.22	2	756	.805	1.56	2	758	.211	0.58	2	757	.559	1.44	2	757	.238
EMOD	*NA*	*NA*	*NA*	*NA*	0.79	2	768	.452	0.05	2	769	.947	1.11	2	768	.331	0.59	2	767	.553
Job Resources																				
AUT	*NA*	*NA*	*NA*	*NA*	0.94	2	831	.389	0.35	2	834	.705	4.64	2	834	.010	2.57	2	833	.077
STAFF	*NA*	*NA*	*NA*	*NA*	3.55	2	824	.029	8.21	2	827	< .001	4.02	2	826	.018	5.13	2	825	.006
RECOV	*NA*	*NA*	*NA*	*NA*	1.43	2	840	.239	2.61	2	842	.074	1.44	2	842	.236	1.64	2	841	.194
Well-Being																				
WE ‡	0.01	2	787	.994	0.19	2	787	.831	0.67	2	789	.511	0.04	2	789	.957	0.61	2	788	.544
EE±	7.93	2	777	< .001	3.14	2	777	.044	0.73	2	779	.480	2.49	2	778	.084	4.14	2	778	.016
DP±	5.14	2	775	.006	0.54	2	776	.584	1.46	2	777	.232	0.57	2	776	.567	0.89	2	776	.409

Note. WTD=Worktime demands, AGGR=Aggression/conflict situations, EMOD=Emotional demanding situations, AUT=Autonomy, STAFF= Staffing, RECOV = Opportunities for within worktime recovery, ENG= Engagement, EE=Emotional Exhaustion, DP=Depersonalization, Multi = multilevel, OD = Organization-directed, *k* = number of emergency departments, numDF=df numerator, denDF = df denomenator, NA=not applicable

[a] transformed variable: log(x)

[b] transformed variable: (x^2)

[c] transformed variable: log(x+1)

Table 3. Post Hoc Pairwise Comparisons for Significant Group*Time Effects

	contrast	Estimated mean difference	*SE*	*df*	*t ratio*	*p*-value	contrast	Estimated mean difference	*SE*	*df*	*t ratio*	*p*-value
	Level = organization-directed (*k* = 5)						Level = multilevel (*k* = 10)					
EE [a]	T1-T2	-0.09	0.03	773	-3.11	.006	T1-T2	-0.03	0.02	775	-1.19	.457
	T2-T3	0.13	0.03	778	4.62	<.001	T2-T3	0.00	0.02	779	-0.04	.999
	T1-T3	0.04	0.03	780	1.57	.261	T1-T3	-0.03	0.02	791	-1.17	.471
DP [a]	T1-T2	-0.13	0.03	773	-4.50	<.001	T1-T2	-0.02	0.02	775	-0.94	.614
	T2-T3	0.11	0.03	778	3.86	<.001	T2-T3	0.02	0.02	779	0.90	.644
	T1-T3	-0.02	0.03	780	-0.54	.852	T1-T3	-0.00	0.02	790	-0.03	.999
	Activity = lower (*k* = 7)						Activity = higher (*k* = 8)					
STAFF	T1-T2	-0.04	0.04	808	-0.99	.586	T1-T2	-0.16	0.04	833	-4.45	<.001
	T2-T3	0.15	0.04	836	3.33	.003	T2-T3	0.28	0.04	827	7.85	<.001
	T1-T3	0.11	0.04	840	2.37	.047	T1-T3	0.12	0.04	852	3.22	.004
EE [a]	T1-T2	-0.07	0.03	767	-2.47	.036	T1-T2	0.02	0.02	780	0.89	.650
	T2-T3	0.08	0.03	780	3.03	.007	T2-T3	0.03	0.02	778	1.14	.493
	T1-T3	0.02	0.03	783	0.68	.775	T1-T3	0.05	0.02	790	1.96	.124
	Fit = lower (*k* = 7)						Fit = higher (*k* = 8)					
STAFF	T1-T2	-0.07	0.04	819	-1.90	.140	T1-T2	-0.14	0.04	826	-3.62	.001
	T2-T3	0.11	0.04	844	2.76	.016	T2-T3	0.34	0.04	818	8.70	<.001
	T1-T3	0.04	0.04	835	0.95	.609	T1-T3	0.19	0.04	859	4.73	<.001

Note. T1=2017, T2=2018, T3=2019, WTD=Worktime demands, AGGR=Aggression/conflict situations, EMOD=Emotional demanding situations, AUT=Autonomy, STAFF= Staffing, RECOV = Opportunities for within worktime recovery, ENG= Engagement, EE=Emotional Exhaustion, DP=Depersonalization, *k* = number of emergency departments, *p*-value adjustment: Tukey method for comparing a family of 3 estimates

[a] transformed variable: log(x+1)

Table 3. *Continued*

	contrast	Estimated mean difference	*SE*	*df*	*t ratio*	*p*-value	contrast	Estimated mean difference	*SE*	*df*	*t ratio*	*p*-value
	Communication = lower (*k* = 7)						Communication = higher (*k* = 8)					
WTD	T1-T2	0.04	0.03	833	1.23	.438	T1-T2	-0.05	0.03	831	-1.73	.195
	T2-T3	-0.17	0.03	843	-5.96	<.001	T2-T3	-0.08	0.03	836	-2.85	.012
	T1-T3	-0.14	0.03	858	-4.63	<.001	T1-T3	-0.13	0.03	850	-4.45	<.001
AUT	T1-T2	-0.05	0.02	831	-2.14	.083	T1-T2	-0.01	0.02	827	-0.27	.962
	T2-T3	0.02	0.02	838	0.70	.765	T2-T3	0.08	0.02	832	3.26	.010
	T1-T3	-0.03	0.03	853	-1.37	.359	T1-T3	0.07	0.03	845	2.93	.010
STAFF	T1-T2	-0.17	0.04	823	-4.43	<.001	T1-T2	-0.05	0.04	820	-1.30	.394
	T2-T3	0.30	0.04	835	7.60	<.001	T2-T3	0.16	0.04	827	3.95	<.001
	T1-T3	0.13	0.04	851	3.15	.005	T1-T3	0.11	0.04	842	2.61	.025
	Employee participation = lower (*k* = 8)						Employee participation = higher (*k* = 7)					
STAFF	T1-T2	-0.10	0.04	829	-2.66	.022	T1-T2	-0.13	0.04	812	-3.09	.006
	T2-T3	0.15	0.04	832	4.14	<.001	T2-T3	0.33	0.04	828	7.69	<.001
	T1-T3	0.06	0.04	847	1.46	.312	T1-T3	0.20	0.04	846	4.57	<.001
EE [a]	T1-T2	-0.03	0.02	778	-1.11	.506	T1-T2	-0.01	0.03	770	-0.20	.978
	T2-T3	0.09	0.02	780	3.96	<.001	T2-T3	-0.01	0.03	778	-0.20	.979
	T1-T3	0.07	0.02	787	2.79	.015	T1-T3	-0.01	0.03	786	-0.38	.924

Note. T1=2017, T2=2018, T3=2019, WTD=Worktime demands, AGGR=Aggression/conflict situations, EMOD=Emotional demanding situations, AUT=Autonomy, STAFF= Staffing, RECOV = Opportunities for within worktime recovery, ENG= Engagement, EE=Emotional Exhaustion, DP=Depersonalization, *k* = number of emergency departments, *p*-value adjustment: Tukey method for comparing a family of 3 estimates

[a] transformed variable: log(x+1)

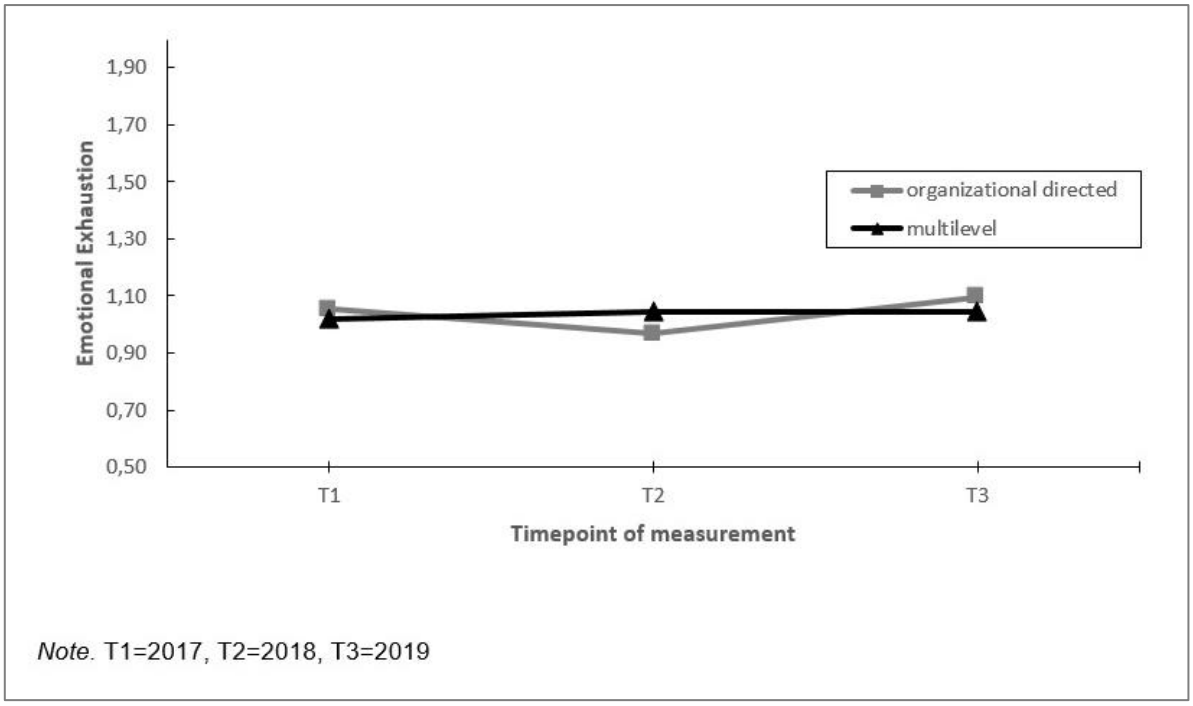

Figure 2. Moderation effect of emergency departments with a multilevel approach versus emergency departments with a solely organization-directed approach towards stress management on changes in emotional exhaustion over time.

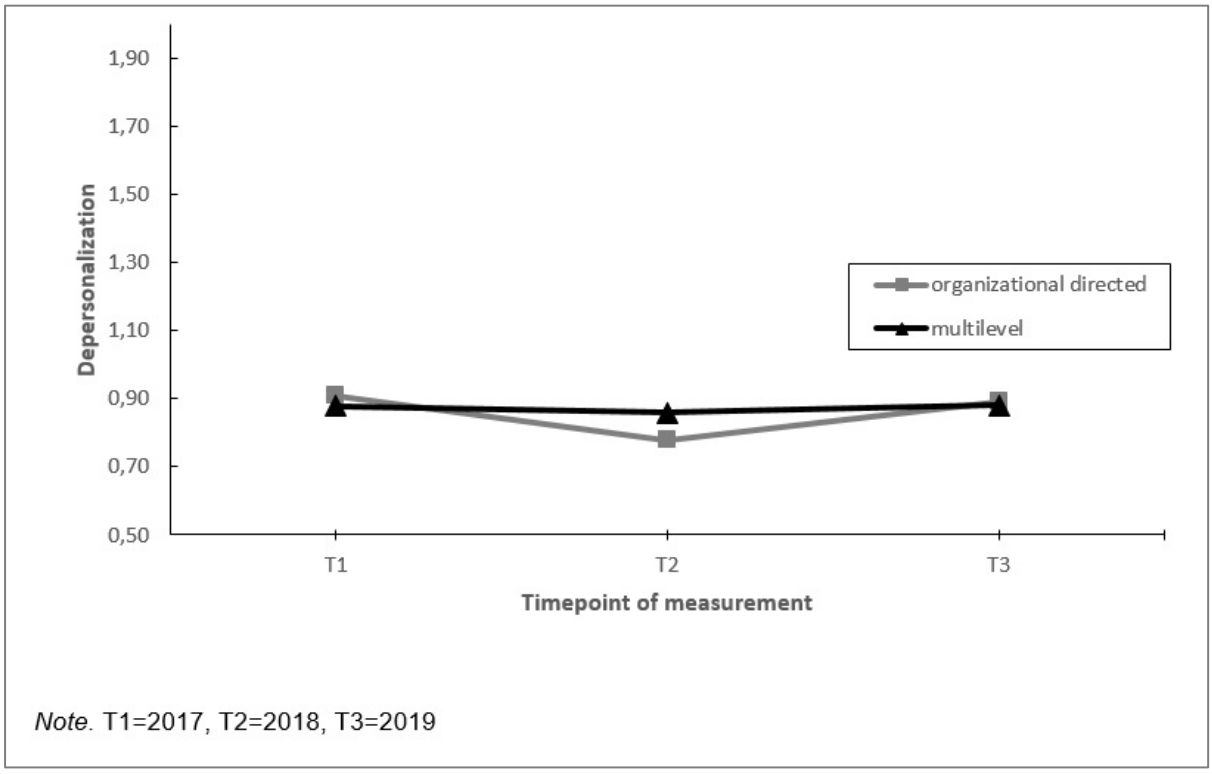

Figure 3. Moderation effect of emergency departments with a multilevel approach versus emergency departments with a solely organization-directed approach towards stress management on changes in depersonalization over time.

Influence of activity

Second, we assessed whether EDs implementing more actions during the project yielded greater improvements in job factors and employee well-being over time, compared to EDs that were less active during the project (hypothesis 3). The results showed that activity had a significant moderating effect on staffing levels and emotional exhaustion over time. Nevertheless, post hoc pairwise comparisons showed that the moderating effect was the result of differential changes during the project (i.e. changes between T1-T2 or T2-T3), but not when considering the whole timeframe (T1-T3) (see Figure 4 and 5).

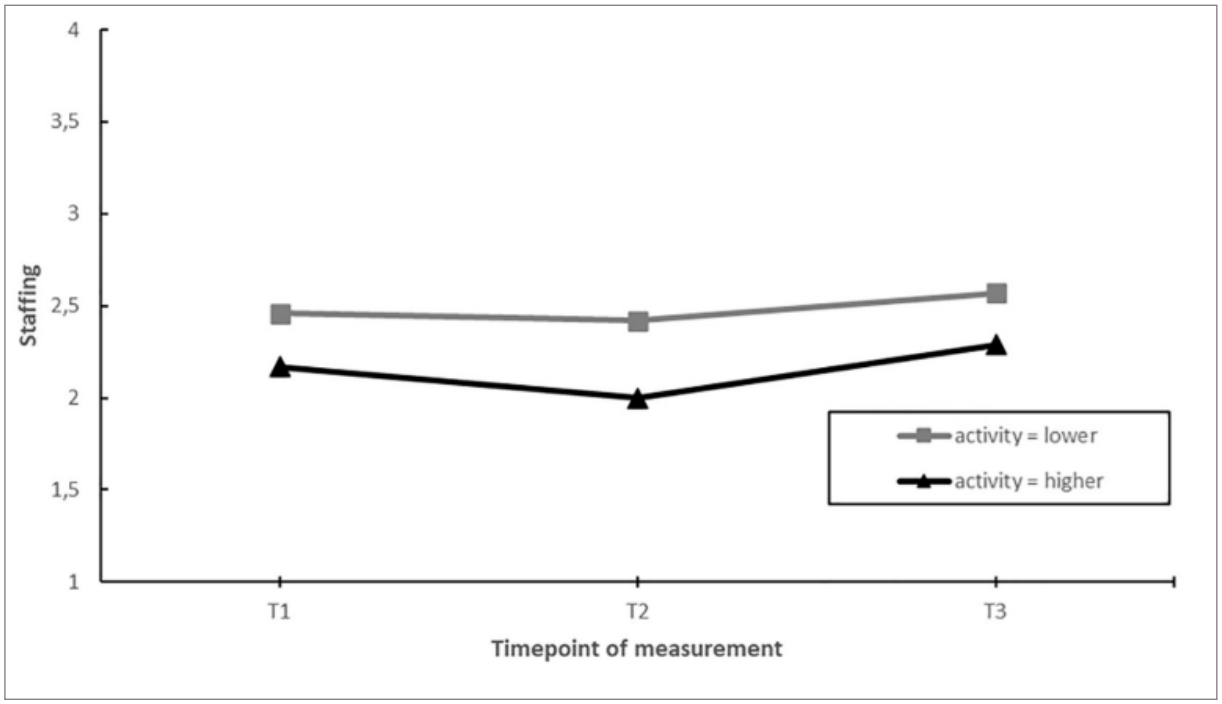

Figure 4. Moderation effect of emergency departments with higher activity (more actions implemented) compared to emergency departments with lower activity during the intervention project on changes in staffing over time.

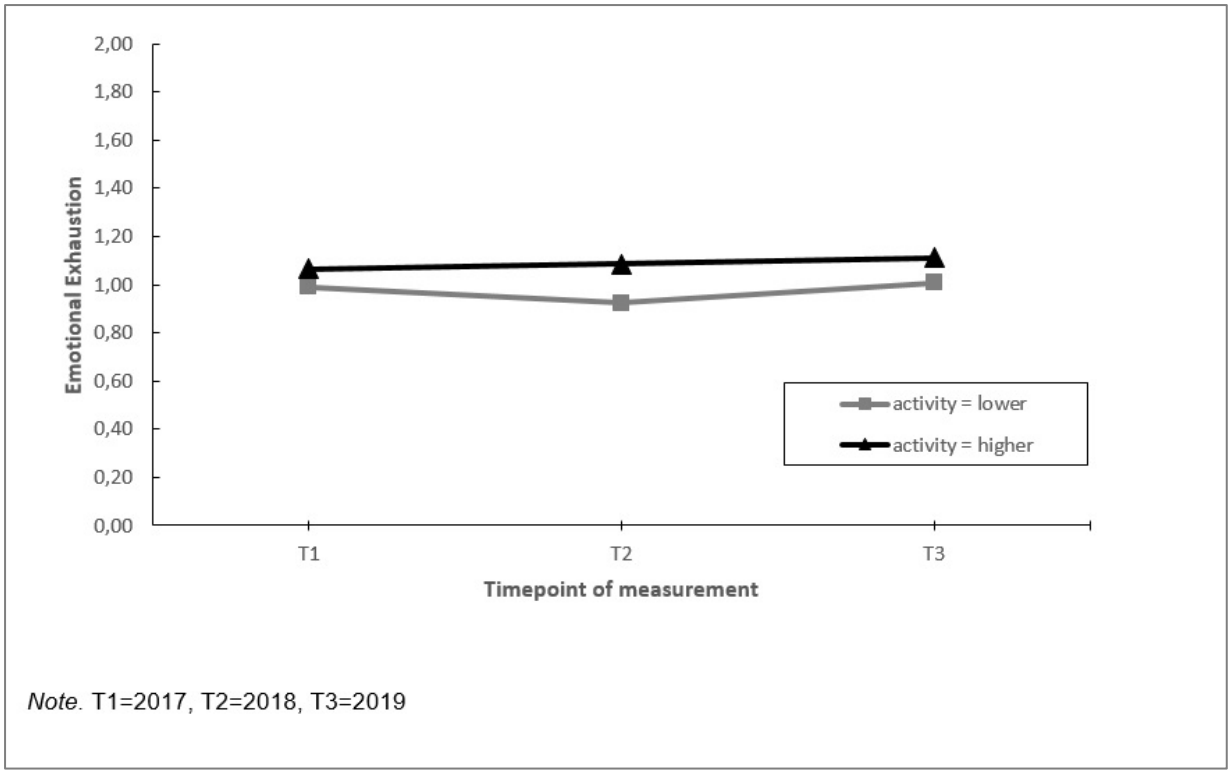

Figure 5. Moderation effect of emergency departments with higher activity (more actions implemented) compared to emergency departments with lower activity during the intervention project on changes in emotional exhaustion over time.

Influence of fit to psychosocial risk factors

Third, we assessed whether EDs implementing more fitting actions to the identified psychosocial risk factors had greater improvements in job factors and employee well-being during the project, in comparison to EDs implementing fewer fitting actions (hypothesis 4). The results showed a significant moderating effect of fit on perceived staffing levels over time. EDs implementing more fitting actions showed a significant increase in staffing levels when comparing the T1 and T3 measurements. In comparison, in EDs implementing fewer fitting actions, no significant changes in staffing levels were found when comparing the T1 and T3 measurements. The moderating effect mainly occurred due to changes in the second half of the project (see Figure 6).

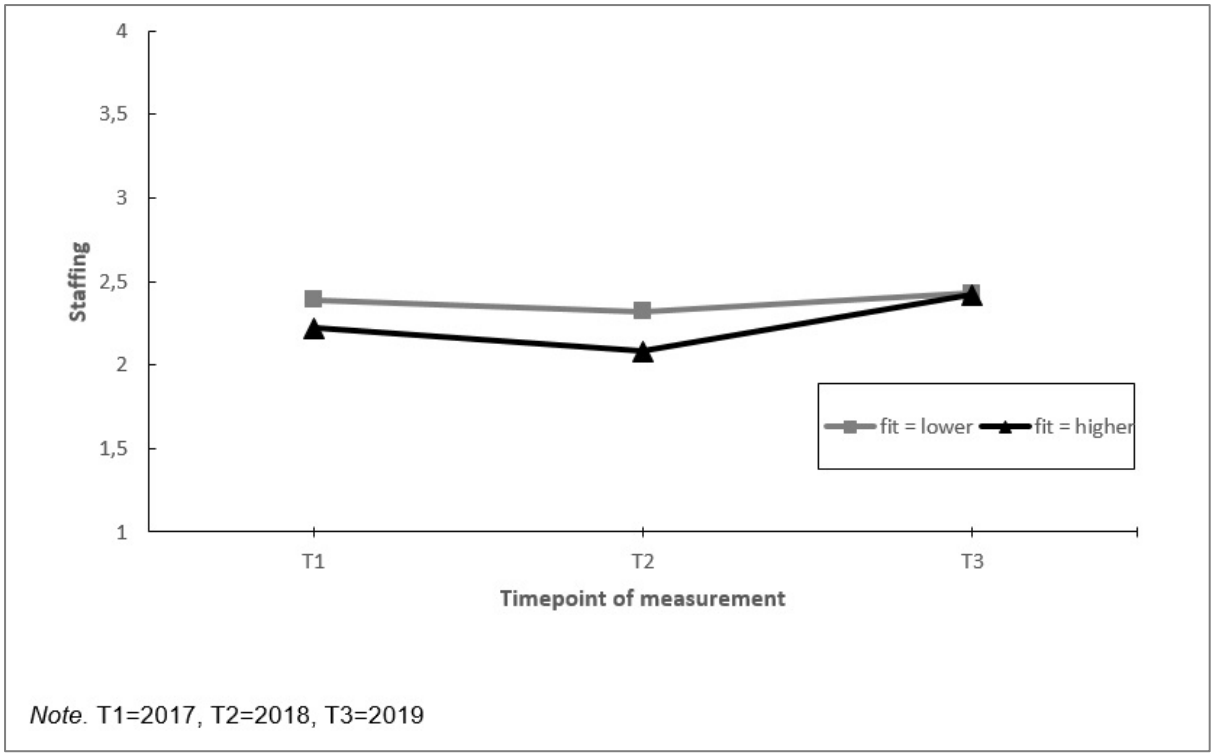

Figure 6. Moderation effect of emergency departments with better fit of the implemented actions to the psychosocial risk factors versus emergency departments with lower fit to actions implemented during the project on changes in staffing over time.

Influence of communication

Next, we assessed whether EDs that communicated more on the project towards employees had greater improvements in job factors, job resources and well-being, than EDs that communicated less (hypothesis 5). The results showed significant moderating effects of communication on changes in worktime demands, autonomy, and staffing over time. Post hoc pairwise comparisons showed that in EDs communicating more, autonomy increased over the course of the project (T1-T3). In contrast, no change in autonomy was found in EDs that communicated less (Figure 7). Regarding worktime demands and staffing, post hoc pairwise comparisons showed that the moderating effect was the result of differential changes during the project (i.e. changes between T1-T2 or T2-T3), but not when considering the whole timeframe (T1-T3) (Figure 8 and 9).

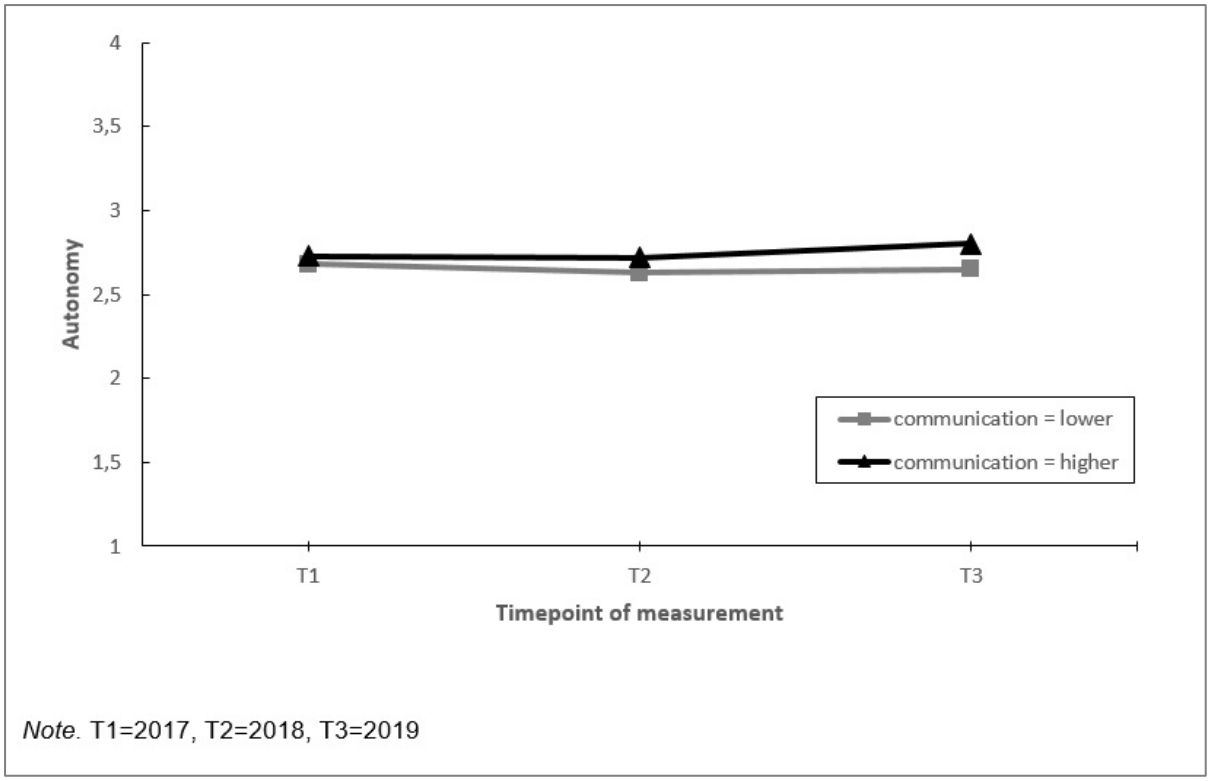

Figure 7. Moderation effect of emergency departments with higher levels of communication versus emergency departments with lower levels of communication during the intervention project on changes in autonomy over time.

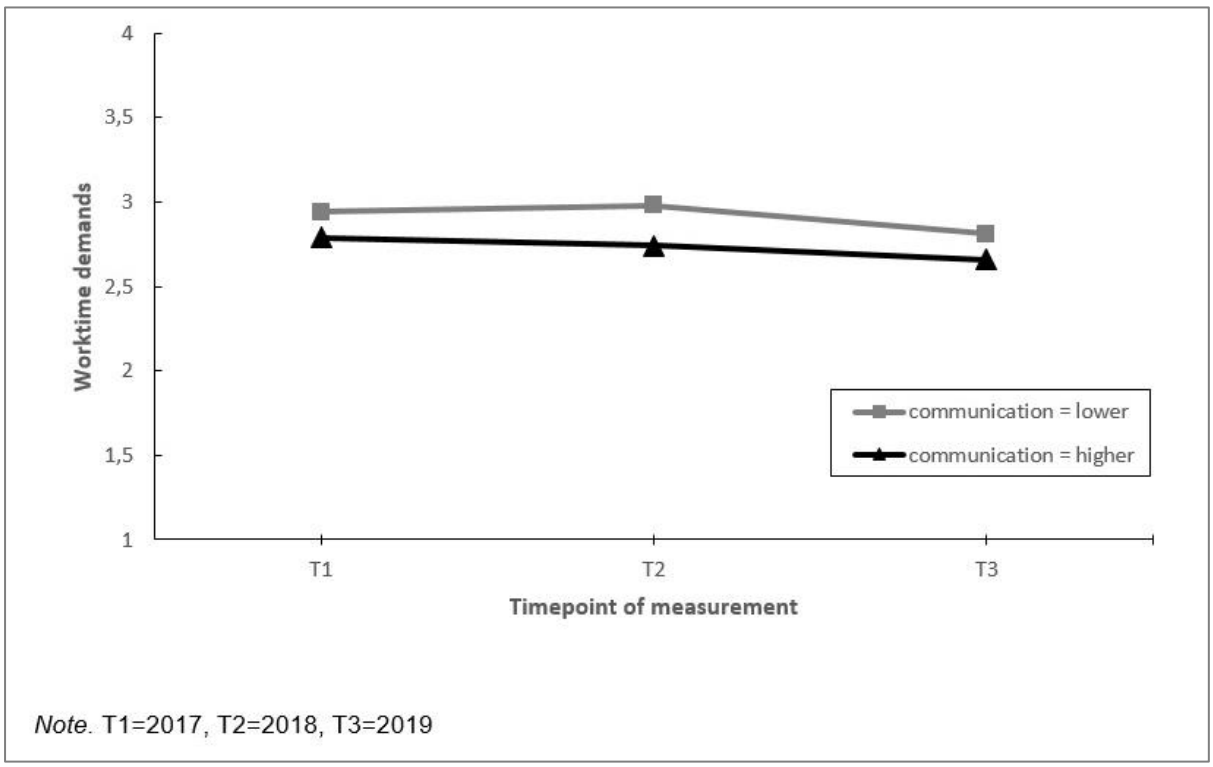

Figure 8. Moderation effect of emergency departments with higher levels of communication versus emergency departments with lower levels of communication during the intervention project on changes in worktime demands over time.

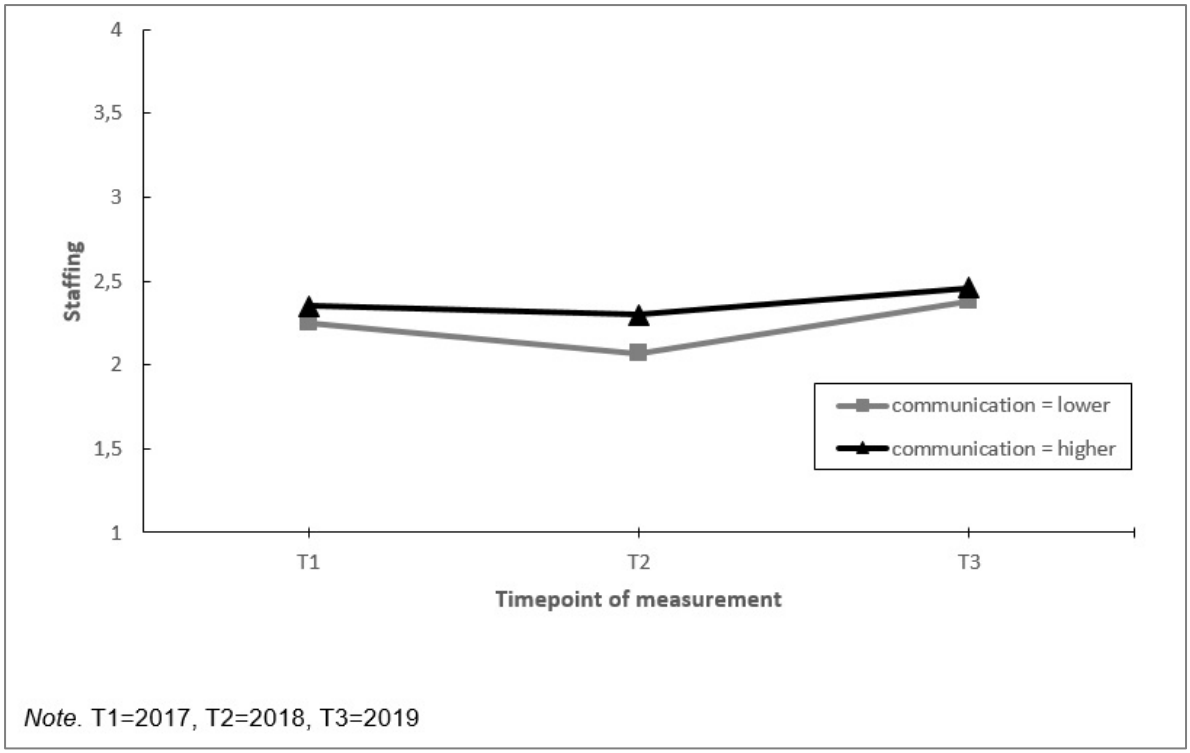

Figure 9. Moderation effect of emergency departments with higher levels of communication versus emergency departments with lower levels of communication during the intervention project on changes in staffing over time.

Influence of employee participation

We assessed whether those EDs that involved their employees more in designing and implementing actions during the project showed greater improvements in job demands, job resources and employee well-being than those that involved their employees less (hypothesis 6). Moderating effects were found for staffing and emotional exhaustion. Post hoc pairwise comparisons showed that EDs with more employee participation, had a greater increase in perceived staffing levels over the course of the project (T1-T3). In addition, EDs with more employee involvement had stable levels of emotional exhaustion, whereas emotional exhaustion increased in those EDs with less employee participation. These moderating effects mainly occurred in the second half of the project (T2-T3) (see Figure 9 and 10).

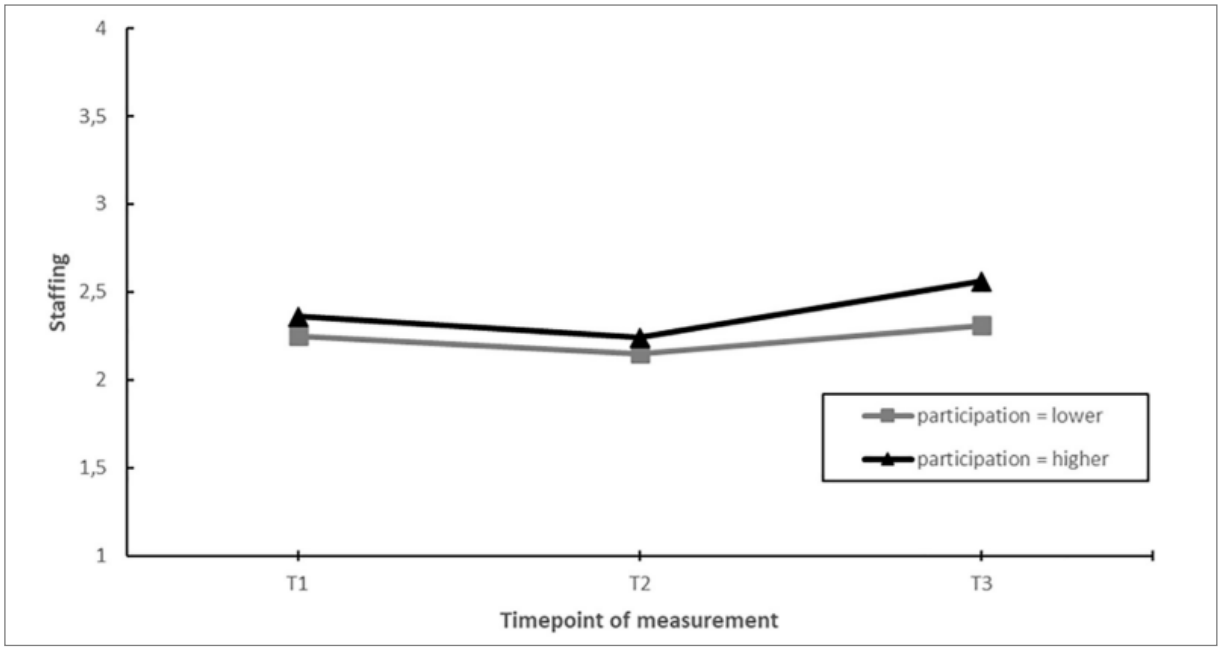

Figure 10. Moderation effect of emergency departments with higher levels of employee participation versus emergency departments with lower levels of participation during the intervention project on changes in staffing over time.

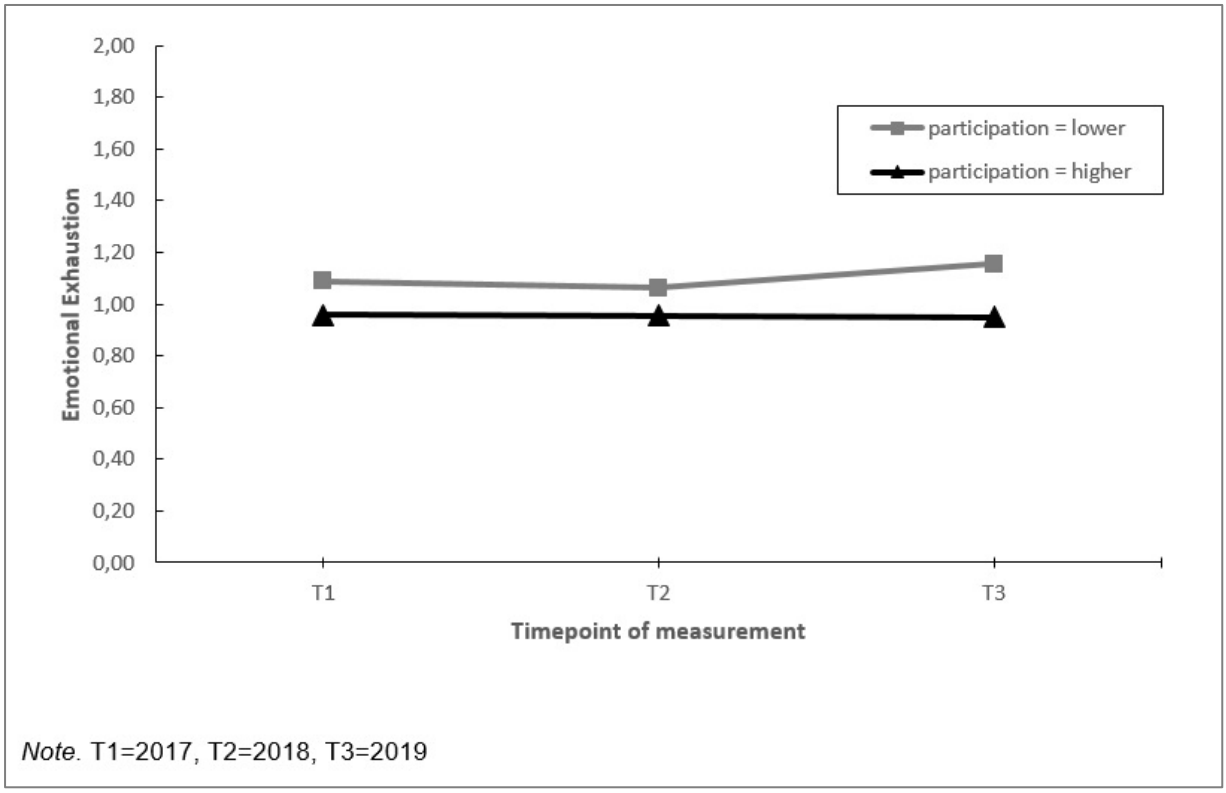

Figure 11. Moderation effect of emergency departments with higher levels of employee participation versus emergency departments with lower levels of participation during the intervention project on changes in emotional exhaustion over time.

Influence of a PSC intervention

Finally, we assessed whether the EDs that participated in the Psychosocial Safety Climate (PSC) intervention around T2 had more positive changes in job demands, job resources and well-being between T2 and T3, compared to EDs not participating in this intervention (hypothesis 7). First, we checked whether the intervention was indeed effective in increasing PSC in the participating EDs. A linear mixed-model analysis was performed with a random intercept for the EDs and the nurses to adjust for the nested structure of the data and a group*time interaction as a fixed effect. Levels of PSC at T2 were similar for those EDs participating and those not participating in the PSC intervention. In addition, the results showed a significant interaction effect of the PSC intervention on PSC levels over time between T2 and T3 ($F(1,474) = 14.72$, $p < .001$). Post hoc paired comparisons showed that PSC increased in those EDs participating in the PSC intervention (estimated mean difference = 0.235, $t(504) = 5.716$, $p < .001$) and remained stable in those EDs not participating in the PSC intervention (estimated mean difference = -0.003, $t(471) = -0.061$, $p = .951$). As such, we can conclude that the intervention was effective in increasing PSC in the participating EDs.

Linear mixed-model analyses for each of the job demands, job resources and well-being indicators showed no significant moderating effect of (non)involvement in the PSC intervention (see Table 4).

Table 4. The Moderating Effect of Implementing a Psychosocial Safety Climate Intervention on Changes in Job Demands, Job Resources and Employee Well-Being Between T2 and T3

	PSC intervention yes (*k*=8) versus no (*k*=7) group*time			
	F	numDF	denDF	*p-value*
Job demands				
Worktime demands	3.82	1	355	.051
Aggression [a]	2.67	1	325	.103
Emotional demands	0.67	1	325	.413
Job resources				
Autonomy	0.22	1	355	.639
Staffing	0.85	1	347	.358
Within workime recovery	0.02	1	355	.894
Well-being				
Work Engagement [b]	0.19	1	337	.660
Emotional Exhaustion [c]	1.03	1	338	.312
Depersonalization [c]	1.05	1	338	.306

Note. PSC=Psychosocial Safety Climate, *k* = number of emergency departments, numDF=df numerator, denDF = df denominator

[a] transformed variable: log(x), [b] transformed variable: (x^2),

[c] transformed variable: log(x+1)

Discussion

The current study reports on the results of a 2.5 year intervention implementation project in emergency departments (EDs) in the Netherlands. The project was based on the `psychosocial risk management approach` (PRIMA) including cycles of assessing psychosocial risks, implementing actions, evaluating the implementation process and outcomes and adjusting the approach if needed. In addition, principles of participative action research (PAR) including an active role of participants throughout the project were integrated: EDs were empowered to design and implemented their own actions during the project. Finally, based upon the halfway evaluation an intervention to increase Psychosocial Safety Climate (PSC) was offered and half of the EDs took part. To pinpoint factors related to greater effectiveness of the project, potential moderators including the level of intervening (an organization-directed or multilevel approach), process variables (the number and fit of actions, communication and employee participation) and taking part in the PSC intervention were assessed. Overall, several favorable effects on job demands and job resources were present. Worktime demands, the frequency of aggression/conflict situations and emotional demands decreased over the course of the project, whilst perceived staffing levels and within worktime recovery increased. Autonomy showed an increase during the second half of the project (T2-T3), but not when considering the entire timeframe (T1-T3). Nevertheless, no beneficial effects were found for employee well-being: Work engagement decreased during the project, whilst no changes were found in burnout levels considering the entire timeframe of the project (T1 versus T3). Moderation analyses showed that those EDs that took more fitting actions to the identified psychosocial risks, that communicated better and/or involved their employees more in the intervention project, showed more favorable changes over time. In contrast, no differences were found with regard to the level of intervening (i.e. multilevel or a solely organization-directed approach) or activity during the project (i.e. less or more actions taken) considering the entire timeframe of the project (T1 versus T3). Finally, although the effects of implementing a PSC intervention could only be assessed for the latter half of the project, it effectively improved PSC in the participating EDs, but no effects on job factors or well-being were found.

Changes in job demands, job resources, and well-being

In line with our expectations favorable changes occurred over the course of the project, including a decrease of job demands and an increase in job resources with the exception of

autonomy. Autonomy showed a significant increase during the second half of the project, but not when considering the entire timeframe (T1 versus T3). A potential explanation for the overall unchanged levels of autonomy is that little actions were taken that focused on increasing this resource. Nevertheless, it should be noted that according to the moderation analyses job autonomy did increase in those EDs that communicated more on the (progress of) the intervention project. This suggests that even without specific actions, job autonomy can be increased by keeping employees informed on the progress of the intervention project and any upcoming changes, which is in line with findings of previous studies (Nielsen & Noblet, 2018; Nielsen & Randall, 2012).

Against what would be expected based on the JD-R model, the improvement of most job resources did not activate the motivational process and work engagement even decreased during the project. There are a number of potential reasons why work engagement diminished during the project. First of all, the awareness the project created for psychosocial risk factors might have shifted the attention of employees to the negative aspects of their work. Second, symptoms of burnout, a stress-related outcome which was highly prevalent amongst ED nurses, can over time lead to reduced work engagement (Maricuțoiu et al., 2017). Finally, in the current study, ED nurses scored very high on work engagement at the start of the study (T1). Although work engagement is generally seen as positive indicator of well-being, some scholars suggest a "too much of a good thing" effect. (Leiter, 2019; Pierce & Aguinis, 2013). For example, high levels of work engagement in settings with high job demands can lead to over-commitment which in turn strengthens the energy-depletion process (Leiter, 2019). In line with this, high levels of work engagement are related to increased worktime demands and work-family conflict (Halbesleben et al., 2009). Still, more research is necessary to fully understand if and at what levels work engagement might be considered a negative rather than a positive aspect of employee well-being and reductions might even be considered beneficial.

Second, also against what would be expected based on the JD-R model, favorable changes in job demands and job resources did not lead to a decrease in burnout symptoms. This may be the result of the large focus on prevention during the project. Considering the high prevalence of stress-related symptoms at the beginning of the project (de Wijn et al., 2021), more focus on treating existing symptoms might be necessary to see an improvement in well-being. Furthermore, it must be noted that an absence of favorable changes on stress-related

symptoms in the presence of favorable changes in job factors has been found in other stress management intervention studies conducted in the hospital setting (Le Blanc et al., 2007; Schneider et al., 2019; Uchiyama et al., 2013). These studies have two things in common. First, the programs evaluated mainly focused on improving job factors and less (or not at all) on relieving existing stress-related complaints. Second, similar to the current study, the effect on well-being in these studies is measured on rather stable outcome variables, including burnout. Although the current project encompasses a relatively long timeframe of 2.5 years, most job factors did not improve until the last year of the project. It is therefore possible that any effects of the actions taken during the project on well-being are not yet visible. Nevertheless, the current project may have been effective in preventing further deterioration of burnout symptoms. For example, in an intervention project amongst oncology care providers (Le Blanc et al., 2007), burnout levels remained stable in the intervention group but increased in the control group. Indeed, data published by the Central Bureau of Statistics shows that in general the levels of burnout amongst healthcare employees in the Netherlands increased between 2017 and 2019 (TNO/CBS, 2019). The unchanged levels of burnout in the current study thus suggest a protective effect of the actions taken by the EDs.

Factors related to greater intervention effectiveness

Against our expectations, a multilevel approach did not lead to more favorable changes in well-being compared to an exclusively organization-directed approach. This might be explained by the person-directed part often being limited (e.g. psychoeducation on recognizing stress-related complaints and how to reduce these, a consult with the occupational health officer of the hospital) and mainly focused on prevention (e.g. implementing peer support, reducing presenteeism by stimulating employees to call in sick when experiencing stress-related complaints). In fact, out of the ten EDs using a multilevel approach, only four provided professional help for their employees (two EDs offered a mental screening followed by sessions with a trained psychologist and two offered individual coaching). Furthermore, in most EDs employees had to request additional support in order to participate in the person-directed part of the intervention. This might have increased the threshold, especially considering the still existing stigma on mental health problems within the healthcare setting (Knaak et al., 2017), resulting in a limited use of these interventions (12% of the sample between T1 and T2 and 9% between T2 and T3 reported having taken part in a person-directed intervention during the project).

Second, against our expectations, EDs that were more active (in terms of actions taken) did not show greater improvements in job factors and well-being compared to those who were less active during the project. Although activity moderated changes in staffing levels and emotional exhaustion over time, when considering the whole timeframe of the project (T1-T3) no differences were found between EDs with less of more activity. Instead, factors indicative of a more favorable implementation process including fit, communication, and employee participation in the design and implementation of actions taken were related to more favorable changes during the project. EDs with better fit of the actions to the psychosocial risks showed a greater increase in staffing levels. EDs with better communication showed greater increases in autonomy and EDs with more employee involvement showed greater increases in staffing and no increase in emotional exhaustion (a key indicator of burnout). These results are in line with previous studies stating that how interventions are designed and implemented plays a key role in the overall effectiveness of stress management interventions (Gray et al., 2019; Nielsen & Miraglia, 2016; Nielsen & Randall, 2013).

Interestingly, although communication on the intervention project was related to more job autonomy, no such effect was found for employee participation. The latter is often expected as having a say in the intervention project should automatically increase employees perceived ability to shape their own working environment. Still, mixed findings in the literature suggest that the link between employee involvement and job autonomy is more complicated than often assumed (Olsen et al., 2020). For example, a recent qualitative study suggests that if employees are involved but still perceive a limited action radius, participation will unlikely lead to the experience of more job control (Olsen et al., 2020). Since we measured participation in terms of how much employees were involved, but not the quality of this involvement (did employees have the experience that their ideas were heard and integrated in the actions taken), this might explain the absence of a relationship between participation and job autonomy in the current study.

Finally, half-way through the project, half of the EDs in the study participated in an intervention to create a more favorable organizational context in terms of the Psychosocial Safety Climate (PSC). It was expected that a more positive context would remove barriers and support management in the creation of more manageable job demands and adequate resources. In addition, it was expected that a more positive context would activate mechanisms related to

better implementation and uptake of actions taken and as such facilitate a more effective intervention project. The results are promising, as the intervention successfully increased PSC. However, no moderating effect of (non)involvement in the PSC intervention was found on changes in job demands, resources or employee well-being over time. The late implementation of the intervention in the project resulted in a small follow-up period, which makes it difficult to draw firm conclusions regarding the influence of PSC on intervention projects. Overall, we did confirm previous research (Bronkhorst et al., 2018) that a more positive organizational context for intervention implementation can be created by means of an intervention, but a longer follow-up period is warranted to fully grasp its effects upon job factors and well-being in this setting.

Strengths

The current study has a number of strengths. First of all, it concerns a field study including freedom for organizations to choose the number and type of actions, and how these were implemented. This made it possible to study different approaches of stress management and gives a realistic view on what can be achieved in terms of improvements in job demands, resources and well-being, within the day-to-day business of the ED. Second, the study includes a longitudinal design with an adequate timeframe to implement and study the effects of actions to reduce stress and increase employee well-being and therefore provides a good understanding of the effectiveness of stress management over time. Third, it uses a realist approach and as such leads to further understanding on how favorable results can be achieved in stress management projects. Furthermore, apart from process variables, it explored the effect of an intervention to improve the organizational context in terms of Psychosocial Safety Climate. The results are promising and might inspire future research in considering the role of contextual factors (such as PSC) in intervention projects.

Limitations

Due to a lack of control group, we cannot be certain that any changes in job factors and well-being were due to participation in the project and do not reflect general changes in this specific work setting. For the current project it was not feasible to establish a suitable control group as it would be incorrect to refrain EDs from taking any actions to reduce psychosocial risks for 2.5 years. Furthermore, as mentioned in the introduction, the use of randomized controlled trials to assess the effectiveness of organization-directed and multilevel

interventions has received a lot of criticism (Nielsen & Noblet, 2018). As recommended (Nielsen & Noblet, 2018), we used a realist approach and focused on success factors in the project including the level of intervening and the implementation process. Finally, it must be noted that the effectiveness of the PSC intervention was assessed by comparison to a self-selected control group of EDs not partaking in this intervention.

A second limitation concerns the measurements of activity, fit and the approach (solely organization-directed or multilevel) which were depended on correct reporting of project leaders. Although follow-up telephone interviews were conducted to improve the validity of this reporting, it is possible that not all actions were listed. For example, previous research indicates that employees often report more changes compared to their line managers, suggesting that employees might also initiate own activities of which management is not aware (Hasson et al., 2012; Nielsen & Randall, 2013). In addition, since we did not have information on existing individual support programs, we were not able to control for these or for support employees might have sought outside the hospital (e.g. via a general practitioner) to alleviate existing stress-related complaints. This could have influenced our findings regarding the effectiveness of a multilevel approach. Future studies might benefit from including employees' viewpoints and more structured approaches to gain a more valid report of activity within an intervention project. Third, we realize that the use of a median split results in crude indicators of the moderators examined, i.e. low or high activity, fit, communication, and employee participation. Furthermore, using median-splits could have led to reduced power and therefore more conservative results in the moderation analyses (Iacobucci et al., 2015). Still, if and under what circumstances the use of a median-split increases Type I error or Type II error, or lead to reduced power, is subject of debate (DeCoster et al., 2011; Iacobucci et al., 2015; McClelland et al., 2015). Fourth, autonomy had moderate internal consistency. This is in contrast to other studies using this scale in similar populations (Adriaenssens et al., 2015; Adriaenssens et al., 2011). Although, the average inter-item correlation was acceptable, it is recommended to optimize this scale by including more items and differ between having autonomy on a task level or on an organizational level. Moderate internal consistency was also found for within worktime recovery. Potentially this is the result of the scale measuring short (un)official breaks as well as experiences (detachment when leaving the workplace for a short while). Future research is necessary to optimize this scale. Finally, the study was

performed in Emergency Departments, future studies are necessary in other contexts to determine the generalizability of the current findings.

Practical implications

First of all, the psychosocial risk management approach (PRIMA) led to successful improvement of job demands and resources. Nevertheless, as shown in the current study, the tool reaches the greatest effects when implemented in the right way and under the right circumstances. For example, the current project emphasizes the importance of the process by which actions are designed and implemented as opposed to the number of actions taken in successfully improving working conditions and well-being. This calls for special attention for the development of fitting actions, and adequate communication and employee involvement in the intervention project. The latter can be stimulated by including employees in identifying current psychosocial risk factors in the workplace, developing actions to reduce these and evaluate the success of solutions (Glazer & Liu, 2017). Previous research indicates that employee participation in the intervention project can also be achieved by the use of employee representatives (Abildgaard et al., 2018), which seems especially advisable in a setting with high workload and high prevalence of stress related symptoms in order to avoid overburdening employees.

Second, the difficulties experienced by the EDs, including limited support from top management and limited resources (time and budget) to take action, suggests the importance of ensuring a favorable context before conducting an intervention project. PSC may be an important prerequisite, as it includes the prioritization and commitment of management to employee well-being over other competitive goals. However, more research is necessary regarding the role of PSC in intervention projects, to provide further practical recommendations

Third although no beneficial effect of a multilevel approach over a solely organization-directed approach was found in the current study, it remains unlikely that prevention alone can alleviate existing stress-related outcomes in employees. Especially considering that stress-related outcomes such as burnout remain rather stable over time, suggesting that a self-healing process is rare (Leiter & Maslach, 2014). In settings with high prevalence of stress related outcomes, such as the ED, prevention as well as additional professional help for those with

severe stress symptoms remains warranted.

Finally, most of the favorable changes in job factors but also the moderating effects of process variables occurred in the latter half of the project. This stresses the need to take into account a large timeframe when evaluating the effectiveness of this kind of intervention projects. It takes time to develop and implement actions, and effects on work factors and employee well-being may not be seen until years after the start of the project. In line with this, and as stressed by Leka et al. (2010), psychosocial risk management is not a one-off activity but instead should be an ongoing cycle and includes a long-term perspective.

Conclusion

The evaluation of the current intervention project based on PRIMA (including cycles of risk assessment, designing and implementing changes, evaluating changes and adapting the approach) and participative action research in which the organizations were empowered to design and implement their own actions, shows an improvement in most job demands and job resources. Still, inclusion of person-directed interventions in the form of professional help to reduce existing stress-related complaints seem necessary to also enhance employee well-being. Furthermore, the results showed that the quality of the intervention project in terms of taking fitting actions to the psychosocial risk factors at hand, communication on the (process) of the project and employee participation in the design and development of actions, is of greater importance than the number of actions taken. This calls for more attention to the process by which actions are designed and implemented. Finally, promising results were found for an intervention to stimulate a more favorable context in terms of the Psychosocial Safety Climate. Future research may focus on the effect of higher quality multilevel interventions (including professional support for those with existing stress related complaints) and a longer follow-up period to understand how stress management interventions can effectively increase well-being.

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Appendix

Table 1. Overview of the different steps in the intervention project based on the `psychosocial risk management approach` (PRIMA) by Leka and Cox (2010)

Preparatory actions	Establish a project group	A project group consisting of 2 researchers, 2 project managers of `Stichting IZZ` (a member collective of healthcare workers) and 1 Emergency Department (ED) manager was established. The project group met every two to three months to discuss the progress of the project and prepare next steps.
	Development of an occupation specific survey	The scientific literature regarding psychosocial risk factors in the ED setting was reviewed. This information was used as input for the development of an occupation specific survey to measure relevant job demands, job resources and indicators of well-being in the project.
,	Gaining management support	At the end of 2016, the study was promoted on relevant conferences/meetings and via an advertisement in the magazine of Stichting IZZ. All EDs in the Netherlands were invited to participate in the study. Next, a meeting was organized with all interested EDs to present the project in more detail. Management support was gained by informing ED management about the importance of their commitment to the project and taking actions based on the findings of the risk assessment.
	Appointing project managers	Each of the participating EDs appointed a project manager (most often the ED manager). Project managers were responsible for inventorying actions taken during the project to reduce psychosocial risks at their department, help setting up the interviews in the department and function as the first point of contact.
Step 1	Conducting a risk assessment	Work e-mail addresses and demographic variables of employees currently employed in the participating EDs were gained from Human Resources. Next, the online survey developed in the preparatory phase was sent to all employees from the participating EDs to measure Psychosocial Safety Climate, job demands, job resources and indicators of well-being. The survey remained open for 4-5 weeks and regular reminders were sent out. Participation in the surveys was on voluntary basis. Individual interviews with the researcher and each ED manager (*k*=15) and 5-6 employees of each ED (*k*=75-90) were held to gain further insight in the most prominent psychosocial risks. Employees were randomly chosen by the researcher based upon the shift plan on the day of the interviews. The interviews were on voluntary basis and held during worktime. Each ED was provided with an advisory report based upon the results of the surveys complemented by insights gained during the interviews. The report including an overview of their most prominent psychosocial risks, how to interpret these risks and a short advice regarding the main points to focus on.
Step 2	Translating risks into action plans	To support and encourage the EDs to take action, a total of nine inspiration sessions were organized by Stichting IZZ throughout the project. The sessions were open for ED management as well as employees to attend. In advance, ED managers were asked to send in any topics that they would like to see discussed during the inspiration sessions. The sessions generally consisted of a presentation on a topic of interest by an expert (e.g. "what is burnout and how to recognize it?", "how can we get psychosocial problems in the ED on the agenda of top management?", "how can we facilitate regular breaks and

		stimulate employees to take them?") and a presentation by one or two EDs to share a (successful) action they implemented and any barriers they encountered. The aim of these sessions was to empower the ED`s in the designing and implementing their own actions during the project and to create a learning network.
Step 3	Implementing interventions	EDs in the project were free to decide themselves on the number and content of the actions they implemented. Actions were inventoried by the researchers every three to four months by means of a form to fill out and a follow-up telephone interview with the ED project manager. The form included the start date of the action, (if relevant) the end date, a description of what was implemented, the goal of the action and any comments by the project manager. Based upon the T2 evaluation a Psychosocial Safety Climate intervention was offered by Stichting IZZ to all EDs in the project (8 out 15 EDs decided to participate). The PSC intervention consisted of three steps. In the first step opinions of employees concerning the most prominent psychosocial risk factors at work were inventoried using a short online questionnaire. As the second step the team discussed the results of this poll to open a dialogue on psychosocial risks at work. In a third step, the main points from this dialogue were discussed in a meeting between employees and top management of the hospital. All steps were repeated at least three times. See Bronkhorst et al. 2018 for detailed description of this intervention.
Step 4	Evaluating process and outcome variables	The survey of the risk assessment was repeated amongst employees at T2 and T3, assessing Psychosocial Safety Climate, job demands, job resources and well-being, complemented by additional questions to measure the process by which actions were implemented in the organization. In addition, individual interviews with each ED manager (*k*=15) and 5-6 employees of each ED (*k*=75-90) were held to gain insight in how actions were implemented (process variables), any changes regarding psychosocial risks and any barriers encountered in implementing actions. Each ED received a report including any changes in job demands, job resources and well-being at their department and the current process by which they implemented actions during the project (i.e. their scores on communication and participation). The survey findings were integrated with findings from the interviews to provide a short advice regarding the main points to focus upon. In addition, halfway and at the end of the project the main findings were presented on one of the inspiration sessions, including an overall reflection of how the project was proceeding and a general advice on how to continue. At T2 this advice included to focus more on communication on the goals and processes of the project towards employees and to involve them more in designing and implementing actions during the project. In addition, it was advised to also implement person-directed interventions to support employees with severe stress-related complaints.

Note. ED=Emergency department

CHAPTER 7

General discussion

The current dissertation revolves around occupational strain and the well-being of emergency department (ED) nurses. The research described in this dissertation is divided in two parts. In the first part (chapter 2 and 3), we aimed to assess the prevalence of stress-related outcomes and levels of well-being in ED nurses and pinpoint the most prominent job factors related to these outcomes. In the second part (chapter 4, 5 and 6), we aimed to assess how job factors and (consequently) well-being of ED nurses can effectively be improved. The research described in this dissertation mainly revolves around a 2.5-year intervention implementation project in 15 EDs in the Netherlands. The overall effectiveness of this project as well as effective elements regarding the approach (organization-directed versus a multilevel approach), the process of implementation (number and fit of actions, communication during the project and employee participation) and the context (Psychosocial Safety Climate) were evaluated. In this chapter the main findings of the studies will be discussed. This chapter ends with the limitations and strengths of the current research, theoretical and practical implications, and recommendations for future research.

Summary and discussion of the main findings

Prevalence and predictors of occupational stress and well-being in ED nurses

In chapter 2 it was shown that Dutch ED nurses are at risk of developing stress-related symptoms: 39.6% scored above the cut-off for emotional exhaustion (a key indicator of burnout), 14.4% reported sleep problems, and 15.7% symptoms of post-traumatic stress disorder (PTSD) on a (sub)clinical level. In addition, there was high turnover intention, whilst the majority of ED nurses also reported high levels of work engagement and job satisfaction. Overall, these results confirm the general image of the ED being a burdening as well as highly rewarding and satisfying place to work (Johnston et al., 2016).

The prevalence of stress-related outcomes in Dutch ED nurses is in line with international findings and far greater than found in the working population in general. This is problematic for a number of reasons. First of all, if left untreated these symptoms may develop into more long-lasting outcomes including psychological illnesses such as anxiety disorders and depression. In addition, nurses that experience high stress levels are hampered in their ability to provide good patient care and more likely to make medical errors (Hall et al., 2016). Finally, stress-related outcomes may increase the rates of absenteeism, presenteeism (which is related to less productivity and reduced patient safety) and turnover in the organization (Brborovic

et al., 2017; Roberts & Grubb, 2014). Regarding the latter, the results from chapter 2 showed that at the start of the current intervention project, one out of three ED nurses considered to find a job outside the hospital in the next three years.

Our findings suggest that the working environment plays an important role in the occurrence of stress-related outcomes in ED nurses (chapter 2 and 3). In line with the Job Demands-Resources (JD-R) model (Demerouti et al., 2001), we found evidence for an energy depletion process predicted by exposure to job demands (i.e. the health impairment pathway). For example, job demands rather than job resources were related to emotional exhaustion, with a prominent role for worktime demands and aggression/conflict situations (chapter 2). Furthermore, frequent exposure to patient-related stressful situations (emotionally demanding situations, aggression/conflict situations and critical events) was directly associated with emotional exhaustion and symptoms of PTSD in ED nurses (chapter 3).

In chapter 3, it was shown that ED nurses are exposed to both low intensity and high intensity demands and that these have differential effects on their health and well-being. For example, emotionally demanding situations and aggression/conflict situations with patients and/or their accompanies were most strongly related to emotional exhaustion, a key indicator of burnout (chapter 3). As burnout complaints develop due to exposure to chronic job stressors, this finding suggests that these demands are (generally) considered low intense by ED nurses but continuous exposure may result in stress-related outcomes over time. On the other hand, critical events (including resuscitation and exposure to suffering and death) were most strongly related to symptoms of PTSD. Although the cumulative exposure to critical events makes ED nurses especially prone to the development of PTSD symptoms (chapter 3), these symptoms can already occur after a single stressful event. As such, these results suggest that the work environment of ED nurses possess risks to the development of immediate stress-reactions as well as delayed stress-related outcomes that may first appear after a long time of exposure to the job demand.

Although the JD-R model implies that the impact of job demands can be reduced by the presence of adequate job resources, limited support was found for the buffering hypothesis in the current research. In chapter 2, none of the job resources appeared to play an important role in the occurrence of stress-related outcomes, with the exception of a small buffering

effect for staffing levels. In chapter 3 a buffering effect of within worktime recovery (i.e., opportunities for breaks) was found but only regarding the impact of emotionally demanding situations on PTSD symptoms. Furthermore, in contrast to previous research (Adriaenssens et al., 2015; Escribà-Agüir & Pérez-Hoyos, 2007; Garcia-Izquierdo & Rios-Risquez, 2012; Schneider & Weigl, 2018), we found no protective effect of autonomy and social support. In general, studies assessing the JD-R model have found inconsistent results for the buffering hypothesis (Van Veldhoven et al., 2019). A possible reason concerns an imperfect fit of job resources to the job demands. For example, it has been suggested that job resources are mainly able to buffer job demands if they are of similar nature (i.e., emotional, cognitive, or physical), which is described by the Demands-Induced Strain Compensation (DISC) model (de Jonge & Dormann, 2003). In the current research, a screening survey was used, which enables studying many job factors, and is an important asset in pinpointing potential psychosocial risk factors for interventions to target. However, more detailed instruments, for example those differentiating between emotional and instrumental support, may provide better insight in the buffering role of job resources in the ED setting. Another explanation concerns the limited variability and both high (e.g. social support) and low (e.g. within worktime recovery) availability of certain job resources in the current setting, which makes it statistically more difficult to find a buffering effect. A final explanation concerns the possibility that the importance of job resources may only become visible under a reasonable amount of job demands. Considering that the ED working environment consists of a number of high job demands, the effect of job resources in this setting may only be limited.

Nevertheless, in line with the Effort-Recovery (ER-) model (Meijman & Mulder, 1998) we did find an important buffering role for recovery. In chapter 3 it was shown that within worktime recovery could buffer the effect of emotional demanding situations on PTSD symptoms. In addition, for ED nurses that reported more recovery experiences during leisure time, the relationship between patient-related stressful situations and stress-related outcomes, was weakened. As such, regular breaks during worktime and the ability to relax, psychologically detach, master new skills and having control over ones` leisure time, can be considered important assets in terms of ED nurses` well-being. These findings are in line with the literature on the nursing population in general showing that regular (micro) breaks and the ability to psychological detach from work can reduce the impact of job demands on stress-related outcomes (Wendsche et al., 2017). Considering the low levels and little variability of within

worktime recovery (chapter 3), suggesting that ED nurses regularly skip breaks, this could be an important target for interventions.

Finally, the JD-R model implies that job resources, alone or in combination with challenging demands, also have a direct motivational role resulting in positive outcomes on the individual (e.g. higher job and life satisfaction) and organizational level (e.g. higher productivity, better patient care, less turnover and absenteeism) (Bakker & Demerouti, 2017). In line with this, the current results showed that work engagement was predicted by job resources rather than job demands, with the most prominent role for developmental opportunities (chapter 2). With few studies focusing on the positive outcomes of work in the ED setting, and hardly any considering developmental opportunities, this finding provides important insights in how work engagement in this setting can be stimulated.

Nevertheless, it must be noted that the level of work engagement amongst ED nurses was (very) high and it has recently been suggested that this can also have a negative impact on employee well-being due to its relationship with overcommitment (Leiter, 2019). This could be especially the case in the ED setting which includes high job demands and involves working with people, in which the output of the work is directly visible. As such, it is likely that work engagement in this setting can lead to overinvestment, triggering the energy depletion process of the JD-R model and thus increasing employees' risk of developing stress-related outcomes. Still, further research is necessary regarding the relationship between work engagement and symptoms of energy depletion, such as burnout, in order to conclude whether and at what levels work engagement may be considered a negative rather than a positive outcome (Leiter, 2019).

Stress management interventions

After gaining a better understanding of the ED working environment and the predominant job factors related to (occupational) well-being of ED nurses, chapter 4, 5 and 6 focused on how stress-related outcomes in ED nurses can be prevented/reduced and well-being promoted. Using meta-analytic techniques, we investigated the overall effectiveness of stress management interventions for nurses reported in the literature and aimed to identify factors relating to greater intervention success (chapter 4). Next, we conducted and evaluated the effectiveness of a 2.5-year intervention implementation project in 15 EDs (chapter 5 and 6). The project

was based on the `psychosocial risk management assessment` (PRIMA) by Leka and Cox (2010) and integrated principles of participatory action research to empower EDs in designing and implementing their own interventions. The EDs were compared retrospectively based upon their approach (multilevel versus solely organization-directed), the implementation process (number and fit of actions, communication and employee involvement) and whether or not they participated in the psychosocial safety climate (PSC) intervention offered halfway in the project.

Person-directed versus organization-directed approach

The results of the meta-analysis showed that there is a main focus on person-directed interventions in the scientific literature, whereas few organization-directed or multilevel (organization-directed complemented by a person-directed intervention) interventions were found. This is in line with meta-analyses regarding stress management interventions for the general working population (Richardson & Rothstein, 2008; Van der Klink et al., 2001) and can be explained as organization-directed and multilevel interventions are more time and cost intensive, more disruptive to organizations status quo and more likely lead to resistance in the organization (Heaney & Van Ryn, 1990). Still, it is questionable whether the strong focus on studying person-directed interventions, will lead to finding a sustainable solution regarding stress-related outcomes in the nursing population. First of all, person-directed interventions insinuate that stress and stress-related outcomes occur due to inefficient coping of the individual (Heaney & Van Ryn, 1990). However, in many high demand work settings, including the hospital, the high prevalence of stress-related outcomes amongst employees suggests that the source of the problem lies within the working environment rather than employees` coping strategies (Heaney & Van Ryn, 1990). As such, person-directed interventions in these settings are more likely to treat the symptoms rather than the causes of stress. Indeed, the results of the current meta-analysis showed that although moderate effects were found directly after a person-directed intervention, the effects were reduced in the small number of studies conducting a follow-up measurement. On another level, considering practical implications, implementing person-directed interventions whilst there are clear indications that the causes of stress are within the working environment, could even be considered unethical. This has already been put forward more than thirty years ago by Heaney and Van Ryn (1990), but the arguments seem particularly applicable to the current situation. First of all, it may incorrectly imply to employees that they themselves are at the source of any stress-related symptoms

that they may experience, which can even lead to adverse effects. For example, inability to cope with a highly demanding environment, even after participation in a person-directed intervention, may very well increase individuals' perceptions of inadequacy and hopelessness (Heaney & Van Ryn, 1990). Second, solely implementing person-directed interventions may also incorrectly increase employees' beliefs that the working environment and organizational policies are outside of their control and thus need to be accepted. That being said, two things must be noted. First of all, there seems to be a mismatch between research and practice regarding this point: Whilst the literature search indicated a main focus on person-directed interventions, the results of the effect evaluation shows that EDs preferred an organization-directed approach to tackle psychosocial risks. In addition, these points of criticism are not meant to suggest that person-directed interventions are unimportant. In fact, the results of the meta-analysis show that (certain) nurses do benefit from them, at least on a short-term basis and mainly on milder stress-related symptoms. The findings merely insinuate that to provide long-term solutions, there is a need for more research on understanding interventions that (also) aim to change working conditions.

Regarding the few studies that aimed to evaluate a solely organization-directed or multilevel approach, small, albeit significant effects on stress-related outcomes in nurses were found (chapter 4). Although this may sound discouraging, there are many reasons for this finding that should be taken into account. First of all, organization-directed interventions have a preventative aim, focusing on improving the working environment and thereby employee well-being. As such, it will take time before changes in the working environment will be visible on indicators of well-being (Nielsen & Noblet, 2018). Indeed, the organization-directed studies included in the meta-analysis first showed significant effects in the long-term follow-up (i.e. after six months). Furthermore, considering the current intervention implementation project in the EDs, which included mainly an organization-directed approach, positive effects were found on job factors, but not yet on indicators of well-being (chapter 6). Possibly not yet, because the project included a time frame of 2.5-years and most actions were first implemented in the second half of the project. Overall, the findings of the meta-analysis (chapter 4) and those of the effect evaluation (chapter 6) suggest that it may take several months or even years before changes in job factors are reflected in improved well-being and reduced stress-related outcomes. Furthermore, several researchers suggest that due to the complexity of these interventions, in which many stakeholders (i.e. management, employees)

can influence the overall results, the effectiveness of these projects also highly depends on the activation of processes (Nielsen & Miraglia, 2016). This is discussed in more detail below.

Finally, in contrast to what many scholars suggest (Holman et al., 2018; Lamontagne et al., 2007; McVicar, 2016; Roberts & Grubb, 2014; Semmer, 2006), a multilevel intervention was not more effective than a solely organization-directed approach. This was neither the case in the meta-analysis (chapter 4) nor in the current intervention project (chapter 6) in which we could compare both approaches. One reason for this finding may be that in multilevel interventions not all employees are equally exposed to the person-directed part of the intervention. For example, in the current intervention implementation project we found limited use of person-directed interventions that were offered by those EDs adopting a multilevel approach. This may imply that there is still stigma around mental health issues in this setting (Knaak et al., 2017) and a change of culture is necessary for these type of interventions to be successfully adopted by the employees. Second, the person-directed part implemented by the EDs was often limited (e.g. education on burnout or a preventive consultation with an occupational health professional, instead of therapy sessions with a trained psychologist or coach). Considering that a large amount of ED nurses experienced stress-related symptoms (chapter 2), it is likely that multilevel interventions will only be more effective when also including professional help to treat existing stress-related problem in this population.

The process of intervention implementation

To gain more insight in the effectiveness of organization-directed interventions and how this could be improved we followed recommendations of Nielsen and Miraglia (2016) and used a realist approach. As such, we aimed to understand not only the effectiveness of interventions on improving job factors and well-being, but also how these effects were achieved (i.e. the implementation process) and under what circumstances (i.e. the role of Psychosocial Safety Climate). The few organization-directed studies (with or without a person-directed intervention) included in the meta-analysis provided limited insight regarding these factors. Mainly, the results showed that all organization-directed and multilevel interventions for nurses included some form of employee involvement (chapter 4). With only one study conducting a thorough process evaluation, it remained difficult to understand why (often) small effects were obtained and how this could be improved in the future.

The design of the current intervention project provided a unique opportunity to assess and even compare the effects of process variables. In line with the broader literature on organization-directed interventions, the results showed that implementing more fitting actions to the identified psychosocial risk factors, better communication during the project and/or more employee involvement, predicted a more effective project in terms of improved job factors and in some cases even employee well-being (chapter 6). However, activity (the number of actions implemented during the intervention project) was generally not related to greater effectiveness (chapter 6). This finding is in line with theoretical propositions regarding this type of interventions, which imply that the effectiveness of these projects relates strongly to the process by which actions are designed and implemented (Kristensen, 2005; Nielsen & Miraglia, 2016; Nielsen & Randall, 2013). As such, the current results provide further evidence of the important role these processes play in whether or not the project leads to the desired outcomes.

The role of the context

Finally, although research regarding the importance of process variables is growing (Havermans et al., 2016), we know little regarding the necessary circumstances to trigger these (Nielsen & Miraglia, 2016). In the current study we assessed the role of the organizational context (i.e. Psychosocial Safety Climate), regarding its direct and indirect (i.e. by activating process variables during the intervention project) effects on improving the working environment and employee well-being. In chapter 5 it was shown that a more favorable Psychosocial Safety Climate (PSC) plays an important facilitating role in stimulating communication on (the progress of) the intervention project and increasing employee participation. Second, in chapter 6 it was shown that PSC can successfully be increased by means of an intervention, but the follow-up time was too limited to assess any effects of the improved PSC on changes in job factors or employee well-being. Overall, the current results suggest that assessing and if unfavorable optimizing PSC is a good starting point for a successful intervention project in terms of a more favorable process by which actions are implemented. Nevertheless, it must be noted that PSC could not predict the number or fit of the actions nor positive appraisals of employees towards the intervention project. Based upon the interviews with ED management and employees, it is likely that other contextual factors, including available staffing, financial resources to take actions but also sufficient mental resources to deal with change, are necessary to activate these processes.

Although not the focus of the current research project, there is reason to believe that improvement in job factors will eventually also benefit relevant organizational outcomes, such as staff turnover and quality of care. For example, in the RN4Cast study including 12 European countries, 500 hospitals and more than 33,000 nurses (Sermeus, 2015), a favorable working environment – measured by nurse participation in hospital affairs, the priority of the organization on quality of care, positive leadership and supervisor support, adequate staffing and resources, and positive collaboration between physicians and nurses (Lake et al., 2002) - was related to less intention-to-leave amongst nurses (Sermeus, 2015; Aiken et al., 2012). Furthermore, in hospitals with better working environments nurses were half as likely to report poor to fair quality of patient care or give their hospitals poor or failing grades on patient safety (Aiken et al., 2012).

Theoretical implications

The findings of the current research have some important theoretical implications. First of all, in line with other research (Van Veldhoven et al., 2019) the current results confirm the existence of the health-impairment pathway and the motivational pathway of the JD-R model. Nevertheless, the overall explanatory value of job resources for work engagement was limited (chapter 2). This suggests that although job resources play a motivational role, other factors seem to be of greater importance for work engagement in the current setting. Considering the type of work ED nurses perform, these factors may relate to the direct visibility of the output of one's work and the ability to contribute to other people's lives. An interesting model in this respect, is the Job Characteristics Model of Hackman and Oldham (1975) which includes 'task significance' i.e. the importance of the task for the organization or society, as predictor for meaningfulness of work and consequently positive organizational outcomes such as work engagement and job satisfaction. Overall, when aiming to study the motivational pathway and the occurrence of engagement in ED staff, the JD-R model may benefit from an extension including job content related factors.

In many occupational stress theories the topic of balance plays an important role. According to the JD-R model, healthy work environments include a balance in job demands and job resources. In addition, the Effort-Recovery (ER) model suggests that efforts exerted at work will lead to adverse effects if these are not balanced out by sufficient recovery. In the current dissertation new insights were gathered regarding a healthy balance in job factors in the ED setting. First of all, the buffering effect of job resources was very limited. In fact, the results

suggested that in highly demanding settings, a healthy equilibrium may only be found by lowering the job demands. This is an important finding, as most of the organization-directed interventions reported in the literature (see chapter 4), focused on enhancing resources including positive management practices, teamwork, staffing and communication. Only a few focused on reducing stressors, such as establishing lean practices and creating more time for patient care. In addition, it is likely that not only the availability of job resources as suggested by the JD-R model, but also their fit plays an important role in their ability to balance out the effects of job demands. For example, it is possible that buffering effects are more profound when including more detailed resources (i.e. differentiating between instrumental and emotional support rather than assessing social support in general). The Demand-Induced Strain Compensation (DISC) model of de Jonge & Dormann, 2003 may provide further insights assessing whether enhanced fit between the job resource, job demand and outcome, increases buffering effects.

Furthermore, the current results suggest that ED nurses benefit from a healthy balance between patient care and self-care. For example, exposure to patient-related stressful situations was less strongly related to negative outcomes in those nurses that had more within worktime recovery and/or recovery experiences during leisure time. This is in line with the Effort-Recovery model (Meijman & Mulder, 1998), suggesting that psychological and physiological changes in employees due to effort exerted at work can be reversed by taking time for adequate recovery. Still, the Effort-Recovery model merely suggests that recovery is necessary to prevent negative health outcomes and does not provide any directions regarding how often recovery should take place. Some new insights were gained as both recovery during leisure time and recovery within worktime showed were beneficial, suggesting that shorter as well as longer opportunities for recovery are important for employee well-being.

Regarding effective stress management interventions, the current results support the idea that the implementation process plays an important role in the effectiveness of an organization-directed (whether or not including a person-directed intervention) approach (Nielsen & Noblet, 2018). Furthermore, in line with the realist approach we found that a more favorable context in terms of Psychosocial Safety Climate, could trigger important processes related to greater intervention success, including better communication on and employee participation in the project. Overall, the results confirm the idea that intervention effectiveness depends

upon the activation of certain processes, which are triggered under certain circumstances. As such, we agree with Nielsen and Miraglia (2016) that the effectiveness of (especially organization-directed) stress management interventions may be best understood by studying Context-Mechanism-Outcome configurations. Finally, the findings suggest an extension of the theory of Psychosocial Safety Climate, with PSC having an indirect impact on job factors by influencing the way organizations implement actions to preserve or increase employee well-being.

Practical implications

Taking the results of all studies together, there are a number of important practical implications. First of all, the results suggest that to prevent and/or reduce stress-related outcomes in ED nurses, efforts should focus on lowering job demands, especially worktime demands and aggression/conflict situations. Chapter 2 gives a number of ways this can be achieved including specific pathways for geriatric care to lower work time demands (Manson et al., 2014) and comfortable waiting rooms for patients to reduce aggression/conflict situations (D'Ettorre et al., 2018). In addition, developmental opportunities, including continuous training, are important to keep ED nurses engaged at work. This may be achieved by creating personal development plans, and exploring opportunities such as job rotation with the Intensive Care and ambulance, or possibilities to perform more challenging tasks including providing assistance with anesthesia. Furthermore, some job demands in the ED are more difficult if not impossible to reduce by interventions, including the occurrence of patient-related stressful situations. Although these demands cannot be avoided, the results suggest that recovery at work and during leisure time are important for ED nurses to buffer the impact of these situations on their well-being. Recovery at work may be best stimulated by creating recovery opportunities (i.e. work breaks) and a positive culture of taking breaks during worktime (Nejati et al., 2016; Wendsche et al., 2017). Whereas recovery outside of work starts with having enough leisure time between shifts, and can be further stimulated by training. For example, an intervention focused on education, reflecting on current recovery experiences and setting goals to gain more of these experiences, resulted in more recovery experiences during leisure time (Hahn et al., 2011). In line with this, it is important to realize that ED nurses are both subject to demands that may immediately result in stress-related outcomes (i.e. critical events), and demands of which the impact will first be visible after a long period of exposure. Especially regarding the latter, in which the consequence does not directly

follow the predictor, interventions to prevent these symptoms may be less obvious. This emphasizes the importance of management and employees realizing that taking breaks from work - even though one still feels energetic enough to continue - may avoid a depletion of resources in the long run.

In terms of the most effective way to improve job factors and (consequently) employee well-being, the current results suggest to assess and if unfavorable improve the Psychosocial Safety Climate (PSC). An intervention in which psychosocial risks and possible solutions are discussed amongst employees and (top) management increased PSC in the current study and as such may provide a good starting point (Bronkhorst et al., 2018). Furthermore, special attention is needed regarding the way interventions are implemented including clear communication during and employee participation in the project, and the design and implementation of fitting actions to the existing psychosocial risk factors. The first two, are more easily activated in a favorable PSC as was shown in chapter 5. Still, in highly demanding settings, such as the ED, one may consider less direct ways to involve employees (e.g. by appointing employee representatives) (Abildgaard et al., 2018), to avoid overburdening staff. To stimulate the design of fitting actions, a thorough risk assessment is recommended in which the most prominent psychosocial risks are pinpointed. In addition, based upon the interviews with project leaders, a wider context may be necessary to solve problems regarding job demands and job resources in this setting. This includes having adequate resources (e.g. time and financial resources) to stimulate implementing (fitting) actions. Finally, although improving the work environment may work preventative, additional professional support is recommended to relieve existing stress-related outcomes, such as burnout and PTSD symptoms.

For a future organizational approach towards stress management in hospital settings, relevant input can be derived from the Magnet model. The model is based on research examining characteristics of exemplary hospitals who were able to attract and retain staff despite shortages on the job market (Rodriguez-Garcia, 2020). Key pillars of Magnet hospitals are transformational leadership, staff empowerment, and exemplary professional practice and innovation (Rodriguez-Garcia, 2020). For nurses specifically, it means more professional autonomy including decision making at the bedside and empowerment to make changes to the workplace environment. Although most studies report that Magnet hospitals do better on nursing, patient and organizational outcomes than hospitals without Magnet status, evidence

is still limited. Several literature reviews point out the lack of standardized evaluations tools (Andersson et al., 2018) and poor study quality including mostly observational (Petit dit Dariel, 2015), cross-sectional and retrospective studies (Rodriguez-Garcia, 2020). TheMagnet4Europe study, a four-year project currently conducted in 63 hospitals from UK, Ireland, Belgium, Sweden, Norway and Germany, and 67 magnet status hospitals from the USA aims to provide better insights, but results are not available yet (magnet4europe.eu, 2022).

Overall, we can conclude that the creation of a healthy working environment for ED nurses is an *art of balance*. This includes finding a good balance in job demands and resources, in effort and recovery, but also regarding the implementation of interventions (i.e. involving employees without overburdening them, providing information without overwhelming).

Strengths

The current research has some important strengths. First of all, by including a large number of job factors and the use of certain statistical techniques (e.g. regression tree analyses of chapter 2) we were able to provide better insight into predominant job demands and resources (and their combined effects) related to stress-related outcomes and well-being in the ED nursing population. As such, important job factors (including developmental opportunities, and within worktime recovery) not considered by previous research in this occupational group, were identified. In addition, by also assessing the relationship between the working environment and work engagement, we were able to provide insight in the motivational effects of work in the ED.

Second, the intervention project described in chapter 6, included an organization-directed approach (with or without a person-directed intervention) and a longitudinal design with a 2.5-year time frame. As such, our research answers to the call of Holman et al. (2018) to conduct more organization-directed interventions and include longer follow-up assessments to provide better insight in the effectiveness of stress management interventions over time. Furthermore, the current project includes one of the first evaluations of a stress management intervention conducted in the ED and provides important insights in the facilitators and barriers for effective stress management in this setting. In addition, by using a realist approach in which we did not only study the effect of the intervention project but also the influence of

process variables and the context. As such, additional insights were gained in how the effectiveness of organization-directed interventions can be improved.

Finally, instead of implementing an intervention based upon theoretical problems, the current intervention project included research cycles of assessing risk factors, implementing actions and evaluation of the results. This had some important advantages. First of all, by pinpointing psychosocial risk factors, and regular evaluation of the outcomes and approach, the project was more likely to fit the problems of the ED and lead to successful outcomes. In addition, EDs were not passive participants, but actively involved and empowered to design and implement their own actions. This increases the probability that actions are designed and implemented that would be fitting to the organizational context and that the project will continue to lead to positive results even after the researchers have left. Finally, the close collaboration between ED management and researchers led to further insights regarding the practical barriers of implementing interventions in the ED setting.

Limitations

This research is also subject to some limitations. Firstly, all data was collected using self-report surveys, and as such is prone to common method bias (Podsakoff et al., 2003). Efforts were made to reduce this, including the use of valid questionnaires and guaranteeing anonymity in the study (Conway & Lance, 2010). In addition, stress-related outcomes and well-being are subjective and as such best measured using self-report methods. Furthermore, the potential impact of common method bias is reduced in longitudinal research (Lindell & Brandt, 2000), implying that this is mainly a concern for the cross-sectional studies reported in chapter 2 and 3. Still, future studies may consider to also include objective measures for job factors (e.g. the number and medical complexity of patients visiting the ED) or stress-related outcomes (e.g. cortisol, heartrate variability), to further rule out the influence of common method bias and gain additional understanding of the influence of the working environment on ED nurses` well-being.

Second, chapter 2 and 3 are based on cross-sectional data and as such do not allow causal interpretation. Although, based upon the JD-R model, we expect that (frequent) exposure to a high level of job demands predicts stress-related outcomes, nurses that already experienced these outcomes, may also experience their working environment as more demanding. Still,

although reverse relationships between job demands and stress-related outcomes have been found, in general these effects tend to be smaller (Guthier et al., 2020).

Third, there was no control group to compare the effects of the intervention implementation project to. As such we cannot be certain that the positive effects on job factors were due to the intervention project or whether the changes were part of an ongoing trend in all hospitals. In general, it is difficult to find a suitable control group to study the effects of organization-directed or multilevel intervention (Nielsen & Noblet, 2018). For example, in the current study, it would not be feasible for EDs to refrain from implementing any actions regarding psychological risk factors for 2.5 years. Nevertheless, we believe that the current approach including a comparison of the EDs on the factors of interest (e.g. more versus less employee involvement) enhances our insight in effective mechanisms for intervention projects.

Finally, the current project was limited to 2.5 years, whereas the results indicate that a longer timeframe might be necessary to determine the effects on employee well-being.

Future directions

The results of the current research offer some important directions for future studies. First of all, the use of an occupation specific screening instrument provided insight into a large number of job factors, but also limited the detail in which these could be explored, which in turn may have influenced our findings regarding the buffering effect of job resources. Future research, including more specific instruments (i.e. differentiating between emotional and instrumental support) may provide further understanding in the potential buffering effect of job resources in the ED. Furthermore, the concept of morally distressing events, situations in which one knows the right action but is constraint from taking this action due to environmental reasons (e.g. limited time, lack of supervisory support, organizational policies), has received increased research attention amongst studies on healthcare professionals (Wolf et al., 2016) and might be an important mediator between job demands and stress-related symptoms in ED nurses. Examples of such situations include: not being able to provide good patient care due to high workload, sending patients home that under normal circumstances would be hospitalized, performing procedures for which one has received limited training, and not having the time and/or materials to keep patients integrity when performing procedures (Corley et al., 2001). Due to a growing workload and overcrowding in the ED, nurses may especially be

confronted with these types of situations, which can have lasting negative effects on their well-being (Wolf et al., 2016). In addition, even though recovery turned out to be an important asset in ED nurses` well-being, the topic of recovery in this setting has received little to no research attention. There are some studies available showing the importance of momentary breaks in the workflow on preventing stress-related outcomes in ED staff, including taking a few seconds of silence with the team after the death of a patient (Cunningham & Ducar, 2019). Still, the effect of (micro)breaks and ways to stimulate these is an important topic for future research and could be challenging as the ED environment provides many barriers for effective recovery. For example, a recent study amongst ED physicians showed that taking breaks was related to concerns about reduced productivity and the safety of patients for which they were responsible (O'Shea et al., 2020).

Third, there is a need for more research on the role of the organizational context in the effectiveness of stress management interventions. This is in line with the general trend in occupational health psychology to study the "cause of causes" (e.g. the theory of Psychosocial Safety Climate) as opposed to more proximal determinants of health and well-being in employees (i.e. JD-R model) (Van Veldhoven et al., 2019). The Context-Mechanism-Outcome (CMO) framework (Nielsen & Miraglia, 2016) may provide a good basis for future studies assessing what processes relate to specific outcomes and under what circumstances these are triggered. Promising effects were found of Psychosocial Safety Climate in predicting information provision and employee participation, but more research is necessary to confirm these findings. In addition, future research is necessary regarding the impact of other contextual factors including ongoing changes during the project (reorganizations, changes in management, high turnover) and available mental resources to actively participate and deal with change caused by the project.

Fourth, the current intervention project including an organization-directed approach (with or without a person-directed intervention) showed positive effects on job factors but not (yet) on employee well-being. This suggests that to understand the effects of these types of interventions on employee well-being even longer-term follow-up measurements are necessary (> 2.5 year after the onset of the program). In addition, apart from improving the working environment, additional professional support may be necessary to relieve any existing stress-related problems, however this idea needs further empirical support.

Furthermore, if the goal is to find long term solutions to reduce and prevent stress-related outcomes in the nursing population, more studies are necessary focusing on tackling the stressor (i.e. organization directed interventions either with or without a person-directed intervention) and gain further understanding on how this can best be done. As the current intervention project shows, this path is difficult, demanding many resources (e.g. time investment, financial resources and commitment) from the organization and patience from the researchers, employees and management, as effects of such interventions may take several months or even years to be shown. However, "in choosing a window dressing or less effective intervention rather than doing the work needed to truly address the problem, a disservice is done to both the organization and individual employees" (Heaney & Van Ryn, 1990, p. 419).

Finally, considering that the healthcare sector is rapidly changing and challenges such as the aging population and pandemics including COVID-19 pose serious risks to the health and well-being of ED nurses, it is important to realize that there are no simple solutions and stress management in this setting should be a continuous process.

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CHAPTER 8

Samenvatting
(Dutch summary)

Curriculum Vitae

Dankwoord
(Acknowledgements)

Samenvatting (Dutch summary)

Dit proefschrift draait om het welbevinden van Spoedeisende Hulp (SEH) verpleegkundigen en is opgedeeld in twee delen. Het eerste deel focust zich op het in kaart brengen van stressgerelateerde klachten en het welzijn van SEH-verpleegkundigen. Daarnaast wordt onderzocht welke werkfactoren hier met name mee samenhangen. Het tweede deel heeft als doel om succesfactoren in stress management interventies voor deze populatie vast te stellen. Hierbij wordt gekeken naar de kenmerken van de interventies, de manier waarop zij worden doorgevoerd en naar de rol van het organisatieklimaat (Psychosocial Safety Climate). Centraal in dit proefschrift staat een interventieproject van in totaal 2,5 jaar (2017-2019), waaraan 15 ziekenhuizen hebben deelgenomen. Het project is ontworpen op basis van de `psychosocial risk management approach` (PRIMA) en bestaat uit de volgende stappen: 1. het vaststellen van de meest prominente psychosociale risico's in de organisatie, 2. het vertalen van deze risico's in actieplannen, 3. het implementeren van acties, 4. het evalueren van de effecten van acties en het proces waarlangs deze zijn doorgevoerd, en (indien nodig) het aanpassen van de aanpak. Daarnaast omvat het project belangrijke aspecten van `participatory action research` (PAR), een aanpak waarin onderzoekers samenwerken met de deelnemers van het onderzoek om praktische problemen te begrijpen en op te lossen. SEHs in het huidige project voerden zelf acties door voor het welzijn van hun medewerkers. Om ze hierin te ondersteunen werden inspiratiesessies georganiseerd rondom de meest belangrijke themas (bijv. “hoe krijg ik psychosociaal welzijn op de agenda van het hoger management”, “hoe kunnen we ruimte creeëren voor pauzes en medewerkers motiveren deze ook te nemen?”, “wat is burnout en hoe herken je het?”).

In hoofdstuk 1, de introductie, wordt kort de achtergrond toegelicht. Het werk op de SEH wordt beschreven als inspirerend en uitdagend maar ook gekenmerkt door de hoge psychosociale belasting. Eerder onderzoek laat zien dat SEH-verpleegkundigen een vergroot risico hebben op het ontwikkelen van stressgerelateerde klachten in vergelijking met verpleegkundigen op andere afdelingen binnen het ziekenhuis. Toch zijn er maar weinig studies gedaan naar het welzijn van deze specifieke doelgroep en is er vrijwel niets bekend over effectieve interventies in deze setting. Vervolgens wordt het `Job Demands-Resources model` geïntroduceerd welke de theoretische fundering vormt voor het merendeel van de studies beschreven in dit proefschrift. Dit model suggereert dat de werkomgeving het welzijn van medewerkers beïnvloed via twee processen; een proces van uitputting door continue

blootstelling aan hoge werkeisen resulterend in stressgerelateerde klachten, en een proces van motivatie, waarbij hulpbronnen op het werk zoals feedback, autonomie en goede sociale contacten motiverend werken, resulterend in bevlogenheid en hogere arbeidstevredenheid. Hulpbronnen spelen daarnaast een belangrijke rol in het reduceren van het eerdergenoemde uitputtingsproces. De introductie eindigt met een uiteenzetting van de verschillende hoofdstukken in dit proefschrift.

Hoofdstuk 2, betreft de resultaten van een cross-sectionele studie. Deze studie heeft als doel een beeld te schetsen van de situatie met betrekking tot de prevalentie van stressklachten en het welzijn van SEH- verpleegkundigen in Nederland aan het begin van het project in 2017. Daarnaast wordt gekeken welke werkfactoren hier met name mee samenhangen. De resultaten laten zien dat er sprake is van een hoge prevalentie van stressgerelateerde klachten (39,6% scoort boven de cut-off voor emotionele uitputting, 15,7% rapporteert symptomen van posttraumatische stress op een (sub)klinisch niveau, en 14,4% rapporteert slaapproblemen). Daarnaast geeft één op de drie SEH-verpleegkundigen aan een baan buiten het ziekenhuis te overwegen in de komende drie jaar. Tegelijkertijd is het merendeel (sterk) bevlogen en tevreden met zijn/haar baan. De resultaten zijn in lijn met de beschrijving van de SEH als belastende maar ook interessante en uitdagende werksetting. In lijn met het uitputtingsproces van het Job Demands-Resources model, zijn werkeisen, met name werktijdsdruk en de mate van agressie/conflictsituaties met patiënten en/of hun begeleiders, het sterkst gerelateerd aan emotionele uitputting (een belangrijke indicator for burnout). In lijn met het motivatie proces, zijn met name hulpbronnen in het werk voorspellend voor bevlogenheid, met een prominente rol voor ontwikkelingsmogelijkheden.

Hoofdstuk 3 rapporteert de resultaten van een cross-sectionele studie en focust zich op een zeer specifieke werkeis van SEH-verpleegkundigen die zich moeilijk laat reduceren door interventies, namelijk de blootstelling aan patiënt-gerelateerde stressvolle situaties. Het gaat hierbij om emotioneel belastende situaties, agressie en/of conflicten met patiënten of hun begeleiders, en potentieel traumatische gebeurtenissen. Uit de resultaten blijkt dat er sprake is van een differentieel effect waarbij frequente blootstelling aan werkeisen van doorgaans een lage intensiteit, namelijk emotioneel belastende situaties en agressie/conflicten, met name gerelateerd zijn aan symptomen van emotionele uitputting. Daarentegen zijn situaties met een hoge intensiteit, namelijk potentieel traumatische of kritieke situaties, sterker gerelateerd aan

post-traumatische stress. Deze verbanden zijn minder sterk voor verpleegkundigen die meer hersteltijd gedurende het werk (bijv. in de vorm van pauzes) en/of herstelervaringen buiten het werk (bijv. mentaal afstand kunnen nemen van het werk) ervaren.

Hoofdstuk 4, betreft een literatuurstudie met betrekking tot de effectiviteit van stress management interventies voor verpleegkundigen werkzaam in het ziekenhuis. Hieruit blijkt dat het merendeel van de gerapporteerde interventies in de wetenschappelijke literatuur (in totaal 74) persoonsgericht zijn en zich dus richten op het verbeteren van coping- of werkvaardigheden en/of het stimuleren van ontspanning. Slechts een klein deel van de interventies (in totaal negen) richt zich op het verbeteren van de werkomstandigheden (organisatiegericht) of betreft een combinatie van beide (multilevel). Persoonsgerichte interventies zijn over het algemeen zeer effectief in het verminderen van stressklachten, maar door het gebrek aan follow-up metingen kan dit alleen worden geconcludeerd voor de korte termijn. Het soort persoonsgerichte interventie (cognitieve gedragstraining, ontspanningstraining, trainen van werkvaardigheden of een mix van het voorgaande) maakt weinig verschil met betrekking tot de effectiviteit. Wel lijken persoonsgerichte interventies effectiever in het verminderen van het huidige stressniveau dan klachten die samenhangen met langdurige of kortstondige hoge belasting zoals burnout en post-traumatische stress. Organisatiegerichte en multilevel interventies laten ook positieve effecten zien op stressgerelateerde klachten bij verpleegkundigen, maar (met name) op de korte termijn zijn deze effecten klein. Mogelijk hangt dit samen met de preventieve focus van organisatiegerichte interventies, moeilijkheden bij het vinden van een geschikte controlegroep en het feit dat het effect vaak wordt vastgesteld op basis van de hele afdeling/organisatie terwijl niet alle medewerkers evenveel worden blootgesteld aan de interventie. Tot slot, worden andere belangrijke factoren voor interventie succes, bijvoorbeeld de manier waarop de interventie is doorgevoerd, niet tot nauwelijks gerapporteerd.

Hoofdstuk 5 betreft de resultaten van een longitudinale studie waarin gekeken wordt naar de invloed van een contextuele factor, het organisatieklimaat (Psychoscial Safety Climate), op het activeren van een gunstig proces waarlangs interventies worden doorgevoerd. Onder dit proces vallen het aantal doorgevoerde acties en in hoeverre deze aansluiten bij de psychosociale risico`s (de fit), de informatievoorziening, betrokkenheid van medewerkers en positieve verwachtingen/beoordelingen van de (geplande) acties. Hieruit blijkt dat het

organisatieklimaat een belangrijke voorspeller is voor de communicatie en de betrokkenheid van medewerkers in het interventieproject. Echter is er geen effect op het aantal en de fit van de ondernomen acties, of op de mate waarin medewerkers positieve verwachtingen hebben van het project. Mogelijk spelen andere factoren binnen de organisatie (bijvoorbeeld financiële middelen en tijd), en individuele bronnen (zoals de mentale gesteldheid en energieniveau van medewerkers), hierin een grotere rol.

Hoofdstuk 6 betreft de effect evaluatie van het 2,5 jaar durende interventie project in de 15 ziekenhuizen. Allereerst is gekeken in hoeverre het doorvoeren van dit proces (risicoanalyse, doorvoeren van acties, evalueren en eventueel aanpassen van de aanpak) op de SEHs heeft geleid tot een verbetering in werkfactoren en het welzijn van SEH-verpleegkundigen. Uit de resultaten blijkt dat de werkeisen (werktijdsdruk, emotioneel belastende situaties en agressie/conflictsituaties) zijn afgenomen en de meeste hulpbronnen (personeelsbezetting en herstel tijdens werktijd) zijn toegenomen, met uitzondering van autonomie. Ondanks de verbetering in de werkfactoren blijft de mate van burnoutklachten gelijk en neemt bevlogenheid zelfs af. Dit laatste is niet per se een negatieve uitkomst. Aan het begin van het project was het merendeel van de verpleegkundigen sterk bevlogen in zijn of haar werk. Recent onderzoek laat daarnaast zien dat een hoge mate van bevlogenheid samenhangt met een overmatige inzet in het werk (overcommitment), wat op zijn beurt gerelateerd is aan het uitputtingsproces en het ontstaan van stressgerelateerde klachten. SEHs die hun medewerkers beter informeren over, en meer betrekken bij het project, laten sterkere verbeteringen zien. Daarnaast is ook de fit van de maatregelen bij de gevonden psychosociale risico's een goede voorspeller voor een meer succesvol project, terwijl het aantal doorgevoerde maatregelen doorgaans geen verschil maakt. Tot slot, is er geen verschil tussen SEHs met alleen een organisatie-gerichte aanpak en SEHs die daarnaast ook individuele ondersteuning aanbieden (een multilevel aanpak). Mogelijk komt dit doordat het persoonsgerichte deel van de aanpak in de meeste SEHs beperkt is tot educatie over stressklachten of een preventief consult bij de bedrijfsarts, in plaats van intensievere interventies zoals sessies bij een getraind psycholoog of coach. Daarnaast geeft slechts een klein deel van de medewerkers aan gebruik te maken van de persoonsgerichte interventies gedurende het project.

In hoofdstuk 7 worden de bevindingen van dit proefschrift samengebracht en bediscussieerd. Hierbij wordt gekeken naar overeenkomsten en verschillen tussen de studies. Daarnaast

worden de zwakke en sterke punten van het onderzoek besproken en implicaties gegeven voor de praktijk en toekomstig onderzoek. Samengevat, bevestigt het huidige onderzoek de hoge mate van stressklachten onder SEH-verpleegkundigen. Tegelijkertijd is er sprake van hoge bevlogenheid en arbeidstevredenheid. In lijn met het Job Demands-Resources model speelt de werkomgeving hierin een belangrijke rol. Voor het behoud van het huidig personeel en het aantrekken van nieuw personeel zouden managers zich met name moeten richten op het reduceren van de werkeisen. Daarnaast is mogelijk professionele hulp nodig om aanwezige stressgerelateerde klachten onder het personeel te reduceren. Goede informatievoorziening, betrokkenheid van medewerkers en de ontwikkeling van passende acties voor de geïdentificeerde psychosociale risico's, zijn belangrijke succesfactoren in een effectief interventie project. De huidige resultaten laten zien dat dit soort processen met name worden geactiveerd in een gunstig organsitatieklimaat, waardoor het meten en (wanneer nodig) verbeteren van dit klimaat mogelijk een belangrijke eerste stap is voor dit soort projecten. Verder onderzoek is nodig naar de bufferende rol van hulpbronnen in deze setting. Meer gedetailleerde instrumenten en het bestuderen van fit tussen de werkeis en de hulpbron (zie ook het Demand-Induced Strain Compensation model), kan hier mogelijk meer inzicht in geven. Daarnaast suggereren de resultaten van het huidige interventie project, dat langere termijn metingen en mogelijk professionele hulp nodig zijn om positieve effecten te zien in het welbevinden van SEH-verpleegkundigen. Tot slot, is er onderzoek nodig naar andere contextuele factoren (o.a. organisationele en individuele hulpbronnen) die mogelijk een belangrijke faciliterende rol spelen in de effectiviteit van dit soort interventie projecten.

Publications

Articles in international peer reviewed journals

de Wijn, A. N. & van der Doef, M. P. A meta-analysis on the effectiveness of stress management interventions for nurses: Capturing 14 years of research. *International Journal of Stress Management (in press)*

de Wijn, A. N. & van der Doef, M. P. (2022). Reducing psychosocial risk factors and improving employee well-being in emergency departments: A realist evaluation. *Frontiers in Psychology, 12,* 728390. https://doi.org/10.3389/fpsyg.2021.728390

de Wijn, A. N., Fokkema, M., & van der Doef, M. P. (2021). The prevalence of stress-related outcomes and occupational well-being among emergency nurses in the Netherlands and the role of job factors: A regression tree analysis. *Journal of Nursing Management, 107,* 13457. https://doi.org/10.1111/jonm.13457

Gerhardt, C. Semmer, N. K., Sauter, S., Walker, A., **de Wijn, N.**, Kälin, W., Kottwitz. M. U. Kersten, B., Ulrich, B., & Elfering, A. (2021). How are social stressors at work related to well-being and health? A systematic review and meta-analysis. *BMC Public Health, 21,* 890. https://doi.org/10.1186/s12889-021-10894-7

de Wijn, A. N. & van der Doef, M. P. (2020). Patient-related stressful situations and stress-related outcomes in emergency nurses: A cross-sectional study on the role of work factors and recovery during leisure time. *International Journal of Nursing Studies 107*. 103579, https://doi.org/10.1016/j.ijnurstu.2020.103579

Articles submitted for publication

de Wijn, A. N. & van der Doef, M. P. Psychosocial safety climate as predictor for the implementation process of a large-scale stress management intervention project in the Netherlands.

Curriculum Vitae

Nathal de Wijn was born on the 21th of July 1991 in Den Hoorn on the island Texel. She attended high school at OSC de Hogeberg from 2003 till 2009. In 2010 she started her bachelor in psychology at Leiden University including a semester abroad at the University of British Columbia in Canada. Between her bachelor and master she was a board member of the study association Labyrint, organizing study related activities for psychology students. In 2014 she started her master specialization in Occupational Health Psychology at Leiden University, which she obtained with honors. After graduating she worked as a research assistant at the University of Bern in Switzerland and as junior researcher at the Public Health Service (GGD - Hollands Midden) in the Netherlands. In 2017 she returned to Leiden University to work on her doctoral thesis at the Health, Medical and Neuropsychology Unit. For her paper on patient-related stressful situations (chapter 3) she received the PhD writing award (December 2019, Health, Medical and Neuropsychology Unit). Alongside her PhD research she was involved in teaching activities including teaching courses in the bachelor psychology and supervisor of 24 bachelor and 18 master theses. In addition, she obtained the partial University Teaching Qualification (BasisKwalificatie Onderwijs-deelcertificaat).

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