Balance at work : discovering dynamics in the Demand-Induced Strain Compensation Recovery (DISC-R) model

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Discovering Dynamics in the Demand-Induced Strain Compensation Recovery (DISC-R) Model

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PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Technische Universiteit Eindhoven, op gezag van de rector magnificus prof.dr.ir. F. P. T. Baaijens, voor een commissie aangewezen door het College voor Promoties, in het openbaar te verdedigen op 1 juli 2015 om 16:00 uur

door

Irene Maria Willemijn Niks

geboren te Zuidlaren

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CONTENTS

CHAPTER 1

General Introduction

"There is nothing more practical than a good theory"
(Lewin, 1952, p.169)

In more economically developed countries, such as the Netherlands, the nature of work has been changing over the past decades. Industrial employment has decreased, whereas the size of the service sector has increased (Eurofound & EU-OSHA, 2014). Along with this change, characteristics of the work environment are more and more shifting from traditional physical factors that are mainly associated with manufacturing work to so-called psychosocial factors associated with service work (Benach & Muntaner, 2007). Psychosocial factors at work refer to those aspects of work organizations that are of human design and construction such as the way work is organized and managed, the social relationships, and the design and content of tasks (Cox & Griffiths, 2005; Dollard, Shimazu, Bin Nordin, Brough, & Tuckey, 2014). These factors are involved with employees' mental and emotional processes linked to the social work environment and, as such, can influence employees' health, well-being, and performance (Stansfeld & Candy, 2006; Theorell & Karasek, 1996). A resourceful psychosocial work context can, for instance, provide opportunities for personal growth, social integration, and career development, which are all positively associated with employees' mental health (Eurofound & EU-OSHA, 2014; OECD, 2014). Good employee health and well-being, in turn, contribute to healthier, longer, and more productive working lives.

However, poor psychosocial work conditions (e.g., lack of social support or excessive work intensity) may lead to negative employee health and well-being outcomes such as work-related stress, job dissatisfaction, low work motivation, and absenteeism (Douwes et al., 2014; EU-OSHA, 2009; Eurofound & EU-OSHA, 2014; Hoel, Sparks, & Cooper, 2001; OECD, 2014). Because such outcomes are often accompanied by higher personnel costs and production loss, poor psychosocial work conditions are a hazard at both the individual and organizational level. Currently, in the Netherlands about one out of every eight employees suffers from occupational stress and 58% of the costs associated with work-related absenteeism can be attributed to psychosocial factors at work (Douwes et al., 2014). Moreover, by affecting employees' health and well-being, poor psychosocial work conditions jeopardize sustained employability. Sustained employability refers to the conservation of employees' work ability until reaching the age of retirement and is of major importance in the light of impending workforce shortages due an ageing population (Blatter, Dorenbosch, & Keijzer, 2014; Douwes et al., 2014; Van der Heijden, Schalk, & Van Veldhoven, 2008). That is, prolonging the working life of older employees can help to diminish these shortages. In conclusion, to prevent negative employee and organizational outcomes and to enable longer employment, a healthy psychosocial work situation is essential.

A sector where health and well-being of employees' and organizations are particularly at stake is the health care sector. This sector is one of the largest in the Netherlands, employing around 18% of the workforce (Douwes et al., 2014) with a significant proportion of healthcare workers being employed in hospitals and nursing homes (UWV, 2013). Specific contemporary challenges in this sector are that organizations, such as general hospitals and nursing homes, have to be managed more and more like regular enterprises, accompanied with increased market competition (e.g., UWV, 2013; Ewijk, Van der Horst, & Besseling, 2013; Den Exter & Guy, 2014). Cost containment programs have become a crucial part of the agenda, driven by medical inflation, volume growth, and contract negotiations with insurers. Also, quality of care from the patients' perspective is becoming increasingly important (Rademakers, Delnoij, & De Boer, 2011). Concurrently, due to the ageing population and declining birth rates, demand on the health care sector is rising, whereas health care professional shortages are growing (EU-OSHA, 2014; UWV, 2013; Ewijk et al., 2013). Hence, health care organizations need to work more efficiently than ever before to optimize the quality of health care and to reduce costs. These changes place a higher burden on health care staff; a group that is already at high risk of work-related stress and job dissatisfaction (e.g., Ilhan, Durukan, Taner, Maral, & Bumin, 2008; Le Blanc, Hox, Schaufeli, Taris, & Peeters, 2007; McHugh, Kutney-Lee, Cimiotti, Sloane, & Aiken, 2011). As such, the risk of high occupational stress levels among health care staff further increases, which in turn can result in higher absenteeism rates (Rugulies et al., 2007), low work motivation (Bakker & Demerouti, 2013), decreased performance (LeBlanc, 2009), reduced patient satisfaction and patient safety (McHugh et al., 2011; Montgomery, Panagopoulou, Kehoe, & Valkanos, 2011), and early retirement (Olesen, Butterworth, & Rodgers, 2012). In other words, organizational attempts to improve efficiency and quality of care may backfire through the potential negative effects of increased levels of job strain.

In sum, in the context of demographic changes, the significance of health care organizations (e.g., general hospitals and nursing homes) is likely to grow, whereas the workforce is decreasing, creating tension between quality and efficiency of health care delivery on the one hand, and health, well-being, and performance of health care employees on the other. Therefore, scientifically validated solutions for work stress prevention and optimal and sustainable utilization of the potential workforce are badly needed (Biggs, Noblet, & Allisey, 2014; Pot & Vaas, 2008). The current dissertation addresses this need by focusing on the optimization of psychosocial working conditions to prevent occupational stress and improve health, well-being, and performance of health care employees. The following paragraphs provide an overview of the theoretical background and the overarching theoretical framework of the dissertation (sections 1.1. and 1.2, respectively). Section 1.3 addresses gaps and shortcomings of the theoretical framework, followed by the research

problem and research aim of the dissertation (1.4). Finally, section 1.5 provides an overview of the entire dissertation.

1.1 A theoretical perspective on psychosocial risk management

In response to the changes in the world of work, research and theoretical perspectives in the field of Industrial and Organizational psychology have developed over the past decades. Whereas around the 1950s the general focus was still on optimal functioning of organizations, around the 1970s health and well-being of employees as well as the quality of working life became a priority (Zijlstra, 2012). This change is also known as the 'humanization' of work (Pot, 2012). Also, around the year 2000, a shift was initiated from research that mainly aimed at preventing negative work-related outcomes (e.g., burnout, sickness absence, turnover intention) to research also concentrating on enhancing positive work-related outcomes (e.g., work motivation, commitment; Schaufeli & Bakker, 2001). In line with these developments, the focus of the current thesis is on preventing negative employee outcomes and enhancing positive employee outcomes through redesign of the psychosocial work situation. More specifically, it centers on providing employees with tools for psychosocial risk management that can contribute to the quality of working life.

An approach towards psychosocial risk management that is pertinent to the abovementioned focus concerns social innovation at work. Whereas work innovation in the past was mainly used to refer to technological developments in the workplace, the social aspect of innovation is increasingly recognized as equally or even more important by both researchers and practitioners. Social innovation is a broad concept that refers to a participative way of redesigning the organization and management of work to improve individual and organizational performance as well as the quality of working life (cf. Pot, 2011, 2012). In other words, social innovation can be seen as a specific approach towards psychosocial risk management. This type of innovation is also commonly referred to as working 'smarter' for enhanced productivity as opposed to working harder or working more hours. It is generally seen as complementary to technological innovation (Oeij, Dorenbosch, Klein Hesselink, & Vaas, 2010; Pot, 2011, 2012). More specifically, to achieve continuous innovation and competitive advantage, new technologies and cost cutting strategies need to be accompanied by the optimal utilization of the potential workforce (Pot & Vaas, 2008). In addition, through improving the quality of working life, social innovation may contribute to healthy and sustainable employment (Pot, 2012). Hence, social innovation fulfils an important role in this thesis with respect to optimizing psychosocial conditions at work.

Although the concept of social innovation is gaining more attention in the light of today's impending workforce shortages, socially innovative principles of work (re)design to improve the quality of working life are rooted in early theoretical job stress models such as the Demand-Control (DC) Model (Karasek, 1979) and the Effort-Reward Imbalance (ERI) Model (Siegrist, Siegrist, & Weber, 1986). These models concentrate on how occupational stress reactions can be explained by the interplay between two main work characteristics: job demands and job resources. Job demands can be defined as work-related tasks that require short-lasting or persistent physical and/or psychological effort to meet the tasks, such as solving complex problems, lifting heavy objects, or dealing with interpersonal conflicts (De Jonge & Dormann, 2003, 2006; Hockey, 2000; Van den Tooren, 2010). Job resources, on the other hand, can be defined as instrumental or psychological means at work that can be used to deal with job demands, such as job autonomy (i.e. the opportunity to determine the order and method of one's work activities), emotional support from colleagues, or technical equipment (De Jonge & Dormann, 2003, 2006; Van den Tooren, 2010). Both the DC and the ERI Model predict that stress reactions at work occur when employees are faced with high job demands and insufficient job resources to effectively deal with these demands. Conversely, when employees have sufficient job resources at their disposal, these resources can be used to counteract negative strain effects of job demands (i.e., stress-buffering effect). Moreover, the availability of job resources can make the difference between a stressful and a challenging situation, with the latter being associated with positive employee outcomes (i.e., activation-enhancing effect; De Jonge & Dormann, 2003; Van Vegchel, 2005). This interplay between job demands and job resources is commonly operationalized as an interaction effect, in which the combined effect of high job demands and low job resources on job strain is larger than the sum of the separate effects of job demands and job resources. In other words, high job demands and low job resources can separately lead to job strain, but the particular combination of both high job demands and low job resources can further augment the level of job strain. This implies that the combination of experienced job demands and job resources should be considered to understand the occurrence of occupational stress as well as positive employee outcomes.

1.2 The current theoretical framework: The Demand-Induced Strain Compensation Recovery (DISC-R) Model

In 2003, De Jonge and Dormann introduced the Demand-Induced Strain Compensation (DISC) Model, a theoretical job stress model that builds on principles of the DC Model and the ERI Model. This model was later extended to the Demand-Induced Strain Compensation Recovery (DISC-R)

Model, as will become clear from the following paragraphs. The DISC Model further elaborates on the proposed stress-buffering effect of job resources by assuming that the probability of finding an interaction effect is higher when measures of job characteristics are specific and targeted, rather than broad and general (De Jonge & Dormann, 2003, 2006). This idea is reflected by two main principles of the DISC Model: the *multidimensionality principle* and the *matching principle*. The multidimensionality principle states that job demands, job resources, and work-related outcomes are multidimensional constructs that contain cognitive, emotional, and physical components (De Jonge & Dormann, 2003; Hockey, 2000). In this respect, job demands refer to those properties of a job that require cognitive, emotional, and/or physical effort (Jones & Fletcher, 1996; Van den Tooren, 2010). More specifically, cognitive demands impinge primarily on the human information processing (e.g., complex tasks that require concentration and precision), emotional demands refer primarily to the effort needed to deal with negative emotions during interpersonal transactions (e.g., conflicts between co-workers or confrontation with suffering patients), and physical demands primarily require effort associated with the muscular-skeletal system (e.g., lifting heavy objects) (De Jonge & Dormann, 2006). In the same manner, the nature of job resources can be primarily cognitive (e.g., information systems), emotional (e.g., colleagues providing a listening ear), or physical (e.g., ergonomic aids). Finally, also job-related health, well-being, and performance-based outcomes consist of cognitive, emotional and physical elements. These outcomes can be either negative or positive, such as concentration problems or employee creativity (i.e., cognitive outcomes), emotional exhaustion or emotional well-being (i.e., emotional outcomes), and physical complaints or physical well-being (i.e. physical outcomes). Overall, the multidimensionality principle makes the DISC Model particularly suitable for service work such as health care because especially in this sector employees are often imposed with highly demanding cognitive, emotional, and physical work tasks (De Jonge & Dormann, 2003).

The matching principle of the DISC Model (De Jonge & Dormann, 2003, 2006) proposes that the stress-buffering effect and the activation-enhancing effect of job resources occur more often when job demands, job resources, and outcomes belong to the same domain. For example, it is proposed that in a situation with high cognitive demands (e.g., solving a complex problem), it is particularly important to have cognitive resources available (e.g., information) to prevent negative cognitive outcomes (e.g., poor decision making; see also Devine & Kozlowski, 1995) and stimulate positive cognitive outcomes (e.g., creativity; see also Amabile, 1996). In a similar fashion, emotional resources (e.g., emotional support from colleagues) are most likely to mitigate the effects of high emotional demands (e.g., delivering bad news to patients) on emotional exhaustion and to enhance emotional well-being (see also Leiter & Maslach, 1988). Finally, in a situation with mainly

high physical demands (e.g., moving heavy objects), the availability of physical job resources (e.g., lifting device) may best prevent physical complaints and enhance physical fitness (see also Smedley, Egger, Cooper, & Coggon, 1995). Thus, the matching principle suggests that job resources should match with specific job demands in order to effectively prevent negative or enhance positive matching job-related outcomes. The roots of this principle can be found in the person-environment (P-E) fit theory (Edwards, Caplan, & Van Harrison, 1998; Ostroff & Schulte, 2007). The core premise of P-E fit theory in the context of work is that both positive and negative work-related outcomes do not arise from the person or environment separately, but rather by their match, fit, or congruence with one another (Edwards et al., 1998; Ostroff & Schulte, 2007). The DISC matching principle, however, is *job-oriented* rather than person-oriented. As such, it can be regarded as a Job-Job (J-J) fit, stating that different aspects of the job design (i.e., job demands and job resources) should be compatible (Daniels & De Jonge, 2010; Van den Tooren, 2010).

Furthermore, a key assumption of the DISC Model is that the matching principle works through employees' self-regulatory processes in combating job demands (De Jonge & Dormann, 2006; De Jonge, Demerouti, & Dormann, 2014): employees will generally try to cope with states of psychological imbalance induced by stressors at work (cf. Pomaki & Maes, 2002) by activating functional *matching* job resources. More specifically, workers who encounter specific job demands (i.e., cognitive, emotional, or physical) are generally inclined to use functional matching job resources to deal with these demanding aspects at work. The most easily available and best matching resources will be activated first. If matching resources are not available or depleted, employees may activate non-matching job resources instead. For example, a nurse who faces high emotional demands (e.g., an angry patient) will most likely be inclined to first activate emotional resources (e.g., emotional support from co-workers) to deal with the demanding situation. If emotional resources are not available, s/he may turn to cognitive resources instead (e.g., information or protocols about how to deal with angry patients). According to the DISC Model, however, non-matching job resources are less effective. Moreover, they are particularly likely to be used as a supplement to matching job resources, rather than a substitute for matching resources (Van den Tooren, 2010). That is, people are more inclined to use a combination of matching and non-matching resources, as opposed to the exclusive use of non-matching resources. In sum, based on the self-regulation principle and the matching principle it is assumed that the probability of finding interaction effects of job resources and job demands on employee outcomes is higher *within* domains than across domains (i.e., cognitive, emotional, and physical).

The integration of recovery from work in the DISC Model

In general, studies on the DISC Model have been supportive of its different theoretical principles (e.g., Daniels & De Jonge, 2010; De Jonge & Dormann, 2006; Van den Tooren, 2010; Van de Ven, 2011). Thus, to enhance positive work-related outcomes and prevent negative effects of specific types of high job demands, the availability of specific corresponding job resources seems vital. However, another line of research has shown that, next to job resources, *recovery from work* also fulfils a key role in combating potential negative effects of high job demands on employee health, well-being, and performance (e.g., Sonnentag, Binnewies, & Mojza, 2010; Sonnentag & Geurts, 2009). Recovery from work refers to the process where bodily systems that were activated on the job unwind and return to baseline levels (Geurts & Sonnentag, 2006). Specifically, the effort-recovery (E-R) theory (Meijman & Mulder, 1998) states that expending effort at work is inherently associated with so-called *load reactions* in the individual. Load reactions are physical and psychological responses to workload (e.g., higher blood pressure, fatigue) that can accumulate and lead to impaired health and well-being, unless individuals can recover during off-job hours. In other words, effort expenditure during work draws on an employee's internal resources, which have to be restored to prevent enduring states of fatigue and exhaustion (Hockey, 2000; Zijlstra & Sonnentag, 2006). By no longer being exposed to work demands, load reactions can return to pre-stressor levels through allostatic regulation processes (McEwen,1998). Allostasis refers to the internal process in which bodily systems adjust from one level of activation to the other, including the change from activity to rest (Sterling, 2004). As such, internal resources can be restored before the next working period starts.

Because of the important role of recovery from work in coping with job strain, off-job recovery has recently been integrated in the DISC Model as an additional explanatory variable, resulting in the Demand-Induced Strain Compensation Recovery (DISC-R) Model (see Figure 1.1) (De Jonge, Spoor, Dormann, & Van den Tooren, 2012; De Jonge et al., 2014). In the DISC-R Model, recovery from work is conceptualized and operationalized as detachment from work, which can be seen as a prototypical recovery experience and a powerful mechanism in the stressor-strain process (cf. Sonnentag & Fritz, 2007, 2015; Sonnentag & Geurts, 2009). Detachment from work refers to an ''individual's sense of being away from the work situation'' (Etzion, Eden, & Lapidot, 1998, p. 579) and includes cognitive, emotional, and physical absence from work. It is viewed as a psychological experience that is known to facilitate recovery from work (Demerouti, Bakker, Geurts, & Taris, 2009; Fritz, Sonnentag, Spector, & McInroe, 2010; Sonnentag & Geurts, 2009).

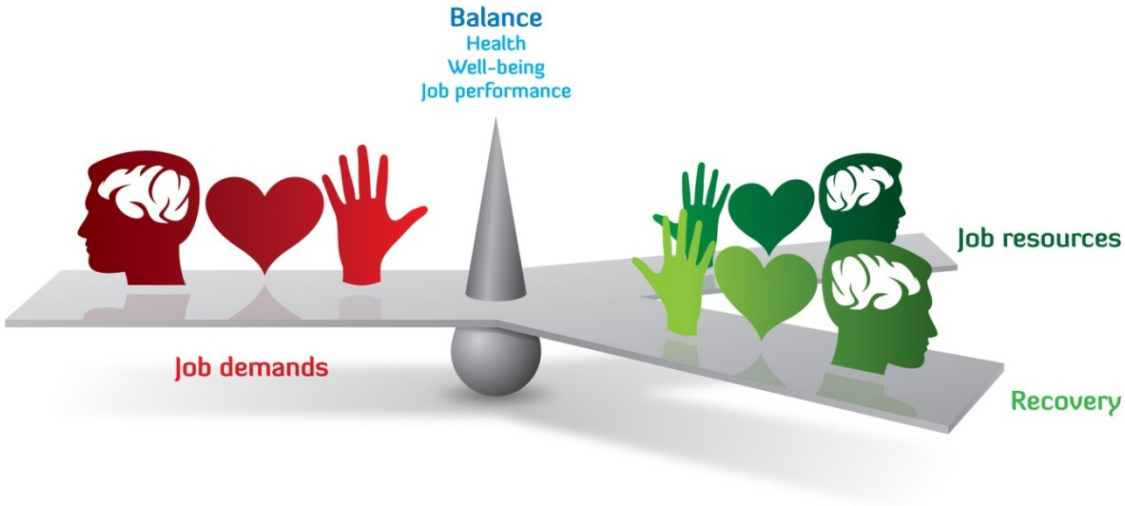

Figure 1.1. The Demand-Induced Strain Compensation Recovery (DISC-R) Model (De Jonge et al., 2014)

By detaching from work, two psychophysiological stress-response systems that have been activated during work, that is, the Sympathetic-Adrenal-Medullary (SAM) and the Hypothalamic-Pituatary-Adrenal (HPA) system, can return to baseline levels (cf. Geurts & Sonnentag, 2006; Sonnentag & Niessen, 2008). Put differently, detaching from work facilitates the allostatic down-regulation of the secretion of (nor)adrenaline and cortisol, so acute load reactions decrease and internal resources can be restored. By counteracting the accumulation of strain, detachment can, thus, prevent negative stress reactions caused by high job demands. It is assumed that a full degree of off-job recovery is attained when the employee feels that cognitive, physical, and emotional systems that were used during work have returned to their baseline levels after work (Sonnentag & Niessen, 2008). In line with both this assumption and the DISC dimensions, the DISC-R model differentiates between cognitive, emotional, and physical detachment from work (De Jonge et al., 2012, 2014). For example, employees can restore their cognitive, emotional, and physical internal resources after work by putting their thoughts of work aside (cognitive detachment), take emotional distance from work (emotional detachment), and shake off physical exertion from work (physical detachment).

Based on existing theories about the role of off-job recovery in the job stress process (Geurts & Sonnentag, 2006; Meijman & Mulder, 1998), the DISC-R Model portrays detachment from work as a complementary way to buffer negative effects from job demands, next to job resources (De Jonge et al., 2012, 2014). This implies that high job demands can result in negative employee outcomes, unless employees have sufficient job resources at their disposal and can detach from work sufficiently in order to deal with the demanding situation. As such, the model proposes an

additional, moderating effect of detachment in the relation between job demands, job resources, and job-related outcomes. In other words, the total stress-buffering effect of recovery from work and job resources is considered to be larger (i.e., synergetic effect) than the sum of their separate effects (De Jonge et al., 2012). In addition, following the DISC matching principle, it is assumed that detachment from work that corresponds with specific types of job demands will be most effective. For instance, in a situation with high physical demands (e.g., lifting heavy objects), physical detachment (e.g., adapting another body posture) might be particularly important in the recovery process. That is, by no longer lifting heavy objects, the specific physical system that was used for this task can recuperate through (allostatic) self-regulation, and physical internal resources can be restored.

On a final note, the DISC-R Model differentiates between two types of matching effects. The prevention of negative work-related outcomes through matching demands, resources, and detachment is referred to as the *compensation (stress-buffering) principle*, whereas the enhancement of positive work-related outcomes through match at work is referred to as the *balance (activation-enhancing) principle* (De Jonge & Dormann, 2003, 2006; De Jonge et al., 2014). This differentiation is in line with the previously addressed potential positive and negative effects of psychosocial work conditions on employee health, well-being, and performance. However, throughout this dissertation, the terminology of 'balance' between demands, resources, and recovery is used in relation to both stress-buffering effects and activation-enhancing effects. That is, the overall perspective in this thesis is that an optimal balance between different (matching) types of job demands, job resources, and recovery from work is a double-edged sword, which can prevent negative outcomes and increase positive outcomes simultaneously (cf. Pot & Vaas, 2008).

1.3 Gaps and shortcomings in empirical evidence

Although the DISC Model has generally received a reasonable amount of empirical support (e.g., Daniels & De Jonge, 2010; Van den Tooren, 2010; Van de Ven, 2011), thus far only one empirical study by De Jonge et al. (2012) has examined the extended DISC-R version. The research in the current thesis further examines this version of the model, by focusing on three main gaps in the existing empirical evidence: 1) theoretical and empirical strengthening of the role of recovery in the DISC-R Model; 2) dynamic and multilevel relations between the elements of the DISC-R Model; and 3) the practical value of the DISC-R Model ('valorization issue'). These three main gaps are described in more detail in the following paragraphs.

Theoretical and empirical strengthening of the role of recovery in the DISC-R Model

First of all, as mentioned in the previous paragraphs, the DISC-R Model portrays detachment from work as an additional, complementary job-stress buffer, next to job resources. However, it remains theoretically and empirically implicit how these job-stress buffers are related to each other and what exactly happens in the presumed synergy between off-job recovery and job resources. Thus, more research into the relation between job resources and detachment is needed to explicate this part of the model.

Second, research on recovering from work has rendered indications of an ambivalent role of detachment from work in relation to job related outcomes (e.g., Binnewies, Sonnentag, & Mojza, 2009; De Jonge et al., 2012). Studies have provided substantial empirical evidence of the positive effects of detaching from work on work-related health (e.g., Sonnentag et al., 2010). However, with regard to *performance-based* outcomes it is assumed that complete detachment from work might be detrimental for processes of learning and creativity to occur, whereas low detachment could be particularly beneficial for such processes (De Jonge et al., 2012, 2014). These assumptions are based on the idea that *not* thinking about work (i.e., high cognitive detachment) in leisure time restrains one from actively exploring new ideas for solutions to work-related problems, which, most likely, does not benefit work-related problem-solving attempts (cf. Fritz, Yankelevich, Zarubin, & Barger, 2010). Conversely, active work reflection (i.e., low cognitive detachment) might enhance employees' creative problem-solving ideas. Nevertheless, these assumptions remain to be further tested to make stronger statements about whether and when detachment from work is actually beneficial for employee performance.

Third, the DISC-R Model focuses exclusively on the operationalization of recovery from work as detaching from work during non-work hours. Indeed, detachment from work can be seen as an important recovery strategy that is most likely to take place during off-job hours (cf. Demerouti et al., 2009; Sonnentag & Geurts, 2009). However, other types of recovery, such as recovery *during* working hours (e.g., work breaks) or sleep, may also influence job demands, job resources, and work-related outcomes. Therefore, it is necessary to further investigate the role of recovery from work in relation to the other DISC-R elements by adapting a broader view of recovery from work.

Dynamic and multilevel associations between the elements of the DISC-R Model

To date, the DISC-R Model has only been examined with a cross-sectional study design (De Jonge et al., 2012), which is also the most prevalent design in previous studies on the DISC Model (Van den Tooren, De Jonge, & Dormann, 2011). Because this type of study design represents a 'snapshot' of the study variables, it does not allow for causal inferences and disregards possible

within-person fluctuations in momentary or daily states of health, well-being, and performance. Thus, most empirical evidence regarding the DISC-R Model reflects *static* as opposed to *dynamic* relations between job demands, resources, recovery, and work-related outcomes. As a consequence, there is still a lack of knowledge with respect to how different elements of the DISC-R Model interact and develop over time. Moreover, it is unclear to what extent dynamic associations between DISC-R elements can be explained at different levels, such as the day level (i.e., dynamics due to (changing) daily circumstances), the person level (i.e., dynamics due to individual differences), or the organizational unit level (i.e., dynamics due to group characteristics). That is, levels of and relations between job demands, job resources, recovery, and employee outcomes may differ between days, between individuals, and between groups. Hence, more research on dynamic relations between DISC-R elements from a multilevel research approach is badly needed (see also Mellor, Karanika-Murray, & Waite, 2012).

The practical value of the DISC-R Model ('valorization issue')

Finally, in line with the above argument, work redesign intervention studies in real-life settings (e.g., quasi-experimental research designs) are needed to establish causal interpretations between key elements of the DISC-R Model with more certainty (De Jonge, Dormann, & Van den Tooren, 2008; Kristensen, 2005; Van de Ven, 2011). Such studies can further contribute to knowledge on how relations between job demands, resources, recovery, and work-related outcomes develop over time as well as on whether and how these processes can be redirected in practice. Moreover, field intervention studies are essential to establish the validity of the assumptions of the DISC-R Model in terms of their application and valorization, as well as their consequences (see also Cox, Karanika, Griffiths, & Houdmont, 2007). That is, applying DISC-R propositions to real practice allows for the assessment of the model's practical guidance for psychosocial risk management and its potential impact on real-life health, well-being, and performance outcomes. In short, field intervention studies are imperative for shedding light on the practical value of the DISC-R Model.

1.4 Research problem and research aim

The current dissertation will examine the DISC-R Model from a dynamic process and redesign perspective. The core question of this thesis is how the balance between different types of job demands, job resources, and recovery during and after working hours can be optimized, to improve health, well-being, and performance of employees in health care organizations. To address this question, a deeper understanding of the DISC-R Model from both a theoretical and a heuristic point

of view is needed. In response to the identified gaps, the aims of the dissertation are (1) to theoretically and empirically strengthen the role of recovery in the DISC-R Model, (2) to gain insight in naturally occurring multilevel dynamics in associations between job demands, job resources, recovery, and work-related outcomes, and (3) to examine the practical value of the DISC-R Model by assessing the effectiveness of a group-level intervention method based on the DISC-R Model in practice. As such, the thesis will extend existing knowledge about the DISC-R Model and job stress theory in general. In addition, it will contribute to bridging the gap between theoretical knowledge and practical applications regarding job stress prevention and social innovation and fulfil an important valorization purpose. Figure 1.2 provides a general overview of the multilevel research perspective in this dissertation.

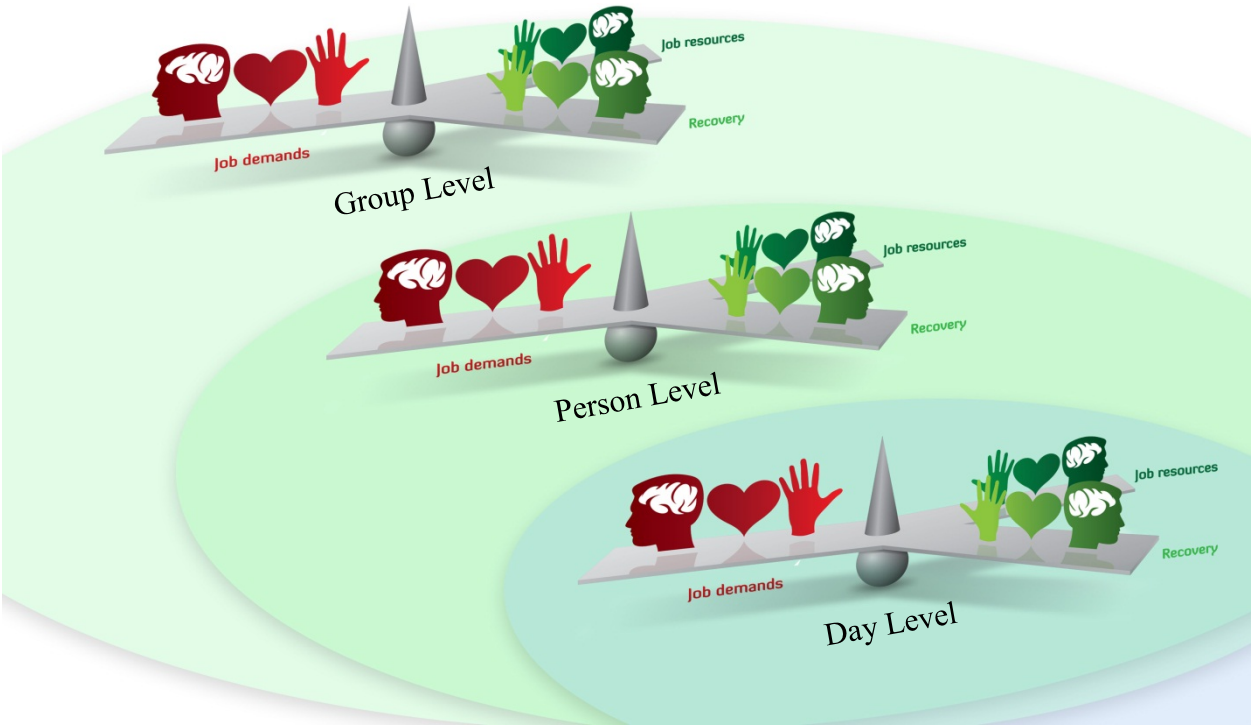

Figure 1.2. General overview of the multilevel research perspective.

To address the three research aims, an overall multi-method research project was designed, containing multiple daily diary studies as well as a longitudinal intervention study in health care institutions in the Netherlands. The study protocol that guided the content of the thesis to a large extent is described in Chapter 2 of this thesis. It should be noted, though, that the dissertation does not represent the exact same focus and facets of this study protocol. For instance, some of the research activities of the overall project, such as a cost-effectiveness analysis of the intervention

study, are still ongoing and not part of this dissertation. Also, to represent various health care settings, we combined data from the research project (i.e., hospital) with data from prior research (i.e., nursing homes) for one of the daily diary studies (Chapter 4). Furthermore, during the course of the research project, we deviated from the original study protocol in response to some unexpected external influences that were not under control of the researchers. First, shortly after baseline data collection, the hospital management announced a merger between two participating organizational units for reasons of cost containment. These units were originally situated in different locations and allocated to different experimental conditions in the intervention study (i.e., emergency room intervention and comparison group). A pragmatic solution was to change the study design for this particular department from a between-group to a within-group study design. That is, we continued the intervention development and implementation within this department and, due to the absence of a comparison group, evaluated the intervention effects by examining within-group changes over time. Second, in another intervention group (i.e., operating room department) it became apparent during the intervention development stage that there were issues that exceeded the scope of the project. In particular, employees in this group prioritized improvements in labor conditions instead of job content, even though boundary conditions for intervention development were communicated beforehand. After consultation with both the management and the employees, we proceeded with an intervention program for the less-prioritized job content issues. However, this intervention program was suddenly suspended when the internal facilitator of the main interventions for that department was detained by unexpected circumstances. Because this facilitator was the only person from within the hospital with the expertise to manage the planned interventions, no short-term replacement was possible. We did organize some alternative intervention activities to prevent possible negative effects of unfulfilled expectations from the employees in this intervention group (e.g., Aust, Rugulies, Finken, & Jensen, 2010). Nevertheless, because this process exceeded the timeline of the overall intervention study and the prioritized unit-specific issues were not addressed by the interventions in the research project, the department was excluded from the study sample of the intervention study in this dissertation (Chapter 5).

1.5 Overview of the thesis

This thesis consists of six chapters. Chapter 2 presents the study protocol of the entire research project that was set up in a Dutch general hospital, the so-called DISCovery project. It provides an overview of the theoretical background of the project, the approach towards intervention development, implementation, and evaluation, and guidelines for data collection and analysis with

regard to both the daily diary studies and the intervention study. As mentioned in the previous section of this introduction, the dissertation is largely, but not exclusively, based on the research project described in Chapter 2.

Next, the aims of the dissertation to theoretically and empirically strengthen the role of recovery in the DISC-R Model (study aim #1) and to gain insight in naturally occurring multilevel dynamics in associations between job demands, job resources, recovery, and work-related outcomes (study aim #2) are addressed by two daily diary studies (Chapters 3 and 4, respectively). Chapter 3 describes a daily diary study about the relation between recovery from work and job resources. In this study, the relation between recovery and job resources is examined simultaneously at the person level and the day level to determine whether and how the prevalence of one is associated with the prevalence of the other at both levels. Chapter 4 presents a daily diary study that elaborates on the question whether detaching from work is beneficial for performance outcomes, such as employee creativity. More specifically, the study focusses on the role of different types of detachment (i.e., cognitive and emotional) in the context of equivalent types of job demands and job resources and in the prediction of day-level change in employee creativity.

Chapter 5 addresses (1) the aim to theoretically and empirically strengthen the role of recovery in the DISC-R Model (study aim #1) and (2) the aim to examine the practical value of the DISC-R Model (study aim #3). This chapter describes a three-wave longitudinal multiple-case intervention study. In more detail, a specific group-level intervention method for stress prevention and social innovation based on the DISC-R Model (i.e., *DISCovery* method) is presented and evaluated in a quantitative and qualitative way. That is, both longitudinal survey data and data from a process evaluation (e.g., logbooks, interviews) are used to assess the outcomes of the intervention implementation. Moreover, the study aims to identify implementation conditions that contribute to intervention effectiveness.

Ultimately, Chapter 6 presents an overview and a general discussion of main findings, methodological considerations, and theoretical and practical implications of this dissertation. Chapter 6 ends with recommendations for future research and several concluding remarks.

CHAPTER 2

Design of the DISCovery project: Tailored Work-Oriented Interventions to Improve Employee Health, Well-Being, and Performance-Related Outcomes in Hospital Care

This chapter is largely based on:

Niks, I. M. W., De Jonge, J., Gevers, J. M. P., & Houtman, I. L. D. (2013). Design of the DISCovery project: tailored work-oriented interventions to improve employee health, well-being, and performance-related outcomes in hospital care. *BMC Health Services Research, 13,* 66.

"*Any study can only be as good as its design*"
(Taris, 2000, p. 5)

2.1 Introduction

Hospitals need to work more efficient than ever before to increase the quality of health care and at the same time reduce costs, which places a higher burden on health care staff. As a consequence, health care workers are often imposed with highly demanding cognitive, emotional, and physical work tasks (e.g., De Jonge, Le Blanc, Peeters, & Noordam, 2008; Elfering, Grebner, & Dudan, 2011; Smedley et al., 2003). Such demanding tasks that require effort are also referred to as job demands (Hockey, 2000; Van den Tooren, 2010). High levels of job demands can have negative effects on employees' health, well-being, and job performance (Rich, Lepine, & Crawford, 2010), unless workers have sufficient job resources to cope with their demanding jobs (Demerouti, Bakker, De Jonge, Janssen, & Schaufeli, 2001). Job resources can be described as work-related assets (i.e., tools, information, people, opportunities) that can be employed to deal with job demands (Van den Tooren, 2010). Examples of job resources are workplace social support and job autonomy. Because job demands often cannot be reduced, the idea to increase job resources instead to combat strain is appealing for today's working life in health care.

A new theoretical model regarding the stress-buffering role of job resources, is the Demand-Induced Strain Compensation (DISC) Model (De Jonge & Dormann, 2003, 2006). In addition to other job stress models, the theoretical basis of the DISC Model is premised on self-regulatory processes of match at work. The DISC Model assumes that job demands, job resources, and job-related outcomes are multidimensional factors comprised of cognitive, emotional, and physical components. It proposes employees to activate functional, corresponding job resources, to mitigate the negative effects of high job demands. In other words, different kinds of high job demands (i.e., cognitive, emotional, or physical) can best be compensated for by corresponding kinds of job resources to counteract negative job-related outcomes. For instance, emotional support from colleagues may particularly help to reduce emotional exhaustion caused by emotional labour (e.g., aggressive patients). Research findings have indeed shown that moderating effects are found more often for matching resources than for non-matching resources (Van den Tooren, 2010; Van den Tooren & De Jonge, 2008). Furthermore, it is proposed that optimal conditions for active learning, growth, creativity, and performance exist when a balanced mixture of (high) demands and corresponding job resources occurs (De Jonge & Dormann, 2003). Employees need both challenging demands and usable, matching, job resources to learn and to grow, and to feel well.

Indeed, a number of DISC studies showed that the combination of high cognitive demands and high cognitive resources was associated with different forms of cognitive well-being, such as high active learning and creativity (De Jonge, Dormann, & Van den Tooren, 2008), and professional efficacy (Van de Ven, Vlerick, & De Jonge, 2008).

Equally important as the role of (matching) job resources, is the process of recovering from job demands (Sonnentag & Zijlstra, 2006). Recovery is defined as the process opposite to the strain process that enables employees to regain the energy they expended at work and to rebuild resources that have been depleted during work (Meijman & Mulder, 1998). Recently, recovery from work was added to the DISC Model, here also distinguishing a cognitive component (e.g., no longer thinking of work), an emotional component (e.g., putting all emotions from work aside), and a physical component (e.g., shaking off physical exertion) (De Jonge, Spoor, Sonnentag, Dormann, & Van den Tooren, 2012). This is in line with Sonnentag and Niessen (2008), who proposed that a full degree of off-job recovery is attained when the employee feels that cognitive and physical as well as emotional systems called upon during work have returned to their baseline levels. According to De Jonge, Spoor, Sonnentag, and colleagues, (2012), recovery that matches particular demands will be most effective (e.g., emotional recovery in relation to emotional demands). The idea is that matching recovery may foster health, by restoring the specific internal resources that have been depleted by specific job demands. Overall, the expanded DISC-R Model (R for recovery) predicts that both job resources and recovery from work that correspond with the specific job demands will most effectively counteract negative effects of job demands, and create optimal conditions for health and performance. For example, high emotional job demands can lead to strong feelings of emotional exhaustion, unless employees have high emotional resources as well as a high level of emotional recovery from work.

Study objectives

As there is a gap between theoretical knowledge gained from work stress and performance models and their practical implications (Le Blanc, De Jonge, & Schaufeli, 2008), this study will apply key propositions of the expanded DISC-R Model to real practice. The main purpose of the DISCovery project is to develop and implement tailored work-oriented interventions to improve a healthy working life and job performance in a general hospital. Health care workers are ideally suited for practical applications of the DISC-R Model, because all three types of job demands (i.e. heavy physical work, negative emotion work, and complex work under pressure) are present in their work.

In line with the DISC-R model, the core question is how different types (i.e., cognitive, emotional, or physical) of job demands, job resources, and recovery during and after working hours

can be optimized to improve health and performance of health care workers. We expect that interventions targeted primarily at work, i.e., at specific job demands and particularly at changing corresponding resources and recovery aspects, will reduce detrimental effects and enhance beneficial effects. In other words, by providing employees with necessary, matching job resources and recovery opportunities for coping with job demands, hospitals may prevent unnecessary stress and strain, and improve worker well-being and job performance. Thereby, the study can contribute to human resources strategies to keep current staff in the house and to ensure longer employment.

Another contribution of this study will be to the area of patient safety and medical treatment errors. Although critical issues in this field have received a great deal of attention lately, little is known about the effects of job demands, job resources, and recovery from work on patient safety and treatment errors (Kessels-Habraken, 2011). Following DISC-R theory, it is expected that a well-balanced match of job demands, job resources, and recovery will lead to fewer treatment errors and better patient safety, due to increased job performance and reduced stress reactions (e.g., less concentration problems). Therefore, intervention effects are also assessed in terms of safety and error outcomes. The study should shed light on what the short-term (e.g., health, motivation, optimal resourcing, and recovery) and long-term (e.g., safety, performance, absenteeism, and turnover) effects of the intervention program are.

Finally, since there is a strong need for research exploring the processes that influence intervention outcomes (Nielsen, Taris, & Cox, 2010), special attention will be paid to learn why and under what circumstances work-oriented interventions succeed. Indicators for successful or unsuccessful implementation of interventions will be investigated, such as supervisor involvement and employee attitude towards the interventions. The implementation goal following this project includes the substantial involvement of stakeholders, as well as the dissemination and embeddedness of findings of the study in health care practice.

2.2 Methods and design

Study design

A quasi-experimental field study with a ‘non-equivalent control group pretest-posttest design’ will be conducted in a top general hospital with three locations in the Eastern part of Netherlands. Four existing organizational departments (consisting of a nursing department, a laboratory, an operating room department, and an emergency room department) within three locations of the hospital are chosen. All departments will provide both an intervention and a comparison group. In other words, four units become intervention groups ($n \approx 100$) and another four become comparison groups ($n \approx$

100). The study will comprise several successive phases, based on former experiences of the researchers with this kind of research (e.g., Spoor, De Jonge, & Hamers, 2010). Two types of research can be distinguished accordingly: (1) a longitudinal web-based survey study, and (2) a longitudinal daily diary study. After the baseline measures (T1) of both studies, existing and yet to be developed interventions will be implemented within the experimental groups. Figure 2.1 presents a flowchart of the design and measurements. To analyze short-term and long-term effects of the interventions, follow-up measurements will be taken one (T2) and two (T3) years after the base-line measures. In addition to the follow-up measurements, a process evaluation and a cost-effectiveness analysis will be carried out.

Participants

All employees working at the four hospital departments will be eligible to participate in the study. To obtain as much information as possible about each unit, temporary staff and apprentices will be included as well. The total group of participants will mainly consist of nurses, laboratory workers, doctors, and operating room teams, but will also include other job positions, such as management and administrative staff.

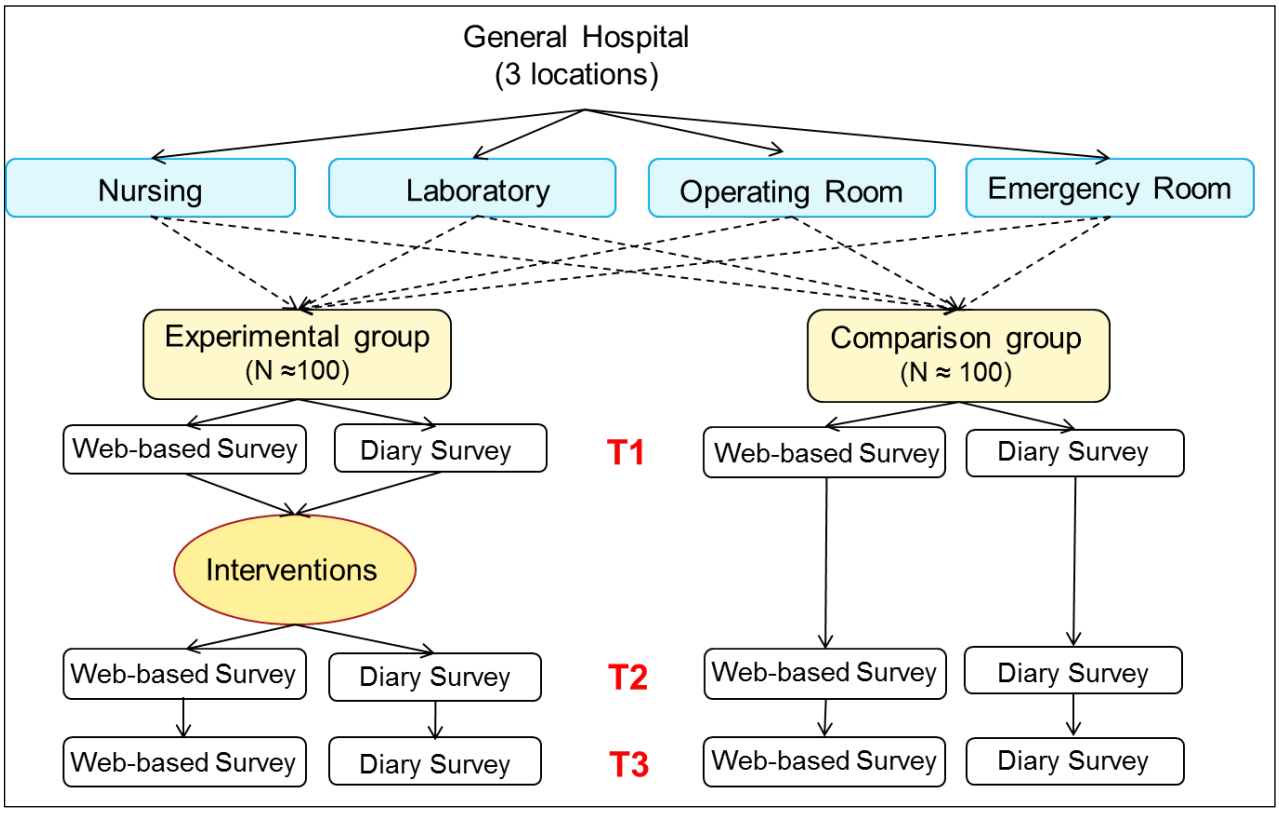

Figure 2.1. Flow chart design and measurements of the intervention study

The distribution of the department units in experimental and comparison groups will be made after the baseline data analysis, in close consultation with the hospital management. Each department will provide one experimental unit. The assignment of units to the experimental group will primarily be based on their scores on the key DISC elements (i.e., are job demands, job resources, and recovery at/after work out of balance?). Furthermore, response rate, unit size and other specific unit characteristics (e.g., representativeness, planned organizational changes) will be taken into consideration. Various department units will be eligible as comparison groups. After the experimental units have been chosen, one or more of the remaining units will be selected to function as comparison unit for each experimental unit, preferably based on similarities in the work contents and target population.

From the total pool of participants in the web-based survey study, a relatively smaller group will be selected to participate in the daily diary study. Although random selection is preferred, eligibility criteria based upon specific individual information of participants hamper this approach. First of all, participants will be asked to participate in all three daily diary studies (i.e., baseline and two follow-ups), requiring reasonable prospects of keeping the same job position for at least two years. Second, to exclude employees who are still in their familiarization period, participants should be active in their current job position for at least three months at the start of the base-line measures. Third, participants should work a certain amount of hours (e.g., 20 hours) within the course of the data collection, so a balanced amount of data from both working and non-working days can be collected. Therefore, the heads of all participating units will be asked to recruit employees that meet the criteria. Every unit will provide a certain number of participants in proportion to the unit size, together making a group of 80 participants.

Procedure

At the base-line measure, every participant will receive a unique link to the web-based survey. An electronic survey tool will randomly assign an identification number to each unique link and a daily diary survey tool will assign identification numbers to each unique device. The device numbers will be linked to the participants in a separate data file. The identification numbers of both studies will be retained and used for the follow-up measures. They are only available for the researchers and will only be used for analysis purposes. Monetary incentives will be offered to participants completing the web-based survey, as well as to participants completing the daily diary study.

The participants of the daily diary study will receive an iPod Touch® for ten consecutive days. They are asked to fill out a brief version of the internet survey on the device on two to three moments a day, on both working and non-working days. It will be investigated how people recover

during and after a working day, how this influences sleep duration, sleep quality, and general health, how it influences the use of particular resources and recovery opportunities, and how emotions relate to recovery. Because three daily survey studies will be conducted (one before and two after the interventions), we are also able to investigate the influence of the interventions on a daily level, given the measured constructs.

Measures

The measures that are used in both the baseline web-based survey and the daily diary survey are described below. With minor adjustments, the items of the web-based survey are made suitable for daily diary research (e.g., from "I need to display high levels of concentration and precision at work" to "Today I needed to display high levels of concentration and precision at work"). All adjusted items are scored on a 5-point Likert scale, ranging from 1 *(strongly disagree)* to 5 *(strongly agree).*

The results of the interventions will be determined with the same measures. Beside the survey measures, the effectiveness of the interventions will be evaluated with more objective indicators provided by the hospital (such as company-registered workplace absenteeism, turnover rates, error and near misses indicators, and financial performance), provided that involved parties formally allow the use of this information. To control for differences between the experimental and the comparison group as well as for possible confounders, several socio-demographic variables and variables regarding location and unit will be recorded, too. Whenever possible, supervisor- and/or peer-reports will be used to check for either self-report bias in several variables or convergent evidence between different kinds of assessments (e.g., for creativity, sickness absence, or performance ratings).

Predictor measures

Cognitive, emotional, and physical job demands and job resources will be measured with a well-validated version of the DISC Questionnaire (DISQ), which was particularly developed for testing the DISC Model in several languages (e.g., Van den Tooren & De Jonge, 2008). Example items of cognitive, emotional, and physical job demands are respectively "I need to display high levels of concentration and precision at work", "I have to deal with people (e.g., clients, colleagues or supervisors) whose problems touch me emotionally" and "I have to lift or move heavy persons or objects (more than 10kg)". Example items of cognitive, emotional, and physical job resources are respectively "I have the opportunity to take a break when tasks require a lot of concentration", "Other people (e.g., clients, colleagues or supervisors) offer me a listening ear when I have faced a

threatening situation", and "I am able to use adequate technical equipment to accomplish physically strenuous tasks". All scales consist of three items, except for the cognitive job resources scales, which has one item extra due to psychometric properties. All items will be scored on a 5-point frequency scale, ranging from 1 *(never or very rarely)* to 5 *(very often or always)*. In the diary study, a selection of two items from each scale will be used.

Cognitive, emotional, and physical home demands and home resources will be measured with one item each, due to space limitations. However, when the construct of interest is relatively narrow or is unambiguous to respondents, a single-item measure may be more appropriate (Wanous, Reicher, & Hudy, 1997). The items are specially developed for this study by adapting DISQ items to the private situation, e.g., "In my private situation I have to deal with a high level of physical demands" and "In my private situation I will get emotional support from others (e.g., family, friends or acquaintances) when a threatening situation occurs". All six items will be scored on a 5-point frequency scale, ranging from 1 *(never or very rarely)* to 5 *(very often or always)*. The six items will be used in the diary study as well.

Off-job recovery will be measured with a scale developed by De Jonge, Spoor, Sonnentag, et al. (2012), which contains a cognitive, emotional, and physical component. Each component will be measured with three items, e.g., "After work, I put all thoughts of work aside" (cognitive), "After work, I emotionally distance myself from work" (emotional), "After work, I shake off the physical exertion from work" (physical). For the diary study, a selection of two items from each scale and one extra item (i.e., "I have recovered sufficiently from my last work duty") will be used.

Recovery at work will be measured with three items derived from the off-job recovery scale and adapted to work breaks. Each of the three items reflects a different component (cognitive, emotional, and physical), e.g., "During a work break, I emotionally distance myself from work". All recovery items will be scored on a 5-point frequency scale, ranging from 1 *(never or very rarely)* to 5 *(very often or always)*. In the diary study, one item will be used to measure recovery at work (i.e., "During my work break(s), I was able to recover sufficiently from my work"), and an additional item is used to measure work break duration, with possible answers ranging from "less than 15 minutes" to "more than 60 minutes".

Health measures

Variables in this study that will be included to measure employee health are concentration problems, emotional exhaustion, depression, physical complaints, sleep quality, and sickness absenteeism.

Concentration problems will be measured with four items derived from a semantic differential scale developed by Meijman (1991). The 5-point response scale has two extremes, for example “No concentration difficulties” and “Concentration difficulties”. Three items will be used in the diary study.

Emotional exhaustion will be measured with the well-validated Dutch version (Schaufeli & Van Dierendonck, 2000) of the Maslach Burnout Inventory (Maslach & Jackson, 1986). The scale contains five items with a 7-point response scale ranging from 0 *(never)* to 6 *(always, daily)*. An example item is: “I feel emotionally drained from my work”. In the diary study, three items will be used.

Depression will be measured with two items from the Primary Care Evaluation of Mental Disorders patient questionnaire (Spitzer et al., 1994), that is, “During the past month, have you often been bothered by feeling down, depressed, or hopeless?” and “During the past month, have you often been bothered by little interest or pleasure in doing things?”. The possible responses are 1 *(no)*, 2 *(sometimes)*, and 3 *(yes)*. The combination of these two items has been suggested to be a useful measure to detect depression in primary care (Whooley, Avins, Miranda, & Browner, 1997).

Physical complaints refer to neck, shoulder, back, and limb problems in the last six months and will be measured with four items derived from a scale developed by Hildebrandt and Douwes (1991). The possible responses are 1 *(no)*, 2 *(sometimes)*, and 3 *(yes)*. Three items will also be used in the diary study.

Sleep quality will be measured by three items derived from the Maastricht Questionnaire (Appels, Höppener, & Mulder, 1987), for instance, “Do you often have problems falling asleep?”. The possible responses are 1 *(no)*, 2 *(sometimes)*, and 3 *(yes)*. In the diary study, one item will be used to measure sleep quality (i.e., “How do you rate the quality of your sleep?”), with a semantic scale ranging from “very bad” to “very good”. S*leep duration* will also be assessed in the diary study, using one item (i.e., “How many hours did you sleep?”), and a scale ranging from “less than 5 hours” to “more than 9 hours”.

Sickness absenteeism will be measured both subjectively and objectively. Two open questions from the Dutch National Working Conditions Survey (Koppes et al., 2012) will be used to measure self-reported frequency and duration of sickness absenteeism, e.g., “How many times have you been on sick leave within the last 12 months?”. Besides the self-report measures, sickness absence registrations will be provided by the Human Resources Department.

Well-being measures

Variables in this study that will be included to measure employee well-being are job satisfaction, work motivation, and emotions.

Job satisfaction and work motivation will be measured by items developed by De Jonge (1995). *Job satisfaction* can be considered as unidimensional and general construct, resulting from positive and negative work experiences. It will be measured with one item, that is, "I am satisfied with my present job". *Work motivation* is the extent to which the work is stimulating, interesting, and challenging and will be measured with two items, for instance, "My work is meaningful". All three items will be scored on a 5-point Likert scale, ranging from 1 *(strongly disagree)* to 5 *(strongly agree).* The same three items will be used in the diary study.

Emotions will be measured only in the diary study, by using eight items of the Job Related Affective Well-Being Scale (Van Katwyk, Fox, Spector, & Kelloway, 2000), for example, "Today during work, I felt enthusiastic". The items will be scored on a 5-point Likert scale, ranging from 1 *(strongly disagree)* to 5 *(strongly agree).*

Performance measures

To measure employee performance, the variables job performance, active learning, employee creativity, and counterproductive work performance will be included.

Job performance will be measured by six items from a scale developed by Roe, Zinovieva, Dienes and Ten Horn (2000), for instance, "Compared to the standards I usually get good results from my work". The items will be scored on a 5-point Likert scale, ranging from 1 *(strongly disagree)* to 5 *(strongly agree).*

Active learning refers to the degree to which employees are enabled and stimulated to acquire new knowledge and skills, and to solve problems at their job. This scale (Taris, Kompier, De Lange, Schaufeli, & Schreurs, 2003) consists of four items that are scored on a 4-point frequency scale, ranging from 1 *((almost) never)* to 4 *((nearly) always).* For example, "At work, I am challenged by new problems".

Employee creativity can be defined as the generation of new and useful ideas by employees. This work-related construct is assessed by a 7-item scale, originally developed by George and Zhou (2001), and translated into a well-validated Dutch version (e.g., De Jonge et al., 2008). The scale will be scored on a 5-point frequency scale ranging from 1 *(never)* to 5 *(always).* For example, "At work I come up with new and practical ideas to improve performance". Three items will be used for the diary study.

Counterproductive work performance will be measured with a selection of five items of deviant workplace behaviors from the scale developed by Kelloway, Loughlin, Barlin, and Nault (2002). Respondents will be asked to report how often they have engaged in each of the five listed behaviors in the recent past, with a 5-point frequency scale ranging from 1 *(never)* to 5 *(always).* For instance, "intentionally worked slowly" and "blamed your coworkers for your mistakes".

Control measures

Next to socio-demographic characteristics (i.e., age, gender, marital status, number of children living at home, education, job position, type of work shifts, contractual working hours, actual working hours), several personal characteristic measures (i.e., overcommitment, general self-efficacy, self-oriented perfectionism) will be included to control for individual differences. Past studies have shown that each of these personal characteristics could have an influence on health, well-being, and performance-related outcomes (Luszczynska, Gutiérrez-Doña, & Schwarzer, 2005; Stoeber & Childs, 2010; Van Vegchel, De Jonge, Bosma, & Schaufeli, 2005).

Overcommitment reflects a respondent's (in)ability to withdraw from work obligations and to develop a more distant attitude towards job requirements and is measured with three items from the Overcommitment Scale (Siegrist et al., 2004). For example, "People close to me say I sacrifice myself too much for my job". The items will be scored on a four-point Likert scale ranging from 1 *(strongly disagree)* to 4 *(strongly agree).*

General self-efficacy refers to one's belief in one's capability of meeting task demands in a broad array of contexts, and will be measured with the New General Self-Efficacy Scale (Chen, Gully, & Eden, 2001). The scale consists of eight items (e.g., "I am confident that I can perform effectively on many different tasks"), that will be scored on a 5-point Likert scale ranging from 1 *(strongly disagree)* to 5 *(strongly agree).*

Self-oriented perfectionism refers to unrealistic standards and perfectionistic motivation for the self and will be measured with three items from the 15-item subscale from the Multidimensional Perfectionism Scale (Hewitt & Flett, 1991). For instance, ''I strive to be as perfect as I can be.'' The items will be scored on a 7-point Likert scale, ranging from 1 *(strongly disagree)* to 7 *(strongly agree).*

The *DISCovery* method: risk assessment, intervention development and implementation

A participatory action approach for diagnosis, development, implementation, and evaluation of workplace interventions will be used, the so-called *DISCovery* method (De Jonge, Spoor, Hamers, & Bergman, 2012). This method is aimed at optimizing a balance between job demands, job

resources, and recovery from work. The purpose is to get insight into employee health, well-being, and performance, to investigate hindering and stimulating factors which are associated with these outcomes, and to implement workplace interventions to increase these outcomes. The *DISCovery* method consists of three successive steps: (1) a psychosocial risk diagnosis, merely based on a web-based survey and/or digital daily surveys using the DISC Model as a theoretical framework; (2) participatory action research (PAR) approach in which both employees and management are responsible for the initialization and development of interventions (Dollard, Le Blanc, & Cotton, 2008); and (3) a work-oriented intervention program, including a process evaluation. The application of the three steps of the method in this study is outlined below.

In the first step of the *DISCovery* method (i.e., the psychosocial risk diagnosis), so-called DISC risk profiles are developed for each participating unit based on baseline survey results. These profiles portray a balance between job demands, job resources, and recovery after work, and are complemented by identical profiles applied on the private situation (i.e., home demands, resources, and recovery). The latter type of profiles will function as a way to check if a lack of balance could also be explained by non-work related factors. Figure 2.2 shows an example of a unit-profile where the physical DISC job components seem out-of-balance (indicated by the dotted area). The DISC risk profiles will be the starting-point to generate ideas for workplace interventions.

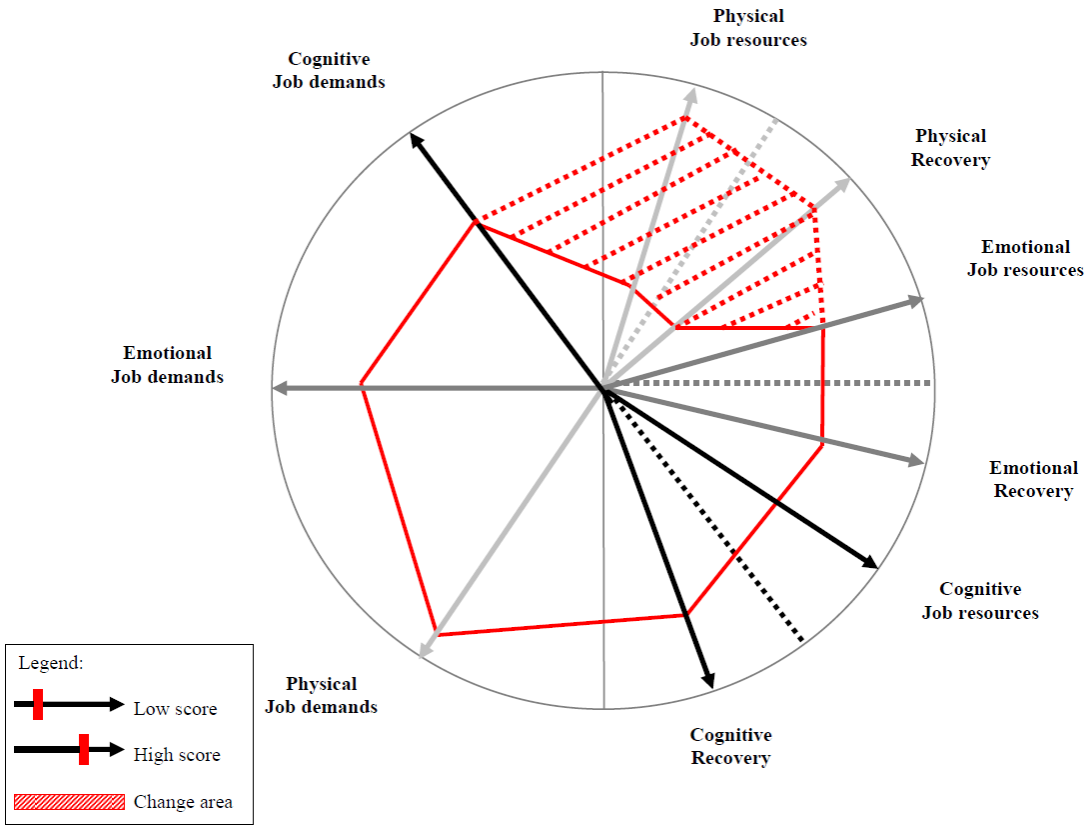

Figure 2.2. Example of a DISC-R risk unit-profile

In the second step of the *DISCovery* method, a participatory action research (PAR) approach will be used, in which both employees and management are responsible for the initialization and development of work-oriented interventions. The philosophy behind PAR is that organizational interventions designed to promote employee health cannot take place without the participation and experience of the subjects under study (Griffiths, 1999). As a matter of fact, all people involved will become the 'owners' of the problems. The effectiveness of PAR in intervention research has been demonstrated empirically (e.g., Mikkelsen, Saksvik, & Landsbergis, 2000). Dollard and colleagues (2008) pointed out that PAR as a philosophy and method embodies core ingredients of successful stress management interventions, and therefore holds promise for the reduction of stress hazards in contemporary working life. They also argued that PAR has the added potential of contributing to organizational sustainability, as organizations learn to continuously solve problems as new issues emerge. In the current study, PAR will consist of six different steps. First, feedback meetings about the results of the diagnosis with a steering group (higher management and researchers) and a project group (line management, human resources advisors, and researchers) will take place. During these meetings, preliminary ideas about interventions can already be introduced and discussed by all parties. The steering group can also veto interventions beforehand, if they seem unfeasible for any reason (e.g., hiring more staff). Second, feedback meetings are organized with each experimental unit about the results as presented in the DISC risk profile (e.g., see Figure 2.2). Third, subsequent to the feedback meetings, brainstorm sessions will be held with each experimental unit about possible work-oriented interventions. During these sessions an efficacious prioritization method to choose interventions will be used (De Jonge, Spoor, Hamers, & Bergman, 2012). Every participant will receive three post-it notes to write down ideas for possible interventions that may contribute to a (partial) solution of the identified problems. This can be done either individually or in small groups of 2-3 persons. Next, the post-it notes with ideas for interventions will be pasted on a flip-chart. Ideas are clarified to all participants and grouped together in different intervention types. A list of interventions will be written down, including possible ideas of the project and steering group. All participants receive three stickers, which they paste on the flip-chart behind their individually preferred intervention. They can either make a personal top-3 or put all three stickers behind one particular intervention. This will result in a specific ranking list with a top-3 of interventions for every experimental unit. Fourth, the steering and project group will be consulted about the several top-3 intervention lists and possible actions to be taken to implement the interventions. Most important are urgency, feasibility, and individual, departmental and organizational values, reflected in short and long term actions. Also, employee preferences should weigh heavily in the final choice of interventions. Fifth, conclusions of the fourth step will be reported to the experimental units and

they will be asked for reactions and commitment. Sixth, higher management makes a final decision in consultation with employees, lower management and researchers, about which interventions will be implemented on each experimental unit.

In the third step of the *DISCovery* method, workplace interventions will be actually implemented, some of which already exist and others that are to be developed. During the process of developing and implementing interventions, the researchers will be supported by external consultants wherever necessary. The interventions are primarily work-oriented rather than worker-oriented, in order to provide more effective and sustainable solutions (Le Blanc et al., 2008). They will mainly be targeted at matching cognitive, emotional, or physical aspects of work and/or recovery, depending on the specific unit-profiles. For instance, if a unit-profile displays that (high) physical job demands, (low) physical job resources and (low) physical recovery are out-of-balance, an intervention aimed at increasing physical job resources or improving physical recovery at/after work can be chosen during the PAR-method in order to counteract the relatively high physical job demands. One intervention possibility is to check if there is sufficient adequate technical equipment to accomplish physically strenuous tasks. It can also be important to find out if already available physical resources are used correctly by the employees (De Jonge & Dormann, 2003). Another example is the introduction of smarter rosters directed at limiting long working hours and night work (Klein Hesselink, De Leede, Goudswaard, 2010). Interventions could also be implemented by means of a workshop, for example a workshop ‘how to cope with physical demands by effective physical recovery’ (De Jonge, Spoor, Hamers, & Bergman, 2012). To conclude, based on the outcome of the PAR-method, the precise intervention program will be determined.

2.3 Intervention evaluation

We will evaluate the short- and long-term effects of the workplace interventions with the first and second follow-up surveys, respectively. After the first follow-up survey, we will investigate if the interventions have led to higher motivation, improved performance and better health. After the second follow-up survey it can be determined if the expected positive effects of the interventions were also noticeable one year later. The results of the follow-up surveys will be displayed in the DISC risk profile for each unit, next to the base-line scores. As such, the change over time within specific job demands, job resources, and recovery opportunities will be made visible for all parties involved.

With an econometric cost-effectiveness analysis (e.g., Strijk, 2012) carried out by an econometrician, intervention costs will be compared with the obtained benefits due to reduced

sickness absence, reduced turnover, improved work productivity, reduced number of incidents, and increased economic performance. Dividing the difference in total costs between the intervention and comparison groups (ΔC) by the difference in effects (ΔE), will result in incremental cost-effectiveness ratios (ICERs) in terms of health, well-being and performance-related outcomes. The time horizon for the cost-effectiveness analysis will be 18 months, starting at the kick-off of the interventions.

Since the study takes place in a dynamic environment, a wide area of external factors could influence the results. A process evaluation will be carried out to gain insight into factors that either stimulated or hindered successful implementation, as well as the effectiveness of the interventions (Semmer, 2006). First, the heads of the participating hospital units will be asked to keep track of all important changes and events on and surrounding their unit in a logbook (e.g., reorganization, interpersonal conflicts, new equipment). They will receive a periodical reminder to fill out the logbook, from the beginning of the base-line measures until the end of the follow-up measures. The logbook will be used to interpret possible changes in performance, well-being, and health in both the intervention and the comparison groups. If necessary, the information in the logbooks will be extended by interviewing the heads of department and other staff members. Second, a semi-structured questionnaire will be used for all participating groups to count how many and what kind of actions were taken as part of the intervention. In this way, it can be examined if the comparison groups implemented interventions on their own initiative. Finally, cultural differences between the locations and units that either have a positive or a negative influence on the effectiveness of the interventions will be mapped. Overall, intervention evaluation criteria proposed by Scharf et al. (2008) will be followed as much as possible, such as participation of workers and management and the inclusion of different organizational levels.

Statistical analysis

Hierarchical regression analysis (SPSS) and structural equation modeling (LISREL or AMOS) will be applied to test cross-sectional baseline relations between specific types of job demands, job resources, recovery, and job-related outcomes. In order to analyze causal associations within the three different waves of all digital surveys, structural equation modeling will be used, as this technique is more useful to rule out alternative assumptions. Multilevel regression analysis (MLwiN) will be used to investigate the relation between job demands, job resources, recovery, and health/performance outcomes, based on data from the three daily surveys (level 1: three waves; level 2: day-level predictor and control variables; level 3: person-level control variables). To evaluate the results of the interventions after the follow-up measures, multilevel repeated measures

analysis will be performed using MLwiN. This technique has several advantages compared to repeated measures MANOVA, such as the inclusion of cases with incomplete data and less restrictive missing data assumptions. Finally, to study change in organizational interventions, knowledge about the type of change underlying the instruments used is needed. Next to assessing baseline factorial validity and reliability, the factorial stability over time (known as alpha-beta-gamma change) of the key measures will be examined (De Jonge, Van der Linden, Schaufeli, Peter, & Siegrist, 2008). Drop-outs will be documented and included in the data-analysis to the point of drop-out. Possible attrition effects (e.g., spurious and under- or overestimated relationships among the study variables) will be analyzed according to the guidelines by Goodman and Blum (1996).

Sample size calculation

Sample size calculation is based on emotional exhaustion, measured by the Dutch version (Schaufeli & Van Dierendonck, 2000) of the Maslach Burnout Inventory (Maslach & Jackson, 1986). This measure is chosen because of the availability of norm scores for nurses, which is a frequently occurring job position in both the intervention and comparison groups. The score ranges between 1 and 7, with an average score of $M = 1.62$ and a standard deviation of $SD = .85$. Setting alpha at 0.05, beta as 0.20 and $\Delta = .43$ (half a standard deviation as a clinically minimal relevant difference; Norman, Sloan, & Wyrich, 2003), results in a required $N = 148$ ($n = 74$ for the intervention group and $n = 74$ for the comparison group) (Cohen, 1977). However, the total number of employees in the four participating departments ($N \approx 200$) somewhat exceeds the required sample size. Taking drop-outs into account, this sample is expected to be large enough to detect significant effects.

Ethical considerations

The Medical Ethics Committee Region Arnhem-Nijmegen of the UMC St. Radboud has exempted the current study from ethical approval: the committee confirmed that the current study is carried out in the Netherlands in accordance with the applicable rules concerning the review of research ethics committees and informed consent (reference number: 2012/546). In addition, both higher and lower management of the hospital have given their consent after ample presentation of the research plan. Finally, potential participants have been informed about the research plan, the nature of the study and voluntary participation, by means of an introduction letter and information gatherings at every participating unit. Participants in the daily diary studies will be asked to sign an informed consent. Throughout the whole research project, it will be stressed that employees participate on a

voluntary basis, that confidentiality is guaranteed, and that they can withdraw from the study at any moment.

2.4 Discussion

Health care workers in today's general hospitals have to deal with high levels of job demands, which could have negative effects on their health, well-being, and job performance. Prior research has indicated that job resources and recovery opportunities can counteract these negative effects and improve positive work-related outcomes (e.g., creativity and active learning behavior), specifically if they match with the type of job demands (i.e., cognitive, emotional, or physical). So far, the translation from theory into practice has not yet been fully made: it is still unclear how the balance between job demands, job resources, and recovery opportunities can be optimized by means of workplace interventions. The current research will contribute to filling this gap between theory and practice. The aim of the DISCovery project is to develop and implement tailored work-oriented interventions, to improve a healthy working life and job performance in health care.

Strengths and limitations of the DISCovery project

Because a systematic and theory-driven analysis of work-related risk factors is often lacking in stress intervention research (Richardson & Rothstein, 2008; Semmer, 2006), a first strength of the study is the theory-driven diagnosis of specific risk factors with both a longitudinal survey study and a longitudinal daily diary study. A second strength is the use of the Participatory Action Research (PAR) approach, which involves multiple stakeholders and allows health care employees to participate in the development and implementation of the interventions. This approach will stimulate problem ownership and commitment at all levels of the organization and has the potential to contribute to organizational sustainability (Dollard et al., 2008). A third strength is that the interventions will be primarily work-oriented, targeted at the source of job stress problems. Whereas individual-level strategies can offer short-term solutions, addressing the sources of job stress (i.e., the stressful working situation) can provide more effective and sustainable solutions (Le Blanc et al., 2008). Furthermore, interventions taking place at the workplace, including multiple, representative health care settings (i.e., different departments in a general hospital) and a diverse, heterogeneous sample (i.e., different job positions), will provide good external validity of the findings with regard to other hospitals and health care institutions. A fourth strength is that, next to self-report measures, more objective measures such as sickness absenteeism and turnover rates will be collected. A cost-effectiveness analysis will be carried out to compare intervention costs with a

number of ‘hard’ outcomes, such as sickness absenteeism and turnover rates, safety and error rates, and work productivity. In previous research, there has generally been a lack of inclusion of ‘hard’ measures next to ‘soft’ measures. A final strength of this study is that different types of interventions can be compared on respectively similar outcomes, which is an important contribution to both theory and practice (Richardson & Rothstein, 2008).

Besides strengths, a few limitations can be identified. One limitation of the study is that the design is not truly experimental. For practical and ethical reasons it is impossible to randomly assign participants to the intervention and comparison groups. The participating units in this project are existing organizational units and, in line with the participative nature of the research, the hospital management will have an important vote in the distribution of the units into intervention and comparison groups. However, various units from each of the four departments will be eligible as comparison groups. This provides the opportunity to compare different units, and to make an adequate selection of a comparison group for each intervention unit, based on similarities in work content and target population (e.g., job position, sex, age, educational level). Another limitation is that a wide area of external factors could influence the results (e.g., reorganization, company and/or departmental policy changes), since the study takes place in a dynamic environment. Yet, a process evaluation will give insights into the kind and the extent of external influences.

In spite of these limitations, the DISCovery project offers a carefully considered triangulation of research methodologies to develop and implement tailored work-oriented interventions and to assess the effects on health, well-being, and performance-related outcomes.

CHAPTER 3

The Relation Between Off-Job Recovery and Job Resources: Person-Level Differences and Day-Level Dynamics

This chapter is largely based on:

Niks, I. M. W., Gevers, J. M. P., De Jonge, J., & Houtman, I. L. D. (in press). The relation between off-job recovery and job resources: person-level differences and day-level dynamics. *European Journal of Work and Organizational Psychology.*

"*Life is about effort and restitution of effort*"
(Åkerstedt, Nilsson, & Kecklund, 2009, p. 205)

3.1 Introduction

Recent societal developments, such as an ageing population and decreasing financial resources, are placing increasingly high demands on health care staff, a group that is already at high risk for work-related stress (Shimizu, Mizoue, Kubota, Mishima, & Nagata, 2003). Highly demanding work situations, characterized by for instance time pressure and a heavy workload, can negatively affect employees' health and well-being (cf. Crawford, LePine, & Rich, 2010; Demerouti, Le Blanc, Bakker, Schaufeli, & Hox, 2009). Moreover, in healthcare settings, stressful working conditions can threaten the quality of patient care and patient safety (Berland, Natvig, & Gundersen, 2008; Laschinger & Leiter, 2006). Nevertheless, a growing body of research has shown that there are at least two important aspects that can counteract potential negative consequences of high demands within the workplace: job resources and recovery from work (e.g., Bakker & Demerouti, 2013; De Jonge, Spoor, Sonnentag, Dormann, & Van den Tooren, 2012). Job resources are work-related assets (i.e., opportunities, data, people, tools) that can be employed to deal with job demands (De Jonge, Demerouti, & Dormann, 2014; Van den Tooren, 2010), such as job autonomy or co-worker support. For instance, health care workers might be able to deal better with aggressive patients if they can count on support from one another. Recovery from work, on the other hand, refers to the process where bodily systems that were activated on the job unwind and return to their baseline levels (Geurts & Sonnentag, 2006). More specifically, by recovering from work during off-job hours, job-related strain that accumulated during work can return to pre-stressor levels before the start of the next working period (Demerouti, Bakker, Geurts, & Taris, 2009). For example, after a hard day's work, one might recover from work by engaging in leisure activities that take one's mind of the demanding day.

Although the beneficial effects of recovery from work and job resources are evident, less is known about the relation *between* the two. Recently, it has been proposed that the joint beneficial effect of recovery from work and job resources is larger (i.e., synergetic effect) than the sum of their separate effects (De Jonge et al., 2012). However, it remains unclear what exactly happens in the presumed synergy between off-job recovery and job resources. Are both job-stress buffers indeed positively related, and if so, in what way? For instance, does recovery enhance the mobilization of job resources? And if there is a positive relation between recovery and job resources, can it be

attributed to individual differences or to changing (daily) circumstances? To gain insight into the relation between off-job recovery and job resources, it is therefore important to consider both between-person differences (e.g., are highly recovered people more likely to mobilize job resources?) *and* within-person differences (e.g., are persons more likely to mobilize job resources on days that they feel highly recovered?) (cf. Fleeson, 2004; Sheldon, Ryan, & Reis, 1996).

In this study, we aim to provide insight into the way off-job recovery and job resources are related, by shedding light on the presumed synergy between both aspects. More specifically, we investigate the *daily* process of recovering from work during non-work time, in relation to levels of job resources that individuals report, grounding the suggested relations on existing theoretical principles and recent empirical findings. By conducting a daily diary study, we are able to investigate both between-person differences and within-person daily dynamics between off-job recovery and job resources. Integrating these two approaches addresses the need for testing comprehensive models of the joint psychological effect of both situational variables and individual differences on organizational outcomes (D'Amato & Zijlstra, 2008). It allows us to learn more about longer-term impact of individual tendencies, as well as short-term (daily) processes (e.g., Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009a), thereby acknowledging the fact that typical individual's behavior is usually highly variable (Fleeson, 2004). As such, the contribution of this study to the literature is twofold. First, we add to the literature about combating job stress by providing insight into differences in the daily process of recovering from work and the activation of job resources due to underlying individual tendencies. Second, literature on predictors of job resources is still very scarce and limited to either cross-sectional designs or to longitudinal designs with relatively long time spans (Hakanen, Perhoniemi, & Toppinen-Tanner, 2008; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009b). In the current study, we shed light on the ways different job-stress buffers (i.e., recovery and job resources) are related on a daily basis, by investigating whether daily fluctuations in the amount of job resources can be predicted by one's state of being recovered. This might provide clues about how to optimize levels of job resources in day-to-day work life, which can be relevant with regard to reducing (daily) job strain.

Theoretical reflections

A theoretical model that incorporates both job resources and off-job recovery, hence providing an excellent starting point to explain and investigate the relation between both aspects, is the so-called Demand-Induced Strain Compensation Recovery (DISC-R) Model (De Jonge & Dormann, 2003, 2006; De Jonge et al., 2012). The DISC-R Model is a theoretical job-strain model that proposes that states of psychological imbalance induced by stressors at work (i.e., high demands), activate self-

regulatory processes (cf. Pomaki & Maes, 2002). More specifically, individuals will generally strive to combat stress by balancing high job demands with the activation of internal (personal) or external (job) resources. Internal resources refer to an individual's sense of their ability to control and impact upon their environment successfully (Hobfoll, Johnson, Ennis, & Jackson, 2003), such as energy or self-regulatory resources. External resources are resources provided by the environment (e.g., organizational and social), which are conceptualized as job resources within a work context (cf. Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Examples of such external resources are job autonomy and emotional support from colleagues. When coping with job stressors, internal and external resources can be of equivalent use (cf. Hobfoll, 2002). For instance, when a nurse needs to deal with a stressful situation (e.g., an angry patient), resilience is likely to be quite helpful (cf. Van Erp, Rispens, Gevers, & Demerouti, 2014), but when the individual lacks this internal resource, emotional support from a coworker may be helpful to the same extent.

An important condition for the effective functioning of self-regulatory processes, as proposed by the DISC-R Model, is that resources that have been used need to be restored. According to the conservation of resources (COR) theory (Hobfoll, 1998, 2001, 2011), the threat of losing resources, the actual loss of resources, or the failure to gain resources after considerable resource investment can lead to psychological stress reactions. A way to prevent these stress reactions is through resource investment, that is, "people must invest resources in order to protect against resource loss, recover from losses, and gain resources" (Hobfoll, 2001, p.349). According to Gorgievski and Hobfoll (2008), energy resources are typically the ones people invest and even deplete, with the expectation based on prior experience that they will get replenished without much effort. However, the inability to replenish these energy resources may lead to long-term fatigue, which hampers normal functioning in many aspects in daily life, including work. In other words, restoration of consumed resources seems vital.

A general assumption is that depleted resources can be restored and additional resources (such as increased energy) can be gained by removing job-related demands during off-job time (Fritz & Sonnentag, 2005; Hobfoll, 1989, 2001; Meijman & Mulder, 1998). More specifically, the effort-recovery theory (Meijman & Mulder, 1998) points out that expending effort at work is inherently related to so-called load reactions in the individual (e.g., higher blood pressure, fatigue). Load reactions can accumulate and lead to impaired health and well-being, unless individuals can recover during respite from work. By no longer being exposed to work demands, load reactions can return to pre-stressor levels, and recovery can occur before the next working period starts. Therefore, the DISC-R Model incorporates the recovery concept of detachment from work as an additional way to buffer negative effects from job demands, alongside job resources (De Jonge et al., 2012; De Jonge

et al., 2014). Detachment from work during off-work time refers to an ‘‘individual’s sense of being away from the work situation’’ (Etzion, Eden, & Lapidot, 1998, p. 579), encompassing cognitive, emotional, and physical absence from work. It is viewed as a psychological experience that is known to facilitate (daily) recovery (Demerouti, Bakker, et al., 2009; Fritz, Sonnentag, Spector, & McInroe, 2010). In other words, whereas recovery from work refers to the entire process of internal resource replenishment, detachment from work can be seen as an important strategy to enhance the process of recovery (cf. Sonnentag & Geurts, 2009). By detaching from work, bodily systems that have been activated during work can return to baseline levels (cf. Geurts & Sonnentag, 2006; Sonnentag & Niessen, 2008). Put differently, detaching from work facilitates the down-regulation of load reactions, so internal resources can be rebuilt. For example, engaging in off-job activities that appeal to other systems than the ones used during work, or by not engaging at all in effort-related activities, can help to replenish one’s energy resources (cf. Geurts & Sonnentag, 2006).

Although the importance of the availability and restoration (i.e., recovery) of internal and external resources is evident, the link *between* recovery and external (job) resources remains empirically implicit. The question remains how the investment and restoration of internal and external resources takes place in the work context and what the role of detachment from work is in this process. In the next section, we will formulate specific hypotheses about the link between off-job recovery and job resources, based on the DISC-R Model, COR principles and recent empirical findings in this field of research.

Recovery and the cumulative gain process of internal and external resources

According to Hobfoll (2001), losing and gaining resources have a cumulative nature - those who have fewer resources to begin with are more prone to resource loss and less capable of resource gain because they have a smaller pool of resources that can be used for resource investment. Contrarily, those with more resources are more likely to gain more. Indeed, the longitudinal study of Xanthopoulou et al. (2009b) showed a positive relation between personal (i.e., internal) resources at time 1 and job resources at time 2, about 18 months later. This is also in line with Frese and Zapf (1994), who argued that using job resources requires *extra effort* necessary for task accomplishment, which implies that additional (internal) resources are needed to activate job resources. For example, changing a stressful situation at work by asking for help or using decision authority (i.e., activating job resources) might come at the cost of using energy or self-regulatory resources. It seems, therefore, that it is not merely the presence of job resources that matters, but also employees’ *ability* to use them. As mentioned earlier, internal resources are defined as an individual’s sense of their ability to control and impact upon their environment successfully

(Hobfoll et al., 2003). Thus, as proclaimed by the COR resource investment principle (Hobfoll, 2001), a certain level of internal resources seems necessary to activate subsequent external (job) resources. In other words, the question is to what extent employees are able to make the extra effort needed for resource activation, through the investment of self-regulatory and energy resources. Using these internal resources, though, will lead to resource depletion, if restoration of internal resources (i.e., recovery) does not occur.

In the absence of job demands, employees can "switch off" from work, thereby facilitating recovery. Various studies have found support for this assumption. For example, Kühnel and Sonnentag (2011) revealed a decrease of emotional exhaustion and an increase of work engagement immediately after vacation, implying that internal individual resources were restored. Although the positive effects of vacationing faded out over time, daily recovery, to a certain amount, seemed to compensate for the consumption of resources restored during vacation. In another study, Binnewies, Sonnentag, and Mojza (2010) found that recovery experiences during the weekend (such as detachment from work) predicted the state of being recovered at the beginning of the working week. The state of being recovered in turn was positively related to weekly task performance, personal initiative, and organizational citizenship behavior, and negatively related to perceived effort. Similarly, Debus, Sonnentag, Deutsch, and Nussbeck (2014) showed that the more a person felt recovered in the morning of a specific day, the more flow he or she experienced on average during that day. The results of these studies suggest that when individuals are highly recovered they may have more resources available that can be allocated to work tasks and thus benefit performance. Moreover, when detaching oneself from work during leisure time, work demands no longer consume resources needed for self-regulation, which facilitates the restoration of internal resources that were used during work (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Fritz et al., 2010). As mentioned before, the DISC-R Model proposes that self-regulation underlies the activation of internal and external resources (De Jonge & Dormann, 2003). Building on this premise, it seems that detachment from work can restore both energy and self-regulatory resources, which in turn can be used to activate subsequent resources. This is also in accordance with the aforementioned cumulative nature of resources (Hobfoll, 2001).

In conclusion, off-job recovery may constitute an important linking pin in the cumulative gain process of internal and external resources. First, as detachment is seen as a facilitator for recovery (Demerouti, Bakker, et al., 2009; Fritz et al., 2010) and in line with the findings of Binnewies et al. (2010), we expect a positive relation between detachment from work and the state of being recovered at the start of a working day (i.e., the degree to which recovery occurred). Second, being recovered from the last working day implies that *internal* self-regulatory and energy resources have

been restored (Kühnel, Sonnentag, & Westman, 2009). In correspondence with the COR resource investment principle (Hobfoll, 2001), these internal resources can be tapped to activate subsequent *external* (job) resources. Hence, we expect a positive relation between one's state of being recovered and one's level of job resources. Finally, in line with our theorizing, we expect detachment from work and job resources to be *indirectly* related. An indirect effect between predictor and criterion is indicated if predictor and outcome are *not* directly related, but if a predictor is related to an intervening variable that in turn links the predictor to the outcome (Mathieu & Taylor, 2006, 2007). As such, we suggest a sequence of effects, with detachment being an initiator and the state of being recovered being the linking mechanism (cf. Binnewies et al., 2010).

As mentioned earlier, we are interested in between-person *and* within-person differences in o predicting an individual's level of recovery and job resources on a given day (cf. Sheldon, Ryan, & Reis, 1996). The assumption is that people differ on their baseline levels of detachment, the state of being recovered, and job resources, due to certain stable, enduring personal characteristics. At the same time, we also assume that for every individual there will be days where the respective levels are higher or lower than usual, that is, their scores will fluctuate around their own mean. Investigating potential causes of these daily fluctuations in one's state of being recovered and level of job resources (while controlling for between person differences) might give clues of how to increase one's daily level of job resources and state of being recovered, regardless of the individual baseline level. Using a daily diary method, we will therefore test the suggested relations at both person level and day level, resulting in the following hypotheses:

Person level

H1: Individuals with high levels of detachment from work will generally have a higher state of being recovered before going to work.

H2: Individuals with a high state of being recovered before going to work will generally report higher levels of job resources.

H3: Detachment from work and job resources will be *indirectly* related in a way that the state of being recovered is the linking mechanism between both aspects at the person level.

Day level

H4: Detachment from work after a working day will be positively related to the state of being recovered at the beginning of the subsequent working day.

H5: The state of being recovered at the beginning of a working day will be positively related to the level of job resources during that day.

H6: Detachment from work and job resources will be *indirectly* related in a way that the state of being recovered is the linking mechanism between both aspects at the day level.

3.2 Method

Procedure and participants

This daily diary study was part of a larger research project in a general hospital. In this project, the participants filled out a baseline and a follow-up survey of a longitudinal study. In consultation with the heads of the participating hospital units, we approached 80 employees who were expected to be working at least 16 hours during the course of the data collection of the diary study. To encourage participation, monetary incentives were offered to participants completing the diary study. A total of 79 employees from nursing departments (24%), operation rooms (41%), a laboratory (23%), and an emergency room (13%) volunteered to take part in this study. All participants received a handheld device (iPod Touch) and printed instructions about how and when to use the device. They were instructed to complete short surveys on eight consecutive days, including both working days and nonworking days. On a working day, the participants filled out surveys on three different moments: before work (T1), after work (T2), and at bedtime (T3). On non-working days, the participants only completed surveys after waking up (T1) and at bedtime (T3). In the current study, the analyses are based on the data collected on working days because those days allowed for the assessment of job resources.

After data was collected, it turned out that twelve participants filled out the surveys incompletely or incorrectly (e.g., more than three surveys filled out on a single day), or missed a large amount of measurement moments (more than 50% of the measurement moments that were expected based on their self-reported work-nonwork pattern). To ensure reliability of the data, these participants were excluded from the analysis. Attrition analyses showed no significant differences on the demographic and key variables on day 1 for those who completed less than 50% of the measurement moments compared to the remaining participants. The final sample consisted of 67 participants and 341 daily observations; 54 participants were female (81%) and 13 male (19%). Their mean age was 42.7 (SD = 11.6) years.

Measures

The daily diary survey measured the state of being recovered, detachment from work, job resources, and several control variables.

The state of being recovered refers to the outcome of the entire process of off-job recovery and was measured before work (T1) with one item that was developed for this particular study: "I am sufficiently recovered from my last work shift". The response categories ranged from 1 (*completely disagree*) to 5 (*completely agree*). The item is based on the Intershift Recovery subscale of the Occupational Fatigue Exhaustion Recovery scale (Winwood, Winefield, Dawson, & Lushington, 2005), which consists of three items that reflect the extent to which recovery is achieved from one work shift to the next. As this construct is relatively narrow and unambiguous to respondents, a single-item measure seemed more appropriate (Wanous, Reicher, and Hudy, 1997), especially in the light of relatively high intrusiveness of multiple daily measurements.

Detachment from work was measured at bedtime (T3) with 6 items derived from the scales that were developed by De Jonge et al. (2012), reflecting a cognitive, emotional, and physical component of detachment. These dimensions are in line with Sonnentag and Niessen (2008), who proposed that a full degree of off-job recovery is attained when the employee feels that cognitive, emotional, and physical systems called upon during work have returned to their baseline levels after work. Each dimension was measured with two items, for example: "After work, I put all thoughts of work aside" (cognitive); "After work, I emotionally distanced myself from work" (emotional); and "After work, I shook off the physical exertion from work" (physical). The items were scored on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). For detachment from work we created a lagged variable (i.e., detachment at T3 on the previous day) with the respective command in SPSS (version 20) to assess effects of detachment from work on the next day's state of being recovered (T1).

Job resources were measured right after work (T2) with 6 items of the shortened DISC-Questionnaire (DISQ-S 2.1; De Jonge et al., 2009; cf. Bova, De Jonge, & Guglielmi, 2013) that were adapted to refer to the specific workday (i.e., daily measurement). In accordance with the DISC-R Model (De Jonge & Dormann, 2003, 2006; De Jonge et al., 2012) and similar to the detachment items, the job resources scale reflected a cognitive, emotional, and physical component, with two items for each dimension. Cognitive job resources refer to the opportunity to determine a variety of task aspects and to use problem solving skills, for example, "Today, I was able to determine my own work method". Emotional job resources refer to emotional support from colleagues or supervisors, for example, "Today, I was able to count on emotional support from others (e.g., clients, colleagues, or supervisors) when a threatening situation at work occurred ".

Finally, physical job resources refer to instrumental support from colleagues and supervisors, or ergonomic aids at work, for example, "Today, I was able to use adequate technical equipment to accomplish physically strenuous tasks". The job resources items were also scored on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

In this particular study, we did not a priori expect differential relations with *specific* dimensions of detachment and job resources, but merely *overall* relations between the study variables, while still accounting for their multidimensional nature. Therefore, we conceptualized these variables as aggregate multidimensional constructs (Edwards, 2001). To test the appropriateness of aggregating the items of different dimensions, we performed a confirmatory factor analysis specifying a second-order two-factor model (model 1), with cognitive, emotional, and physical detachment loading on one factor, and cognitive, emotional, and physical job resources on another. Subsequently, we compared this model to the alternative six-factor model (model 2). According to the criteria formulated by Hair, Black, Babin, and Anderson (2010), results revealed a good model fit for both model 1 (χ^2 = 93.12, *df* = 47, $p < .001$, root mean square error of approximation (RMSEA) = .06, comparative fit index (CFI) = .96, Tucker-Lewis index (TLI) = .94, and standardized root mean squared residual (SRMR) = .05) and model 2 (χ^2 = 82.12, *df* = 39, $p < .001$, RMSEA = .06, CFI = .96, TLI = .94, SRMR = .05). However, the values of the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) were both smaller for model 1 (AIC = 6299.771 and BIC = 6455.448) than for model 2 (AIC = 6304.922 and BIC = 6489.564), indicating a slightly superior fit of model 1 with regard to model parsimony (Akaike, 1974; Schwarz, 1978). There was no significant correlation between both second-order factors (r = .01, p = .53). Additionally, we assessed the internal consistency reliability of the multidimensional measures. Because the number of measured cases varied between days, the reliability coefficients were averaged across eight days. This resulted in $\alpha = .83$ for detachment from work and $\alpha = .71$ for job resources, suggesting that the respective constructs were rather consistent. Therefore, we used the aggregated multidimensional constructs to test the hypotheses of this study.

Control variables

To rule out alternative interpretations of the study results, we included a number of control variables. First, as sleep plays a very important role in the process of recovery (Baumeister, 2002; Zijlstra & Sonnentag, 2006), we assessed the daily hours of sleep and sleep quality as additional predictors of the state of being recovered before work. It might be that good sleep during the night compensates for poor detachment during the evening. *Sleep hours and sleep quality* were measured with the daily survey before work (T1), with one item each. The corresponding items were "How

many hours did you sleep?" with a 6-point response scale, ranging from 1 (*less than 5 hours*) to 5 (*more than 9 hours*), and "How do you rate the quality of your sleep?" with scale anchors ranging from 1 (*very poor*) to 4 (*very good*). Second, previous research has indicated the relevance of age and gender with regard to job resources, recovery, and sleep (e.g., Day & Livingstone, 2003; Huang, Liu, Wang, Van Someren, Xu, & Zhou, 2002; Krishnan & Collop, 2006; Sonnentag, 2003). Therefore, they were included as control variables, too. Age and gender of the participants were derived from the longitudinal study.

Data analysis

Because all participants responded to the same questions for eight consecutive days, we had day-level data (level 1) nested within persons (level 2). We used the Mplus software (Muthén & Muthén, 2010) to test the hypotheses with multilevel structural equation modeling (MSEM; see Figure 3.1).

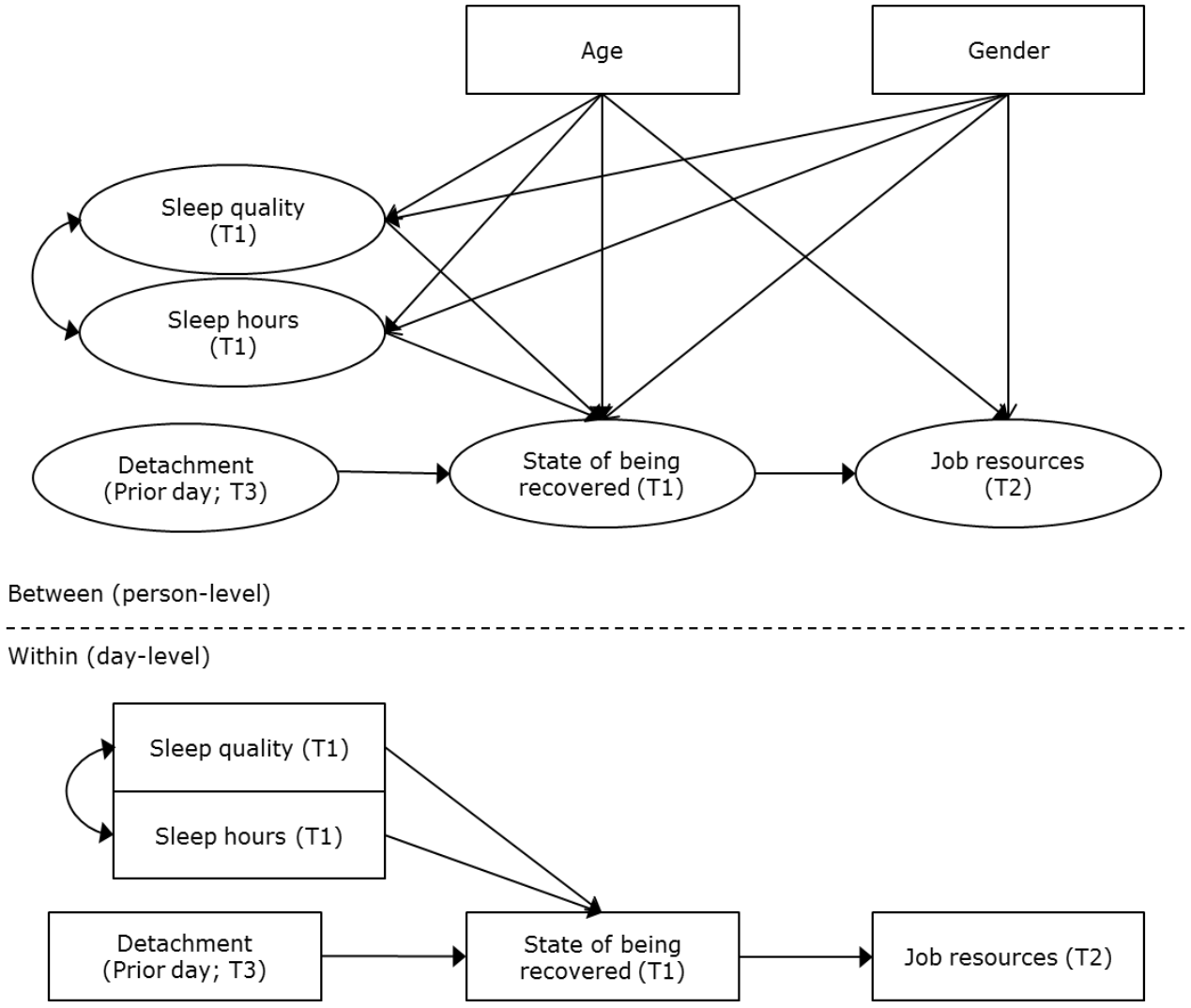

Figure 3.1. Hypothesized model of this study

Next to analyzing the predicted pathways, this approach allowed us to test for indirect effects of sleep hours, sleep quality, and detachment from work on the level of job resources. We did not integrate the measurement model into the multilevel model, to avoid model non-identification due to insufficient cases for the number of parameters to be estimated on both levels (Mehta & Neale, 2005). For all study variables, except for age and gender, variance components were modeled at the person level and the day level to account for both between- and within-person variability respectively (Mehta & Neale, 2005; Preacher, Zyphur, & Zhang, 2010). In other words, we expected differences between individual baselines of sleep quality, sleep hours, detachment, the state of being recovered, and job resources (between-person variance), and that for each person their scores on these variables fluctuate across days (within-person variance). By modeling the variables on both levels, the possibility that day-level relations between the study variables are due to differences between persons can be ruled out. Finally, age and gender were only modeled at the person level (i.e., no daily fluctuations), with age being centered around the grand mean.

3.3 Results

Table 3.1 presents means, standard deviations, and correlations among the study variables. To determine whether multilevel modeling was justified, we examined the intra-class correlations (ICC) of the outcome variables, which show how much of the variance may be attributed to the different levels of the analysis.

Table 3.1. *Means, Standard Deviations, and Correlations Among Study Variables*

	Mean	*SD*	1	2	3	4	5	6	7
1. Age	42.70	11.51	-						
2. Gender	.81	.39	-.07	-					
3. Detachment (prior day)	3.89	.58	.19	.12	-	.03	.25***	.19***	.03
4. Sleep hours	3.22	1.09	-.33**	.05	-.12	-	.44***	.18***	-.08
5. Sleep quality	2.95	.65	.01	.37**	.09	.44***	-	.17**	-.02
6. State of being recovered	3.75	.94	.28*	.37**	.48**	.14	.77***	-	.13*
7. Job Resources	3.44	.53	-.29*	.22	.05	.21	.16	.34**	-

Note. Correlations below the diagonal are person-level correlations (N = 67). Correlations above the diagonal are day-level correlations (N = 341). *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

For job resources, 59% of the variance could be explained by between-person differences and 41% by within-person differences. The respective percentages for the state of being recovered were 45% (between-persons) and 55% (within-person). Finally, the ICCs of detachment, sleep quality, and sleep hours showed that also for these variables a substantial proportion of the variance could be attributed to within-person variations (ranging from 57-71%). These results confirmed the multilevel structure of our data and, thus, supported the choice for multilevel modeling.

Testing the hypothesized model

The fit of the hypothesized MSEM model to the data was very good: χ^2 = 14.42, *df* = 12, *p* = .275, RMSEA = .02, CFI = .98, TLI = .95, SRMR = .05 (within level) and .07 (between level). Figure 3.2 depicts the final model based on the results of multilevel structural modeling, including standardized estimates of path coefficients. The level of statistical significance was set at $p \leq .05$. However, *p*-values at the level of .10 are also reported for the main effects (i.e., $p \leq .10$). Although not statistically significant, this kind of results can provide clues for possible power-related type II errors (i.e., concluding that a supposed effect or relation does not exist when in fact it does) and, as such, directions for future research.

At the person level, we proposed a positive relation between detachment from work and the state of being recovered (H1), as well as between the state of being recovered and job resources (H2). Both hypotheses were supported: detachment from work was positively related to the state of being recovered (β = .36, *p* = .006), which in turn was positively related to job resources (β = .38, *p* = .011). Put differently, people who generally detached well from work also felt more recovered before work than people with lower scores on detachment from work (see also Von Thiele Schwarz, 2011). Similarly, people who generally felt more recovered before work also reported a higher level of job resources than people who generally scored lower on their state of being recovered before work. The control variables at the between-person level showed various significant relations with the predictor and outcome variables. First, sleep quality was positively related to the state of being recovered (β = .75, *p* < .001). Second, age was negatively related to both job resources (β = -.40, *p* = .001) and sleep hours (β = -.34, *p* = .014). Finally, gender was positively related to sleep quality (β = .36, *p* = .010), implying that females generally reported a better sleep quality than males. As the results at the person level showed that detachment from work and sleep quality predicted the state of being recovered, and the state of being recovered predicted job resources, the state of being recovered might be the linking mechanism between detachment and job resources (i.e., indirect relation - H3). In addition, sleep quality might also be linked to job resources through the state of being recovered. Therefore, we examined the indirect effects from detachment from work and sleep

quality on job resources, using the respective commands in Mplus (Muthén & Muthén, 2010) and the online interactive tool of Preacher and Selig (2010) for creating 95% confidence intervals (CIs) for the indirect effects. Results revealed a statistically non-significant indirect relation between detachment from work and job resources (β = .14, p = .053, CI = .01–.33), thereby not supporting Hypothesis 3, and a significant indirect relation between sleep quality and job resources (β = .28, p = .021, CI = .04-.69).

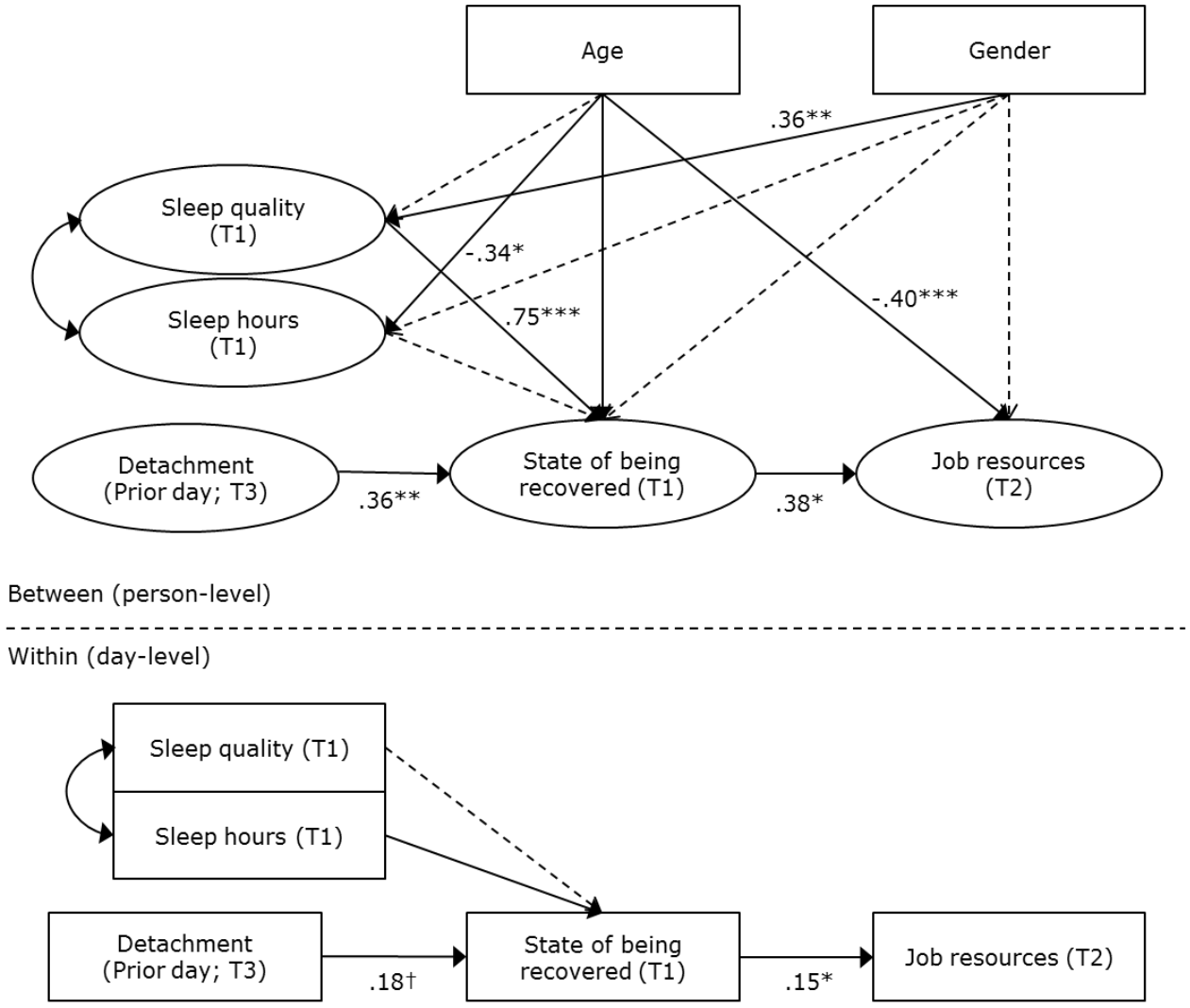

Figure 3.2. Final model based on results of multilevel structural equation modeling. †$p \leq .10$; *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$. The dashed lines represent the paths that were statistically non-significant at $p > .10$.

At the within level, we also expected a positive association between detachment from work and the state of being recovered (H4), as well as between the state of being recovered and job resources (H5). Although the estimated path coefficient from daily detachment from work at T3 to the state of

being recovered on the next day at T1 was in the hypothesized direction, it was not statistically significant on the .05 level (β = .18, p = .074), thereby not supporting Hypothesis 4. The relation between the daily state of being recovered at T1 and daily job resources at T2 was relatively small but significant (β = .15, p = .044), providing support for Hypothesis 5. In other words, on days that individuals felt more recovered before going to work, they also reported a higher level of job resources by the end of their working day. Regarding the control variables, we did not find any significant relations between the day-level sleep variables and the day-level state of being recovered.

Finally, as the path between detachment from work and the state of being recovered was not significant at the within level, the conditions for indirect effects between detachment and job resources through the state of being recovered were not met (H6). Thus, Hypothesis 6 was not supported by our data.

3.4 Discussion

The aim of this study was to provide insight into the way that job resources and recovery from work are related to each other. Both characteristics have an important function in buffering job-related strain and, as such, can contribute to improved health and well-being of employees (e.g., Bakker & Demerouti, 2013; De Jonge et al., 2012). However, little is known about the relation between job resources and recovery and, more specifically, whether and how the prevalence of one is associated with the prevalence of the other. In this daily diary study, we simultaneously examined the relation between job resources and recovery on the between-person level and the within-person (day) level. In line with our expectations, results from multilevel analyses revealed that detachment from work in the evening is positively related to the state of being recovered at the beginning of the working day, and that the state of being recovered is positively related to the level of job resources. Moreover, the results indicated that both person-level differences and, to a seemingly lesser extent, day-level dynamics play a role in these relations. We discuss the findings in more detail below.

Implications for theory and practice

At the person level, the results indicated that individuals who generally detach more from work than others generally feel more recovered before work, and individuals who generally feel more recovered before work than others generally report higher levels of job resources. At the day level, our study addressed but did not confirm the link between daily detachment from work in the

evening and the daily state of being recovered at the beginning of the subsequent working day. However, we did find a positive trend, indicating that this relation might exist nonetheless. Future research should replicate the findings to allow for a stronger statement about this hypothesized relation. Nevertheless, the expected positive relation between the daily state of being recovered and daily job resources was indeed confirmed by the results: on days that employees felt highly recovered from their last work shift before going to work, they reported higher levels of job resources during their work shift on the same day. This finding is consistent with COR theory (Hobfoll, 1998, 2001, 2011), suggesting that having more resources at one's disposal to begin with (e.g., self-regulatory and energy resources) makes it more likely to gain more (e.g., job resources). Finding these results on the within-person as well as the between-person level demonstrates that the relation between recovery from work and job resources indeed seems to hold components on both levels: there are differences between persons in their general levels of recovery and job resources, but apart from that, it seems possible for individuals to manage their daily within-person levels of job resources to a certain extent. This provides some support for the self-regulation principle of the DISC-R Model (De Jonge & Dormann, 2003, 2006; De Jonge et al., 2012), which proposes that people generally deal with states of psychological imbalance through self-regulatory processes. That is, they can set goals and make modifications in their behaviors or cognitions if there is a discrepancy between a goal (e.g., feeling energized) and a current state (e.g., fatigue) (cf. Lord, Diefendorff, Schmidt, & Hall, 2010).

With regard to the control variables, the findings of the study show that *sleep quality* at the person level is closely related to the state of being recovered, whereas *sleep duration* at the person level is unrelated. Most likely, the general amount of hours a person sleeps is less important with respect to feeling recovered, as long as the sleep quality is good. On the contrary, *daily* sleep quality and sleep duration do not seem to influence the daily state of being recovered at the beginning of the subsequent working day. The reason we did not find (robust) within-person effects of sleep on being recovered the next day might be explained by the fact that poor sleep quality or a lack of sleep hours mainly becomes problematic when it accumulates over time (e.g., Van Dongen, Rogers, & Dinges, 2003). In other words, a single night of not sleeping well might be relatively easy to overcome. Finally, age was negatively related to job resources at the person level. A possible explanation can be found in Rhodes' (1983) model of age-related differences in work behavior, which showed how physiological aging processes can negatively affect the basic cognitive and psychomotor abilities required to successfully perform work activities. In this sense, older employees might depend more on job resources to perform well than younger employees, which could make the absence of job resources more salient to this group.

Against our expectation, we did not find indirect effects with the state of being recovered being the linking mechanism between detachment and job resources. A possible explanation is that in the temporal sequence between detachment from work and the state of being recovered the next morning sleep might be an additional and interrelated linking mechanism. More specifically, detachment might be related to sleep, which in turn is related to the state of being recovered and, indirectly, to subsequent job resources. In fact, the results did show indirect effects from sleep quality on job resources through the state of being recovered at the person level.

Overall, the findings of the current study provide some support for the view that next to sleep detachment from work allows for the restoration of an individual's internal resources (Baumeister et al., 1998; Sonnentag et al., 2010), which is reflected in the state of being recovered at the beginning of a working day (Binnewies, Sonnentag, & Mojza, 2010). In turn, these internal (self-regulatory and energy) resources can enhance the ability to activate subsequent job resources, according to the self-regulation principle as proposed by the DISC-R Model (De Jonge & Dormann, 2003, 2006; De Jonge et al., 2012).

Results from our study also have practical implications. Organizations should not solely focus on providing sufficient job resources, but also make sure employees can recover from work when being at home. This can down-regulate the bodily systems that were activated during work and, as such, restore the internal resources necessary for the activation of job resources. Detachment from work can be enhanced, for instance, by establishing spatial and technological work-home boundaries (Park, Fritz, & Jex, 2011; Sonnentag, Kuttler, & Fritz, 2010). Decreasing expectations for employees to enact work-related roles at home during off-work hours could provide them with more time to "switch off" from work. Furthermore, Sonnentag and colleagues (2010) propose the following approaches for detachment: engaging in non-work activities that require full attention, developing "rituals" that help to detach, and sharing information with spouses about the working day directly after work and then move on to other topics for the rest of the night. Finally, organizations could offer training and counseling to their employees about how to effectively detach from work (e.g., by increasing recovery-related self-efficacy; Sonnentag & Kruel, 2006) and about how to enhance sleep quality. The latter can be improved by sleep hygiene measures, such as regular bedtimes and a decrease of the intake of alcohol or caffeine before bedtime (Mastin, Bryson, & Corwyn, 2006).

Study limitations and future research

Although the study followed a strong design with multiple daily measurements, it also has some limitations. First, the analyzed data only relies on self-report and, thus, can be subject to common

method bias (Podsakoff, MacKenzie, & Podsokoff, 2012). However, by taking into account individual baselines on the between-person level, the possibility that day-level results can be attributed to general individual tendencies can be partially ruled out. Moreover, it can be argued that variables such as detachment from work, feeling recovered, and the level of job resources are individual perceptions that fluctuate on a daily basis, therefore being difficult or impossible to be rated by anyone else other than the concerning individual (Podsakoff et al., 2012; Spector, 2006). For future research it would be interesting, though, to include physiological measures (such as neuroendocrine and cardiovascular indicators) as additional recovery indicators (cf. Geurts & Sonnentag, 2006), or objective data and supervisor or peer ratings regarding the availability of job resources. The latter could provide information about the extent to which there is a gap between the level of job resources that are actually available or perceived by others, and the level of job resources perceived by an individual.

Second, although the multilevel structural equation model in this study was theoretically grounded and showed a good fit to the data, the relations between the study variables are correlational in nature and could also be modeled differently. It cannot be excluded that models with alternative causal ordering could show a good fit to the data as well. Therefore, no strong inferences about causality of the relations between the study variables can be made. Nevertheless, we did analyze the reverse model with job resources at T2 predicting detachment from work at T3. The results showed a worse fit of this alternative model to our data (χ^2 = 27.44, *df* = 10, *p* = .002, RMSEA = .08, CFI = .87, TLI = .62, SRMR within-level = .06, and SRMR between-level = .09), thereby supporting the current causal ordering. For future research it would be interesting to further examine whether job resources can (indirectly) predict recovery (e.g., through reduced job strain levels), and to investigate the role of possible confounders in the relation between (daily) recovery and job resources, such as affect, work-home interference, and off-job activities.

Third, our study was based on a rather specific sample, consisting mainly of females. It would be interesting to replicate our study in occupational groups other than health care that might also be at risk for psychological or physical health complaints (e.g., technology sector; Van de Ven, 2011). We expect that the dynamics between recovery and job resources will also become apparent in other more gender-mixed occupational groups because the current study was based on general theoretical principles that apply to all sorts of work.

As in this study no differential relations were expected a priori with different dimensions of detachment and job resources (i.e., cognitive, emotional, and physical), it was more parsimonious to examine the variables as aggregate multidimensional constructs. However, for future research it would be interesting to examine the relative importance of each dimension in the interplay between

recovery and job resources, in relation to specific job demands. It might be, for example, that in jobs where physical job demands are very high, physical detachment is more directly related to internal energy resources (and therefore to the activation of job resources) than emotional and cognitive detachment.

Conclusion

This study highlights the importance of recovering from work, in the sense that it does not only help individuals by repairing negative strain effects (Demerouti, Bakker, et al., 2009), but can also function as a catalyst in the activation of job resources, both at the person level and, to a lesser extent, at the day level. As such, recovery from work and job resources should not be seen as 'stand-alone' job strain buffers, but as two positively related mechanisms that might help employees to effectively deal with job demands.

CHAPTER 4

The Dark and Bright Sides of Detachment from Work: A Day-Level Study on Creativity

This chapter is largely based on:

Niks, I. M. W., De Jonge, J., Gevers, J. M. P., & Houtman, I. L. D. (2015). The Dark and Bright Sides of Detachment from Work: A Day-Level Study on Creativity. *Manuscript submitted for publication (Revise & Resubmit).*

"*I never made one of my discoveries through the process of rational thinking*"
(Albert Einstein)

4.1 Introduction

After a hard day's work, should employees set their work aside and disengage from it to replenish their energy levels for the next day? Or is it more beneficial to let work-related thoughts and/or feelings linger during non-work time to address and solve work-related problems? Although research on recovering from job stress extensively demonstrated the positive effect of disengaging from work on health and well-being (e.g., Sonnentag, Binnewies, & Mojza, 2010; Von Thiele Schwarz, 2011), recent studies suggest that the link between detachment from work and performance outcomes, such as employee creativity, may not be that straightforward (e.g., Binnewies, Sonnentag, & Mojza, 2009; De Jonge, Spoor, Sonnentag, Dormann, & Van den Tooren, 2012; Fritz, Yankelevich, Zarubin, & Berger, 2010). Detachment from work is defined as an "individual's sense of being away from the work situation" (Etzion, Eden, & Lapidot, 1998, p.579), meaning that the bodily systems that have been activated during work can return to baseline levels. In other words, detachment from work provides employees an opportunity to reduce strain, by recovering resources that were lost due to coping with job demands (cf. Fritz et al., 2010). However, distancing oneself from work might also impede one's reflection on work-related problems during non-work time, thereby blocking employee's creative processes and opportunities to solve these problems. Employee creativity can be defined as the generation of new and useful ideas about work by employees (Amabile, 1988; George & Zhou, 2001). Employees' creative ideas are of great importance because they are the building blocks for organizational innovation, problem-solving, change, and competitiveness (e.g., Amabile, 1988; Woodman, Sawyer, & Griffin, 1993). The importance of employee creativity applies to all sorts of organizations, as day-to-day problems occur in any job (cf. Dul & Ceylan, 2011). Especially in a dynamic economic environment, organizations rely on the creativity and flexibility of their personnel to survive. Therefore, more in depth research into the potential undesired side-effect of detachment from work on employee creativity is clearly needed.

Literature suggests that time away from a problem (e.g., working on another task, taking a shower, exercising) helps elicit new problem-solving ideas (Madjar & Shalley, 2008; Sio & Ormerod, 2009), a phenomenon commonly referred to as incubation. However, consistent empirical support for such incubation effects is scarce, and the underlying psychological processes remain unclear (Madjar & Shalley, 2008; Sio & Ormerod, 2009; Vul & Pashler, 2007). It is not clear, for

instance, whether incubation effects result from unconscious problem-solving processes during the time away from the problem or from sustained conscious reflective thinking (cf. Cohen & Ferrari, 2010), which would respectively plead in favor or against detachment from work for creative problem-solving. In a cross-sectional survey study, De Jonge et al. (2012) found that a *lack* of detachment predicted active learning behavior and creativity. Thus, not totally "switching off" after work was related to positive performance outcomes. Binnewies et al. (2009) reported a similar relation in a longitudinal study: positive work reflection, as opposed to the complete absence of work-related thoughts, predicted an increase in creativity 6 months later. These findings indeed suggest that complete detachment from work might not always be exclusively beneficial, in that it may block the generation of creative problem-solving ideas. However, due to limitations of these studies' designs, important information about the *process* of detachment is lost (cf. Demerouti, Bakker, Geurts, & Taris, 2009). For example, the question remains whether there is a difference in daily employee creativity directly before and after detachment takes place. Moreover, it remains unclear how detachment effects are influenced by the specific working conditions (i.e., particular job resources and job demands) that employees encountered during the day, and whether different working conditions require different levels and/or kinds of detachment.

The aim of the present study is to provide more insight into the relation between detachment and creativity from a process perspective, by examining the effect of detachment from work on day-level changes in employee creativity. Such a day-level approach enables us to learn more about variations in levels of creativity during the day and the underlying processes in terms of job demands, job resources, and detachment (see also Ohly, Sonnentag, Niessen, & Zapf, 2010). We expect to gain a deeper understanding of the relation between day-to-day detachment and creativity, by capturing within-person changes in relatively short-time intervals: because detachment from work usually takes place between work and bedtime, we assess creativity at bedtime, while controlling for creativity directly after work and employees' general level of creativity. In other words, we examine whether employees' creativity levels change after they have had the chance to fully detach from work, but before they have actually gone to bed. There are indications that creative thoughts on a particular day may develop overnight, increasing the probability of creative thoughts the following (work) day (Amabile, Barsade, Mueller, & Staw, 2005). As the focus in this particular study is on the *immediate* effects of detachment on employee creativity, possible carry-over effects from one day to the next (and the confounding role of sleep) are excluded.

Further, we will use the Demand-Induced Strain Compensation Model (De Jonge & Dormann, 2003; 2006) as a theoretical framework for this study. This model provides the opportunity to investigate the influence of the specific work conditions on detachment effects because, along with

detachment, it incorporates job demands and job resources. Moreover, the model allows for a more detailed elaboration on the interplay between the study variables because it differentiates between cognitive, emotional, and physical aspects of job demands, resources, and detachment. However, as creativity is an inherently cognitive phenomenon, which is primarily associated with determinants of cognitive and affective nature (e.g., De Dreu, Baas, & Nijstad, 2008; George & Zhou, 2002, 2007), our focus will solely be on the cognitive and the emotional components of the model. In sum, we will investigate the role of different types (i.e., cognitive and emotional) and combinations of job demands, resources, and detachment in the explanation of day-level fluctuations in employee creativity. We will perform this study within the health care sector because health care employees in particular are often imposed with highly demanding cognitive and emotional work tasks.

By looking at day-level fluctuations in the study variables, our study addresses the need for research into the role of time in the relation between off-job recovery, job demands, job resources, and performance-related outcomes (De Jonge et al., 2012; Binnewies & Wörnlein, 2011). In terms of practical implications, the study sheds light on more precise conditions under which detachment from work can foster employee creativity.

Demand-Induced Strain Compensation Recovery Model

The Demand-Induced Strain Compensation Recovery (DISC-R) Model is a current work stress model that comprises four central elements: job demands, job resources, detachment from work, and work-related outcomes (De Jonge et al., 2012). According to this model, each of these elements encompasses a cognitive, emotional, and physical component (De Jonge & Dormann, 2003). However, as previously mentioned, the physical components are left out of consideration in the current study. Cognitive job demands are work-related tasks that require cognitive effort, whereas emotional job demands are work-related tasks that require emotional effort (Van den Tooren, 2010). Examples of cognitive and emotional job demands are complex tasks and confrontations with aggressive clients, respectively. Job resources are instrumental or psychological means at work that employees can use to deal with their job demands (Van den Tooren, De Jonge, & Dormann, 2012), such as job autonomy (cognitive) or emotional support from colleagues.

Parallel to job demands and job resources, detachment can also be divided into a cognitive and an emotional component (De Jonge et al., 2012). Cognitive detachment implies no longer thinking about work, for instance, by directing one's thoughts to something else. Emotional detachment means taking distance from emotionally aggravating situations at work and no longer experiencing those emotions. Generally speaking, detachment can help the restoration of individual resources that were lost due to job demands (cf. Fritz et al., 2010).

A fundamental assumption of the DISC-R model is employees' functional self-regulatory behavior in combating job demands (De Jonge & Dormann, 2006; De Jonge, Demerouti, & Dormann, 2014): employees will generally try to cope with states of psychological imbalance induced by stressors at work (cf. Pomaki & Maes, 2002), by activation of functional *matching* job resources and detachment. The most easily available and best matching resources will be activated first. If matching resources are not available or depleted, employees may apply less-matching or non-matching job resources as replacement, which may also help to cope with high demands. According to the DISC-R Model, however, they are less effective. For instance, an employee with an emotionally demanding job (e.g., aggressive clients) is likely to use emotional resources (e.g., emotional support from colleagues) to deal with the high demands. If emotionally supportive colleagues are not available, other job resources can be useful to some extent, for example, protocols of how to deal with problematic clients. In addition, if internal resources are depleted due to high demands, employees will generally be inclined to restore those resources by detaching from work. In the foregoing example, it is likely that the employee will try to engage in leisure activities that are not emotionally draining.

Regarding the relation between demands, resources, and detachment on one hand, and work-related outcomes on the other, an important distinction can be drawn between additive and interactive (i.e., moderation) effects (cf. Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010). Additive effects assume that demands, resources, and detachment are independently related to outcomes. The DISC-R Model, on the other hand, proposes interaction effects, with resources and detachment moderating the relation between demands and work-related outcomes (De Jonge et al., 2012). Moreover, based on functional self-regulatory principles, the model's matching principle assumes that interactive relations between job demands, job resources, detachment, and work-related outcomes are stronger if they are within the same dimension (e.g., cognitive or emotional) (De Jonge & Dormann, 2006; Daniels & De Jonge, 2010). For example, to prevent emotional exhaustion, it is particularly important that emotional job demands (e.g., aggressive patient) are accompanied by emotional job resources (emotional support from colleagues) and emotional detachment; that is, taking distance from negative emotions experienced during the day. Statistically, the given example would be represented by a *matching three-way interaction* between emotional job demands, emotional job resources, and emotional detachment from work.

Detachment and creativity

According to the DISC-R Model, job demands, resources, and detachment are related to both health and performance-related outcomes, including employee creativity. An activating and stimulating (work) situation (e.g., challenging job demands) is believed to enhance creativity (cf. Amabile & Mueller, 2008; Zhou, Hirst, & Shipton, 2012). Cognitive job demands (such as complex work problems) in particular, are considered useful to initiate employees' creativity (e.g., Amabile & Mueller, 2008), but only under the condition that employees have sufficient cognitive resources at their disposal (cf. De Jonge & Dormann, 2003). Only if there are sufficient cognitive resources (such as job autonomy or access to useful information), there is room for thinking about problems and developing new ideas about how to deal with the job demands (cf. Ohly, Sonnentag, & Pluntke, 2006).

Still, the question remains how the relation between job demands, resources, and creativity is influenced by detachment from work, and if different types of detachment (i.e., cognitive and emotional) have different effects. With respect to cognitive detachment, one could reason that *not* thinking about work (i.e., high cognitive detachment) in leisure time does not benefit work-related problem-solving attempts because it refrains from actively exploring new ideas for solutions to work-related problems. This is in line with Binnewies et al. (2009) and Baas, De Dreu, and Nijstad (2008), who found that complete (mental) relaxation (and absence of work-related thoughts) during leisure time was not conducive to creativity, whereas cross-sectional research by De Jonge et al. (2012) showed that, in cases of high cognitive job demands and resources, *low cognitive detachment* was positively associated with employee creativity. In other words, these findings suggest that thinking about work during free time might be a condition for effective work-related problem-solving.

In line with the above, we hypothesize that a positive change in day-level employee creativity (i.e., after work – at bedtime) is predicted by both high cognitive job demands and high cognitive job resources during the work day (i.e., activating work situation), as well as *low* cognitive detachment from work afterwards. This assumption is reflected by a statistical three-way interaction effect of matching cognitive demands, resources, and detachment (cf. Van Vegchel, De Jonge, & Landsbergis, 2005).

Hypothesis 1: A positive change in day-level employee creativity is predicted by both high cognitive job demands and high cognitive job resources during the day, followed by *low* cognitive detachment from work (three-way interaction).

Much less is known about the role of emotional detachment from work in relation to employee creativity. Literature has shown that, besides cognitive aspects of the work situation, emotions can also elicit cognitive activation (De Dreu et al., 2008; Baas et al., 2008), and that positive affect, in particular, fosters creativity (Amabile et al., 2005). This suggests that an activating work situation of high emotional job demands and high emotional job resources may be conducive to employees' creative problem-solving, and that emotional detachment (putting one's (negative) work-related emotions aside after work) may further stimulate this process by allowing for an increase in positive affect. In their cross-sectional study, De Jonge et al. (2012) indeed found a positive association between high emotional detachment from work and employee creativity. Thus, following the above line of reasoning, and given the assumption that *matching* job resources and detachment are most functional in balancing domain-specific demands and restoring domain-specific energy reservoirs, our expectation is that high emotional job demands in combination with high emotional resources might lead to more creativity (i.e., an activating work situation), especially under the condition of high emotional detachment.

Hypothesis 2: A positive change in day-level employee creativity is predicted by both high emotional job demands and high emotional job resources during the day, followed by *high* emotional detachment from work (three-way interaction).

4.2 Method

Procedure and Sample

We conducted the study in two Dutch nursing homes and four departments of a Dutch general hospital, with health care workers completing daily surveys on handheld devices over eight consecutive days (i.e., working and non-working days). The total group of participants mainly consisted of nurses (64.5%), anesthesiologist assistants and surgical nurses (20.4%), and laboratory workers (12.5%). Participants had to be active in their current job position for at least three months at the start of the data collection. Also, participants had to work at least 16 hours within the course of the data collection, so that a balanced amount of data from both working and non-working days could be collected. Because these eligibility criteria are based upon specific individual information of employees, we recruited participants in consultation with the heads of all participating units. To encourage participation, monetary incentives were offered to participants completing the study.

Out of 160 employees who were asked to participate, 157 employees agreed to be part of the study. During the study, four devices broke down (e.g., battery and software failures) and lost all

their data. One respondent only filled out the surveys on non-work days and is, therefore, not included in the analysis. Moreover, one respondent did not fill out any of the surveys. The result is a final sample of 151 participants (94.4% of 160 people).

Participants received both face-to-face and printed instructions in small groups (2-7 persons) and signed an informed consent form. Participants were also told that during the study they could call one of the researchers, in case they would need help. The respondents were asked to fill out surveys on their device for eight consecutive days. Due to irregular working hours, the number as well as the sequence of working and non-working days differed among participants. To stimulate survey compliance by creating a daily response routine, the participants were instructed to fill out surveys on both working days and non-working days. On a working day, the participants had to fill out surveys directly after work (T1) and at bedtime (T2). On non-working days, the participants filled out surveys after waking up (T1) and at bedtime (T2). The analyses in the current study are based on the data collected on working days, which resulted in a total of 368 days of completed surveys (i.e., pairs of after work and bedtime).

A week before the start of the study, every participant received a handheld device containing the surveys. The daily diary survey tools assigned identification numbers to each unique device. The device numbers were linked to the participants in a separate data file, which was only available to the researchers. The identification numbers were retained and used for analysis purposes and follow-up measures.

The participants' age ranged from 19 to 61 years (M =39.9; SD = 11.3) and 84.6% of the group was female. With respect to education level, 23.7% completed high school, 41.6% completed (intermediate) vocational education, and 34.7% obtained a university degree. Over the course of eight days, 24.6% of all the work shifts of the participants were irregular, and 26.9% of the irregular work shifts were nightshifts (6.6% of all the work shifts).

Measures

The daily surveys were based on items of existing scales for measuring job demands, job resources, detachment, and employee creativity, which are used in regular survey studies. With minor adjustments, the items were made suitable for daily diary research (e.g., from "I need to display high levels of concentration and precision at work" to "Today, I needed to display high levels of concentration and precision at work").

All constructs were measured with one to three items. The items were rated on a 5-point Likert scale, ranging from 1 *(strongly disagree)* to 5 *(strongly agree)*. To assess the reliability of the scales, we calculated Cronbachs alpha for the three-item scales and the Spearman-Brown

coefficient for the two-item scales, as the latter is the most appropriate reliability coefficient for a two-item scale (Eisinga, Te Grotenhuis, & Pelzer, 2013). Due to divergent numbers of measured cases per day, the reliability coefficients reported in the next section are averaged over eight days (cf. Sonnentag, Binnewies, & Mojza, 2008).

Job demands and job resources

Cognitive and emotional job demands and job resources were measured right after work (T1), with one to two items for each construct. The items were taken from the shortened DISC-Questionnaire (DISQ-S 2.0; De Jonge et al., 2007). An example item measuring cognitive demands (two items in total) is "Today, I had to do a lot of mentally taxing work" (Spearman-Brown coefficient = .71). Emotional demands were measured with one item: "Today, I had to do a lot of emotionally draining work". For cognitive resources we used one item: "Today, I had access to useful information to solve complex problems". Emotional resources were measured with two items, for example: "Today, I was able to count on emotional support from others if a threatening situation at work occurred". The Spearman-Brown coefficient of emotional resources was .87.

Detachment from work

Cognitive and emotional detachment from work were measured at bedtime (T2). The items were derived from scales developed by De Jonge et al. (2012), who confirmed the existence of empirically different dimensions of detachment from work. Each detachment component was measured with two items, for example, "After work, I put all thoughts of work aside" (cognitive) and "After work, I emotionally distanced myself from work" (emotional). The Spearman-Brown coefficients of the cognitive and emotional detachment items were .80 and .88, respectively.

Employee creativity

Employee creativity right after work (T1) was measured in exactly the same way as employee creativity at bedtime (T2). We used three items from a well-validated Dutch scale for employees' self-ratings of creativity (e.g., De Jonge, Le Blanc, Peeters, & Noordam, 2008) that was based on George and Zhou's (2001) scale for employee creativity (cf. Dul & Ceylan, 2011). An example item is "My head is full of creative solutions to problems at work". The average Cronbach's alpha was .89 for the measurement right after work, and .92 for the one before going to sleep.

Data analysis

The focus of the current study lies on the immediate effect of detachment after work on creativity. To isolate this effect, we assessed the creativity level after detachment (i.e., at bedtime) while controlling for the creativity level before detachment (i.e., directly after work), following the regressor variable approach (i.e., residualized regression) for change analyses (Allison, 1990; Taris, 2000). Thus, creativity before going to bed (T2) is the dependent variable, and creativity right after work (T1) is used as a control variable. Because the outcome of this approach reflects change scores, we will from here on refer to the dependent variable as 'change in creativity levels'.

To analyze our data, we used a multi-level linear modeling approach with MLwiN 2.25 software (Rasbash, Browne, Healy, Cameron, & Charlton, 2012). Data collected in this study can be distinguished on two levels: a day level (level 1) and a person level (level 2). Day-level data, such as scores on job demands, can vary within persons from day to day. On the other hand, person-level data, such as age and sex, cannot vary within persons from day to day. The focus of this study lies on the question whether a higher or lower level of job demands, job resources, and detachment a person experiences on a specific day (in comparison to the average personal score over eight days) is related to an increase or decrease of that person's creativity before going to sleep. Therefore, we centered all day-level predictor and control variables (Level 1; i.e., job demands, job resources, detachment, and creativity at T1) at the respective person mean (cf. Sonnentag et al., 2008). The person-level control variables (Level 2; i.e., age and education) were centered at the grand mean. Hence, all between-persons variance is removed, hereby ruling out interpretations of our results referring to individual differences such as personality. Finally, gender and irregular shifts were included in the analysis as dummy-coded control variables.

To test the hypotheses (i.e., three-way interactions between matching job demands, job resources, and detachment), different models were tested and compared. Model 0 only included the intercept. In Model 1, control variables at the person level (gender, age, education, type of shift) and at the day level (creativity after work) were added. In Model 2, the different types of job demands, resources, and detachment (main effects) were entered. Subsequently, two-way interactions between job demands, resources, and detachment were added to Model 3. Finally, Model 4 also contained three-way interactions between the DISC components. Following the main assumption of the theoretical model, all interactions were of matching kind (cf. De Jonge et al., 2012; De Jonge, Dormann, & Van Vegchel, 2004), resulting in six two-way interactions and two three-way interactions. Within the models, only the intercept varied at the person level (level 2) (cf. Sonnentag et al., 2008). Therefore, the assumption was that the level of creativity at bedtime varies between

persons, but that the strength of the relation between job demands, resources, and detachment on the one hand, and creativity on the other, is the same for every individual.

4.3 Results

Preliminary analysis

Before testing our hypotheses, we examined whether creativity before going to bed varies within persons. By calculating the intra-class coefficient, it turned out that 63.3% (0.342 / (0.342 + 0.198) = 0.633) of the variance in creativity at bedtime can be explained by differences between persons. The remaining 39.7% of variation in creativity at bedtime can be explained by differences within persons. For creativity after work, job demands, job resources, and detachment, the within-person variation ranged from 49.8% to 66.6 %. These substantial proportions support the choice for multi-level analysis.

Table 4.1 displays day-level means, standard deviations, and correlations between the study variables. As expected, creativity after work and creativity at bedtime were relatively strongly associated (r = .70, p < .01). Regarding the control variables, only gender was negatively related to creativity at bedtime (r =- .11, p < .01). Furthermore, cognitive and emotional resources were each positively related to creativity after work (respectively: r = .23, p <.01; r = .21, p < .01) and to creativity at bedtime (respectively: r = .19, p < .01; r = .20, p < .01). There were no significant correlations between different kinds of job demands and detachment on one hand and both measures of creativity on the other.

Table 4.1. *Means, Standard Deviations, and Correlations Between Study Variables (day level; N = 368)*

		M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Age	39.89	11.25	-												
2.	Gender[a]	0.85	0.35	-0.15**	-											
3.	Education	4.90	1.22	-0.04	0.13*	-										
4.	Irregular shift (excl. night)	0.15	0.36	0.03	0.02	0.11*	-									
5.	Nightshift	0.01	0.09	-0.09	0.04	-0.02	-0.04	-								
6.	Cognitive demands	3.80	0.76	0.09	-0.07	-0.05	0.06	0.00	-							
7.	Emotional demands	3.04	1.09	0.02	-0.02	-0.38**	-0.05	0.00	0.32**	-						
8.	Cognitive resources	3.47	0.85	-0.22**	-0.03	0.14**	0.08	-0.05	0.16**	0.14**	-					
9.	Emotional resources	3.57	0.75	-0.18**	0.11*	0.19**	0.11*	-0.17**	0.11*	0.00	0.38**	-				
10.	Cognitive detachment	3.87	0.88	-0.11*	0.16**	0.17**	0.04	-0.12*	-0.10	-0.25**	0.20**	0.31**	-			
11.	Emotional detachment	3.90	0.83	-0.12*	0.16**	0.13*	0.11*	-0.14**	-0.04	-0.23**	0.12*	0.26**	0.72**	-		
12.	Creativity (after work)	2.91	0.71	-0.07	0.09	-0.05	-0.06	0.00	0.09	0.04	0.23**	0.19**	0.04	0.03	-	
13.	Creativity (bedtime)	2.79	0.73	-0.11*	0.02	-0.02	-0.05	-0.06	0.07	0.02	0.21**	0.20**	0.07	0.02	0.70**	-

Note. ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed); [a] 0 = Male; 1 = Female.

Effects on employee creativity

The results of the multi-level analyses are depicted in Table 4.2, including model fit information (-2*log likelihood), estimates for fixed parameters, and estimates for the variance components. The model that included three-way interactions (Model 4) did not show a significant improvement compared to the model containing two-way interactions (Model 3; Δ-2*log = 3.425, Δ*df* = 2, *ns*). Nevertheless, Model 3 showed a significant improvement compared to Model 2 (Δ-2*log = 13.840, Δ*df* = 6, $p < .05$), and was, therefore, the best fitting model. This implied that matching two-way interactions between job demands, resources, and detachment significantly contributed to the prediction of change in creativity levels. In the following, the results of Model 3 are discussed in more detail.

As expected, creativity after work contributed significantly to the prediction of creativity at bedtime ($t = 7.19$, $p < .01$). None of the control variables at the person level (level 2) had a significant effect. Of all the particular kinds of job demands, resources, and detachment, only cognitive detachment had a positive main effect on change in creativity levels ($t = 2.63$, $p < .01$). In other words, more cognitive detachment was related to an increase in creativity. The three matching cognitive interactions did not show significant effects. However, the interactions between emotional demands on one hand, and emotional resources and detachment on the other hand, turned out to be significant ($t = 3.33$, $p < .01$; $t = -2.05$, $p < .05$).

To obtain a closer understanding of the significant interaction effects, we plotted the slopes and performed simple slope tests (Aiken & West, 1991; Preacher, Curran, & Bauer, 2006), as depicted in Figures 4.1 and 4.2. First, when emotional resources were low, an increase in emotional demands was associated with a decrease in creativity over time (resources -1SD; $t = -3.49$, $p < .01$). In the case of a high level of emotional resources, an increase in emotional demands was related to positive change in creativity levels (resources +1SD; $t = 2.15$, $p < .05$). To put it differently, whereas emotional demands were related to an increase in creativity when emotional resources were high, they were related to a decrease in creativity when emotional resources were low.

Second, when emotional detachment was low, the level of emotional job demands did not predict any changes in the level of creativity (detachment -1SD; $t = 0.81$, *ns*). However, in a situation with high emotional detachment from work, emotional demands were associated with a decrease in creativity (detachment +1SD; $t = -2.33$, $p < .05$). In other words, on a day with high emotional demands, complete emotional detachment after work time was not beneficial to creativity.

Table 4.2. *Multilevel Estimates for Models Predicting Creativity at Bedtime*

	Creativity (bedtime)									
	Model 0		Model 1		Model 2		Model 3		Model 4	
Variable	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*
Intercept	2.761**	0.053	2.734**	0.156	2.718**	0.158	2.692**	0.159	2.708**	0.158
Control variables										
Creativity (after work)			0.416**	0.048	0.386**	0.054	0.381**	0.053	0.370**	0.053
Gender (F)			-0.010	0.168	0.030	0.171	0.032	0.172	0.016	0.172
Age			-0.005	0.005	-0.006	0.005	-0.006	0.005	-0.005	0.005
Education			0.035	0.048	0.024	0.049	0.027	0.049	0.031	0.049
Irregular shift (excl. Night)			-0.016	0.075	-0.018	0.080	0.001	0.079	-0.012	0.079
Nightshift			0.074	0.239	-0.327	0.318	-0.294	0.313	-0.278	0.312
Independent variables										
CDem					0.032	0.048	0.040	0.048	0.035	0.048
EDem					-0.029	0.037	-0.057	0.037	-0.054	0.037
CR					-0.013	0.041	-0.008	0.040	-0.001	0.040
ER					-0.056	0.048	-0.048	0.047	-0.058	0.048
CDet					0.122*	0.048	0.129**	0.049	0.142**	0.049
EDet					-0.060	0.058	-0.087	0.058	-0.095	0.058
Two-way interactions										
CDem X CR							-0.020	0.070	0.079	0.089
CDem X CDet							-0.009	0.081	-0.029	0.081
CR X CDet							0.011	0.061	0.006	0.061
EDem X ER							0.260**	0.078	0.248**	0.078
EDem X EDet							-0.125*	0.061	-0.130*	0.063
ER X EDet							0.040	0.101	0.049	0.101
Three-way interactions										
CDem X CR X CDet									-0.186	0.103
EDem X ER X EDet									0.070	0.125
-2*LL	897.468		683.577		611.418		597.578		594.153	
Δ -2*LL			213.891**		72.159**		13.840*		3.425	
Δ df			6		6		6		2	
Level 1 intercept variance (SE)	0.342	0.048	0.357	0.054	0.341	0.054	0.348	0.055	0.344	0.054
Level 2 intercept variance (SE)	0.198	0.015	0.175	0.015	0.172	0.015	0.162	0.014	0.161	0.014

Note. CDem = cognitive demands; EDem = emotional demands; CR = cognitive resources; ER = emotional resources; CDet = cognitive detachment; Edet = emotional detachment;

* $p < .05$; ** $p < .01$; LL = log likelihood

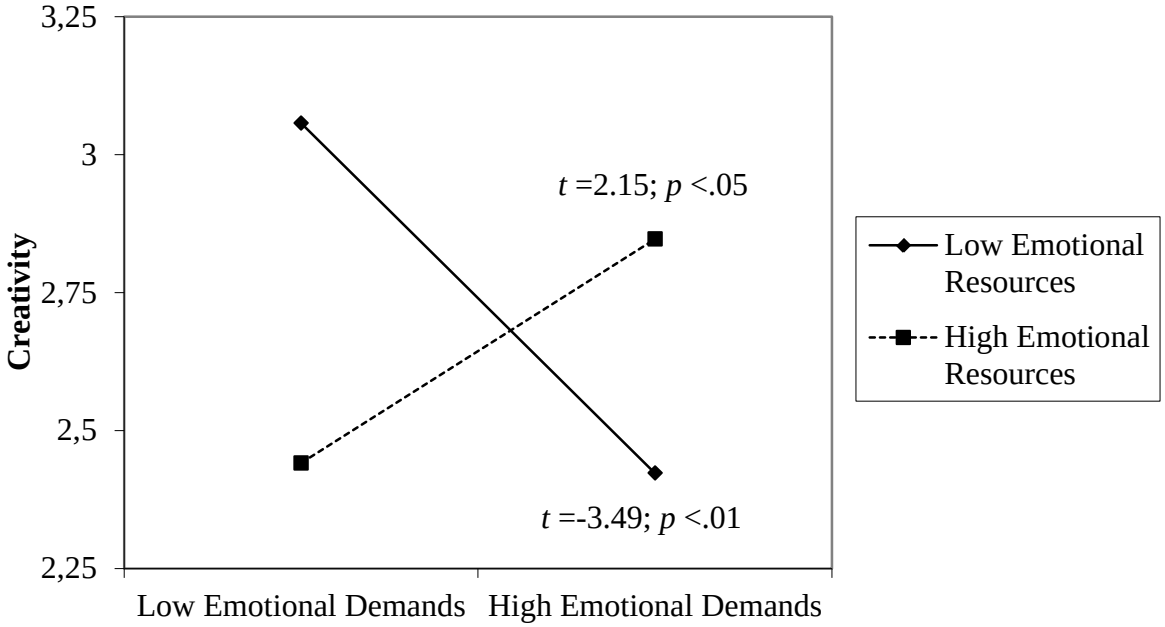

Figure 4.1. Interaction effect of emotional job demands and emotional job resources in the prediction of creativity.

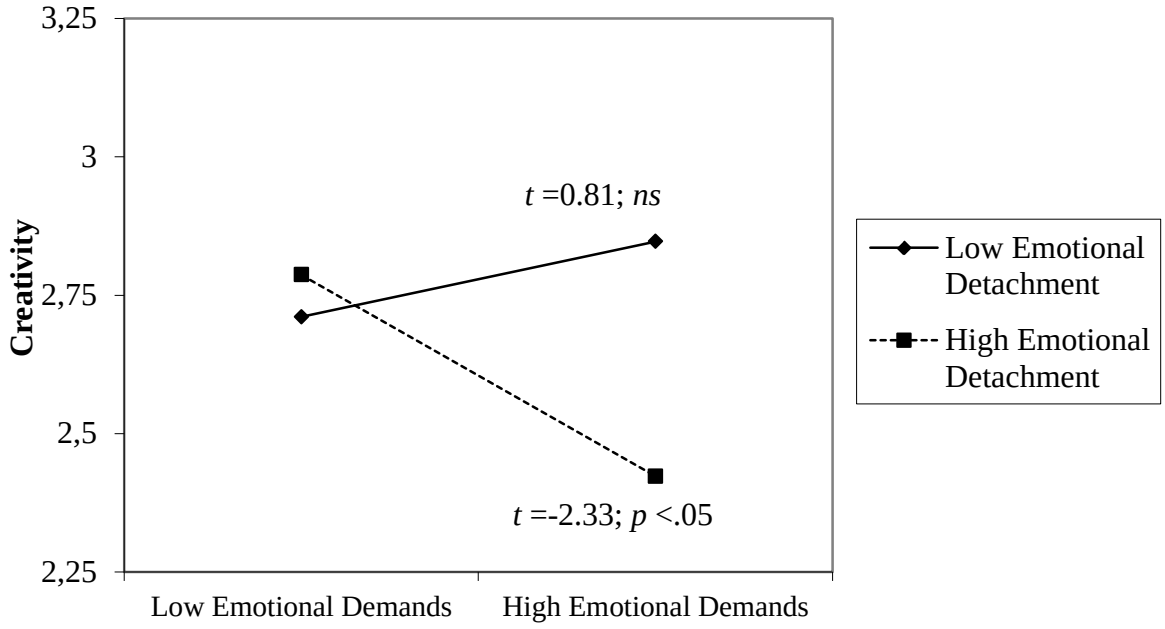

Figure 4.2. Interaction effect of emotional detachment and emotional job demands in the prediction of creativity.

4.4 Discussion

Previous studies have provided ample evidence that detachment from work can prevent work-related health complaints (e.g., Sonnentag et al., 2010). Research into the relation between detachment and job performance, however, has rendered indications for a dark side of detachment: the effects of complete detachment from work might not always be beneficial to performance outcomes, such as creativity (Binnewies et al., 2009; De Jonge et al., 2012). The current study addressed this enigma by shedding light on the interplay of different kinds of detachment, job demands, and resources, as predictors of fluctuations in employee creativity levels between the moment right after work and the moment an employee goes to bed. We expected that, in cognitively active jobs, *no* complete mental detachment from work might enhance problem solving thoughts and ideas about work, and hence, foster employee creativity. For emotionally active jobs, however, we expected that putting one's (negative) work-related emotions aside might increase positive affect, and, as such, benefit employee creativity. More specifically, we hypothesized that the combination of high cognitive demands, high cognitive resources, and low cognitive detachment would be positively related to creativity, as well as the combination of high emotional demands, high emotional resources, and high emotional detachment. Neither hypothesis was confirmed by our data: we found the main effect of cognitive detachment on creativity to be in the opposite direction (i.e., positive), and none of the interactions between the cognitive predictor variables were significant. Additionally, analyses showed that the combination of *low* emotional detachment and high emotional demands was conducive to creativity, as well as the combination of high emotional demands and high emotional resources. Although the specific hypotheses were not confirmed in this study, our findings do demonstrate that, indeed, detachment from work is not always beneficial to creativity, depending on the specific job demands encountered during work and the specific type of detachment.

The reason we did not find significant effects for cognitive demands and resources in the prediction of creativity at bedtime, might be explained by the fact that we controlled for creativity directly after work. In this way, effects of demands and resources on creativity at bedtime (T2) are likely to be (partially) mediated by creativity after work (T1). Nonetheless, we did find that high cognitive detachment from work was associated with higher rather than lower employee creativity, thereby not supporting the previous findings of Binnewies et al. (2009) and De Jonge et al. (2012). The mixed findings might be due to the fact that, as opposed to more static study designs, we investigated short-term within-person fluctuations in creativity from a dynamic process perspective. Alternatively, the mixed findings might also suggest that the relation between cognitive detachment

and creativity is more complicated. Although thinking about work during free time can be a condition for effective problem solving, a recent study of Wiley and Jarosz (2012) showed that too much focus or attentional control may actually limit creative problem solving—it may limit the scope of solutions that are explored and lead solvers to adopt or persist in suboptimal strategies. According to the authors, a more diffuse or leaky attentional state may be better for creative problem solving. It is also plausible that seemingly problem solving thoughts about work can easily turn into worrying or rumination. Rumination is defined as repetitive and unintentional perseverative thoughts in the absence of obvious external cues (Martin & Tessier, 1996), which is associated with energy depletion and even with emotional exhaustion (Donahue et al., 2012). The conceptual difference between both types of thoughts about work lies in whether they are adaptive or maladaptive to problem solving. This argumentation is in line with Treynor, Gonzalez, and Nolen-Hoeksema (2003), who made a distinction between 'reflective pondering' and maladaptive 'brooding'. They defined reflective pondering as an adaptive cognitive problem solving strategy, which is utilized by the individual to confront and alleviate depressive symptoms. In contrast, brooding refers to the passive comparison of one's predicament against an unachieved standard. Most likely, the latter type of thoughts about work will predominantly impede employee creativity.

With respect to the emotional DISC components, high emotional demands in combination with either high emotional resources or low emotional detachment were associated with an increase in creativity. These results support the assertion that an emotionally activating and stimulating (work) situation (i.e., challenging job demands) leads to more creativity (Zhou et al., 2012). Nevertheless, in order to deal with high emotional demands, employees also need a large amount of emotional resources (e.g., emotional support from colleagues), which is consistent with DISC's matching principle. Furthermore, high emotional job demands were associated with a decrease in creativity only if emotional detachment from work was high. This finding is not in accordance with the cross-sectional findings of De Jonge et al. (2012), who found that *high* emotional detachment from work was associated with more creativity. Our finding, on the other hand, suggests that after an emotionally demanding day at work, completely emotionally 'switching off' from work might not be the best strategy to produce new solutions for problems at work. Next to the difference in study designs, emotion regulation literature points toward another possible explanation for the current results. Emotional detachment implies taking distance from one's emotions, which are elicited by the work situation. On a day with high emotional demands, however, a high degree of emotional detachment could have the same effect as emotion suppression. Research has shown that suppression is not only strongly related to psychological distress (Kashdan, Barrios, Forsyth, & Steger, 2006), but also negatively associated with task-related job performance (Wallace, Edwards,

Shull, & Finch, 2009). Suppressing emotions might also inhibit the urge to create ideas about new solutions to problems at work. Therefore, employees might be better off using another emotion regulation strategy (such as positive reappraisal), when facing highly emotionally demanding situations. Evidently, an active approach to regulating emotions implies not completely emotionally detaching from work. Moreover, Bledow, Rosing, and Frese (2013) recently found that creativity increases if a person experiences an episode of negative affect that is followed by a decrease in negative affect and an increase in positive affect (i.e., affective shift). According to the authors, an episode of negative affect can lay the foundation for high creativity at a later point in time, whereas the regulation of negative affect plays a key role for achieving high levels of creativity. Applying their findings to the current study, it could very well be that the experience of high emotional demands during the day, followed by the regulation of associated negative emotions after work (i.e., *low* emotional detachment), represents such an affective shift and, thereby, contributes to creativity.

Study limitations

Despite the strong day-level design and the relatively large sample size for this kind of study, there are a few limitations to the study's scope and method. First, no strong inferences about causality can be drawn. Although the suggested causal ordering was theoretically driven and assessed by temporal sequence between the measured study variables (cf. Derks & Bakker, 2014), possible influences of third variables cannot be ruled out. Second, because all data are assessed with self-report measures, there is a possibility of common method variance (Podsakoff, MacKenzie, & Podsakoff, 2012). However, we minimalized this problem by centering the day-level variables (level 1) around the person-mean, hereby eliminating all between-person variance that could be attributed to individual response tendencies (e.g., social desirability). Moreover, concerns with common-method variance are smaller with diary research because not all variables are measured at the same moment (Podsakoff et al., 2012). Third, due to space limitations and reduced filling-out time combined with daily triple measurement, we had to use single-item scales, which can jeopardize construct validity. Nevertheless, other studies on work and recovery have shown that the use of one-item scales does not have to be problematic (e.g., Van Hooff, Geurts, Kompier, & Taris, 2007). This is in line with Wanous, Reicher, and Hudy (1997), who stated that when the construct of interest is relatively narrow or is unambiguous to respondents, a single-item measure may be more appropriate. Another limitation is that we only tested matching interactions. Nonmatching (cross-domain) interactions might also account for part of the variance in day-level creativity, although this has theoretically been assumed and also empirically been shown to be less likely (De Jonge et al., 2012). The added value of testing nonmatching interactions in this study is therefore

assumed to be marginal. Finally, as our study is based on a health care sample, it is possible that our findings are unique to this occupational group. More research is clearly needed to add to the generalizability of the current results.

Directions for future research

In our study, we focused on off-job recovery (i.e., detachment from work). It would be interesting for future researchers to investigate the relation between 'on-job' recovery (i.e., recovery during work breaks), creativity, and other work-related variables (cf. Trougakos, Beal, Green, & Weiss, 2008). This could provide specific guidelines about how to use work breaks in the most beneficial way, regarding employee creativity levels and health outcomes.

Another possible research direction concerns the role of the emotional valence (positive vs. negative) of work-related thoughts in the relation between detachment from work and of job performance outcomes. Although we found that high cognitive detachment predicts higher creativity, other studies have shown that thinking about one's job in a positive way during leisure time was positively related to performance outcomes, such as proactive behavior, creativity, and the pursuit of learning something new at work (e.g., Binnewies et al., 2009; Fritz & Sonnentag, 2005). In the study of Binnewies et al. (2009), negative work reflection was unrelated to work performance. However, no distinction was made between a ruminative form and a problem-focused form of negative work reflection (cf. Cropley & Zijlstra, 2011). The latter type, as also described earlier in this section, may enhance job performance because it motivates the individual to solve work-related problems (Binnewies et al., 2009). It is not inconceivable that, despite a negative content of reflective work-related thoughts, the accompanying emotion of problem solving thoughts can have a positive valence and, thus, foster creativity (cf. Amabile et al., 2005).

Finally, as we were interested in what happens directly before and after detachment from work takes place, the focus of our study was on relatively short-term time intervals. Future research, however, could extend the current study by investigating how effects of detachment and creativity unfold overnight. It would be very relevant, for instance, to find out how sleep might influence this process and whether employees actually make use of their creative problem-solving ideas at some later point in time.

Implications for practice

Our study has several important implications for practice. First, high-level job demands can lead to higher work pressure, but, as seen in the current and extant research (e.g., Amabile & Mueller, 2008; De Jonge et al., 2012), can also stimulate positive outcomes, such as employee creativity.

This is in accordance with Crawford, LePine, and Rich (2010), who showed that job demands can be divided into hindering demands and challenging demands, implying that the concept of job demands by itself is not positive or negative by nature. It is important, however, that employees are provided with enough job resources and opportunities to recover, so that job demands can be perceived as challenging rather than hindering.

A second practical implication is that detachment from work not only benefits health (e.g., Sonnentag et al., 2010), but, in the case of cognitive detachment, is also positively associated with employee creativity. Supervisors and employees should pay attention to detachment from work as an important predictor and/or sustainer of health, but in the case of emotionally demanding work, they should be aware that *not* completely switching off one's emotions after work is related to higher employee creativity levels. This finding might be particularly important for the service sector because emotional labor is one of its key characteristics. In general, supervisors could stimulate effective detachment from work in several ways: by acting as role models, by showing how detachment can be most effective (De Jonge et al., 2012); by setting clear guidelines for separating work and non-work life (cf. Sonnentag, Binnewies, Mojza, & Scholl, 2008); and by providing employees with workshops how to adequately detach from work, preferably in a cognitive and emotional way.

In conclusion, there seems to be both a bright and a dark side to detachment from work. Whether detaching from work is conducive to creative problem-solving, largely depends on the specific type of detachment and the particular work situation one encounters during the day. The ability to detach in a cognitive way by not thinking about work in leisure time seems beneficial at all times. However, on emotionally demanding days, *not* disregarding work-related emotions seems to be the best strategy to produce new solutions to problems at work.

CHAPTER 5

The Development, Implementation, and Evaluation of Tailored Workplace Interventions in Hospital Care: A Multiple-Case Study

This chapter is largely based on:

Niks, I. M. W., De Jonge, J., Gevers, J. M. P., & Houtman, I. L. D. (2015). The development, implementation, and evaluation of tailored workplace interventions in hospital care: a multiple-case study. *Manuscript submitted for publication.*

"*Interventions are fragile creatures. Rarely, if ever, is the 'same' program equally effective in all circumstances.*"

(Pawson, 2006, p.30)

5.1 Introduction

Health care staff is widely regarded as a group that is at high risk of occupational stress and job dissatisfaction (e.g., Ilhan, Durukan, Taner, Maral, & Bumin, 2008; Le Blanc, Hox, Schaufeli, Taris, & Peeters, 2007; McHugh, Kutney-Lee, Cimiotti, Sloane, & Aiken, 2011). High levels of occupational stress are related to higher sickness absenteeism rates (Rugulies et al., 2007) and decreased performance (LeBlanc, 2009), thereby jeopardizing patient safety (McHugh et al., 2011; Montgomery, Panagopoulou, Kehoe, & Valkanos, 2011). Hence, effective workplace interventions to prevent stress and improve health, well-being, and performance of health care employees are badly needed (see also Nielsen, Taris, & Cox, 2010).

Although stress prevention has received considerable attention over the last two decades, there is still a gap between theoretical knowledge regarding job stress prevention and corresponding practical applications (Le Blanc, De Jonge, & Schaufeli, 2008; Nielsen et al., 2010). Scientifically well-performed studies on job stress and performance interventions are still scarce, and organization-level interventions often fail to achieve the desired results (Cox, Taris, & Nielsen, 2010; Kompier & Kristensen, 2000; Kompier & Taris, 2004). For instance, Kompier and Kristensen (2000) argue that the majority of stress management programs has a "one size (or one pill) fits all" character (p. 170) with some interventions resembling "smoking cessation courses for non-smokers" (p. 182). In other words, there is a lack of proper diagnosis of risk factors (i.e., job stressors) and risk groups. Furthermore, the primary focus of intervention research has been on *what* works (i.e., whether or not an intervention works), as opposed to the questions of *why* and *how* an intervention works (Nielsen et al., 2010). However, in workplace interventions, causal relations are not simple but embedded within complex contexts that do not allow for rigid research protocols, such as used in controlled lab settings (Griffiths, 2000). This complexity calls for an examination of not only risk factors and risk groups, but also of the context and processes connecting interventions to the targeted outcomes, such as the implementation of interventions (Kompier & Kristensen, 2000; Nielsen et al., 2010; Nielsen, Fredslund, Christensen, & Albertsen, 2006). In this way, desired and potentially undesired outcomes of workplace interventions can be better understood and, subsequently, enhanced or minimized (Biron & Karanika-Murray, 2014). To conclude, more eclectic approaches that incorporate elements of both quantitative and qualitative methods are

needed to cumulate evidence on how, why, and when workplace interventions are effective (Biron, Karanika-Murray, & Cooper, 2012).

Based on the abovementioned considerations, the current study presents a specific method for the diagnosis of risk factors and subsequent development and implementation of tailor-made workplace interventions, the so-called *DISCovery* method (De Jonge, Spoor, Hamers, & Bergman, 2012). The aim of the study is to (1) quantitatively and qualitatively assess the effectiveness of the *DISCovery* method in hospital care, and (2) identify implementation conditions that determine the intervention effectiveness. Following the recommendations of Kompier and Kristensen (2000), we use a multiple-case study approach. In a multiple-case study, the context is different for each of the cases. This provides the opportunity to explore holistic explanations within and across settings, taking into account the dynamic and process nature of unfolding events that are embedded in an organizational context (Pettigrew, 1992; Flyvbjerg, 2006). As such, the focus of this intervention study is on both content (i.e., cause-effect relations) and process ("why and how"), thereby contributing to bridging the gap between theory and practice in job stress prevention.

Background of the DISCovery method

The *DISCovery* method (De Jonge, Spoor, Hamers, & Bergman, 2012) is a method to improve employee health, well-being, and performance, through the development and implementation of tailored workplace interventions that are based on a proper diagnosis of risk factors. Specifically, it is founded on key principles of the Demand-Induced Strain Compensation Recovery (DISC-R) Model (De Jonge & Dormann, 2003, 2006; De Jonge, Spoor, Sonnentag, Dormann, & Van den Tooren, 2012) and participatory action research (PAR; e.g., Dollard, Le Blanc, & Cotton, 2008). In the next paragraphs we will address these principles consecutively.

The DISC-R Model is a job-stress model that is used as a theoretical framework for the identification of risk factors and risk groups. The model comprises three central components; that is, job demands, job resources, and the recovery concept of "detachment from work". Job demands are defined as work-related tasks that require physical and/or psychological effort from the worker (Van den Tooren, 2010). In other words, job demands place a certain amount of strain on employees. Job resources, on the other hand, are instrumental or psychological means at work that can be used to deal with job demands, such as job autonomy and workplace social support (Van den Tooren, De Jonge, & Dormann, 2012). As such, the use of job resources can counteract negative strain effects of job demands. Detachment from work is defined as an 'individual's sense of being away from the work situation' (Etzion, Eden, & Lapidot, 1998, p. 579). By detaching from work, functional bodily systems that were activated during work can return to baseline levels (De Jonge,

Spoor, Sonnentag, et al., 2012). In general, it can be seen as a promising strategy to recover from job-related strain (Sonnentag & Geurts, 2009). Thus, similar to job resources, detachment from work has a mitigating function with respect to detrimental effects of high job demands.

The *DISCovery* method is based on two main principles of the DISC-R Model (De Jonge, Demerouti, & Dormann, 2014; De Jonge, Spoor, Sonnentag, et al., 2012). First, the model proposes that a *balance* between job demands, job resources, and detachment from work will lead to favorable outcomes in terms of employee health, well-being and performance, whereas an imbalance will lead to unfavorable outcomes, such as job dissatisfaction or emotional exhaustion. Put differently, job demands can lead to negative strain effects, unless employees (1) have sufficient job resources to deal with the demands and (2) can recover sufficiently from effort expenditure. Because job demands often cannot easily be reduced, the focus in this study is on combatting job stress by enhancing job resources and detachment instead. Second, in line with the DISC-R Model, stress-buffering effects of job resources and detachment from work are expected to be the strongest if they are *specific and targeted*, rather than broad and general (De Jonge et al., 2014). Job demands, job resources, and detachment from work can each be divided into cognitive, emotional, and physical elements. Prior studies have shown empirical support for this assumption (e.g., De Jonge & Dormann, 2006; De Jonge, Spoor, Sonnentag, et al., 2012). For example, health care employees often have to carry out complex tasks under time pressure (cognitive demands), deal with aggressive patients (emotional demands), or lift heavy objects (physical demands). Similarly, examples of different types of job resources are decision authority (cognitive), emotional support from co-workers (emotional), and lifting devices (physical). With regard to detachment from work, one can direct one's thoughts to a non-work topic (cognitive), put work-related emotions aside (emotional), or shake off physical exertion (physical).

In sum, unlike other job stress models, the DISC-R Model incorporates both job resources and recovery from work as means to counterbalance high job demands. In addition, it offers specific guidelines about the kind of job resources and recovery that should be aimed for, by proposing that job resources and recovery that correspond with specific types of job demands are most effective ('matching principle'). Applying these DISC-R propositions to real practice, we expect that interventions are most likely to be effective if they are tailored to specific job demands (i.e., cognitive, emotional, or physical) and particularly aimed at changing corresponding job resources and recovery aspects.

The approach towards development and implementation of the interventions in this study is based on principles of PAR (e.g., Dollard et al., 2008). The philosophy of PAR is that organizational interventions designed to promote employee health cannot take place without the

participation and experience of the subjects under study (Griffiths, 1999). This is in line with Nielsen, Randall, Holten, and González (2010), who state that occupational health interventions have the best chance of achieving a significant impact if they follow a structured and participatory intervention process. Moreover, Dollard and colleagues (2008) argue that PAR has the potential to contribute to organizational sustainability, as organization members learn to solve self-identified problems. Previous studies have shown the effectiveness of PAR approaches in intervention research (e.g., Mikkelsen, Saksvik, & Landsbergis, 2000; Le Blanc et al., 2007).

The aim of the *DISCovery* method is optimizing the balance between job demands, job resources, and recovery from work through three successive steps: (1) a psychosocial risk diagnosis based on the DISC-R Model; (2) the development of interventions by using a PAR approach; and (3) the actual implementation of tailored work-oriented interventions, followed by an effect and process evaluation (see the method section for a detailed discussion of each step). Using this method within a multiple-case study approach with intervention and comparison groups, we expect the tailored work-oriented interventions to have positive effects on job resources and recovery from work, and on employee health, well-being, and performance outcomes for the intervention groups. In this particular context, a distinction can be made between two types of outcomes. Job resources and recovery from work can be viewed as *proximal* outcomes of the interventions, as these work-related characteristics are directly targeted by the interventions, and, therefore, expected to be most sensitive to the intervention process (see also DeJoy, Wilson, Vandenberg, McGrath-Higgins, & Griffin-Blake, 2010). Improved employee health, well-being, and performance, on the other hand, are referred to as *distal* outcomes, as it may take more time for such effects to unfold compared to the proximal outcomes (see also Taris, Kompier, Geurts, Houtman, & Heuvel, 2010; Dormann & Van de Ven, 2014). Hence, two main hypotheses guided our study:

Hypothesis 1 (H1): Relative to the comparison groups, intervention groups show positive changes in targeted work-related characteristics after intervention implementation (proximal outcomes).

Hypothesis 2 (H2): Relative to the comparison groups, intervention groups show improvements in targeted employee health, well-being, and performance outcomes after intervention implementation (distal outcomes).

Investigating both content and process aspects of unique, tailor-made intervention programs within multiple cases inherently yields an extensive amount of information. Throughout this paper

we will, therefore, focus on the main points of the study, while referring to appendices for more detailed information.

5.2 Method

Study design, participants, and procedure

The research was conducted in a multi-located Dutch general hospital over the course of two years, using a three-wave longitudinal, quasi-experimental, multiple-case study design. Three existing organizational departments situated in two different locations agreed upon participation in the study: a nursing department (i.e., Case 1), a laboratory (i.e., Case 2), and an emergency room department (i.e., Case 3). At the start of the study, each department consisted of two or more different work units, thereby allowing a subsequent division into intervention and comparison groups within each department. However, due to unforeseen organizational changes, the comparison group within the emergency room department merged with the intervention group a few months after baseline data collection (Time 1). Because no other suitable comparison group existed for this department, we decided to adjust the study design for this specific case to a within-group study design. In sum, two cases followed a non-equivalent comparison group pretest-posttest design, whereas the third case followed a within-group pretest-posttest design. Table 5.1 shows the baseline demographic characteristics of all subsamples (demographic differences between groups are discussed in a subsequent section).

All employees within the three departments were invited to participate on a voluntary basis. They received an email with a unique link to an online survey on three occasions: October, 2011 (Time 1); January, 2013 (Time 2); and November, 2013 (Time 3). Intervention development and implementation started after Time 1. This time frame was based on the estimated time needed to complete the *DISCovery* method in this particular study. In addition, it allowed for the evaluation of intervention effects at two different time points (Time 2 and Time 3), as to investigate possible differences between proximal and distal outcomes of the interventions. Note that everyone in the sample was invited to fill out the surveys at Time 2 and Time 3, regardless of whether they had completed the survey at the previous time point. Table 5.2 shows more detailed information about the response rates for each subsample. Online surveys were linked to the employees' email addresses for second-round and third-round identification. To guarantee confidentiality of the data, the identification information was only available to the researchers and exclusively used for data-management purposes.

Table 5.1. *Baseline Demographic Characteristics of Intervention and Comparison Groups*

	Department				
	Nursing		Laboratory		Emergency Room
Variables	IG	CG	IG	CG	IG
Location	A	A	A	B	A
Gender					
Male	7.1%	9.4%	11.8%	26.3%	18.4%
Female	92.9%	90.6%	88.2%	73.7%	81.6%
Age					
M (*SD*)	40.4 (10.2)	34.1 (10.8)	48.6 (11.4)	45.5 (10.5)	41.2 (10.7)
Education					
High school	28.6%	25.0%	11.8%	5.3%	23.7%
Vocational education	21.4%	43.8%	29.4%	36.8%	28.9%
Higher education	50.0%	31.3%	58.8%	57.9%	47.4%
Marital status					
Single	32.1%	22.6%	70.6%	10.5%	31.6%
Cohabiting / Married	67.9%	77.4%	29.4%	89.5%	68.4%
Irregular working hours					
Yes, including night shifts	78.6%	90.6%	17.6%	89.5%	80.6%
Yes, excluding night shifts	3.6%	0.0%	58.8%	10.5%	16.7%
No	17.9%	9.4%	23.5%	0.0%	2.8%

Note. IG = intervention group; CG = comparison group; *M* = Mean; *SD* = standard deviation.

Table 5.2. *Response Rates of the Participating Departmental Units*

Department	Response T1	Response T2	Response T3	Final panel
Nursing				
Intervention group	N=28 (90%)	N=19 (61%)	N=26 (84%)	N=16 (52%)
Comparison group	N=32 (86%)	N=26 (70%)	N=35 (95%)	N=20 (54%)
Laboratory				
Intervention group	N=17 (74%)	N=17 (77%)	N=15 (75%)	N=13 (65%)
Comparison group	N=18 (95%)	N=17 (89%)	N=17 (100%)	N=16 (94%)
*Emergency Room**				
Intervention group	N=38 (76%)	N=31 (62%)	N=41 (80%)	N=23 (45%)

Note. *Employees of the former comparison group are excluded from all sample statistics, as they were no part of the specific psychosocial risk diagnosis and subsequent intervention development process for this department.

Risk diagnosis, intervention development, and implementation

The *DISCovery* method consisted of three successive steps: 1) psychosocial risk diagnosis, 2) development of interventions, and 3) implementation of the interventions. In the first step, we used baseline survey results to assess the (lack of) balance between key elements of the DISC-R Model (i.e., job demands, resources, and detachment from work) in combination with psychosocial risk scores (e.g., health complaints) for each participating unit. We used internal benchmarks and external reference groups to determine whether scores were relatively high or low. An example of

an assumed lack of balance is the combination of (relatively) high scores on emotional demands, low scores on emotional resources and/or emotional detachment, and high scores on emotional exhaustion.

In the second step of the *DISCovery* method (i.e., development of interventions), we used a six-step PAR approach to raise support and ownership among employees and management for identified risks and corresponding ─ yet to be developed ─ interventions. First, we communicated outcomes of the psychosocial risk diagnosis (*DISCovery* method: step 1) to the line management and human resources advisors (i.e., project group) and to the higher management (i.e., steering group). During these feedback meetings, participating units were divided into intervention and comparison groups, based on several selection criteria: actual presence of risk scores, response rate (> 60%), group size (larger groups were preferred because of possible attrition), management preferences (e.g., units with long-term issues or high absenteeism rates), feasibility (e.g., possible interference of organizational activities), and willingness of the unit to participate. Additionally, preliminary intervention ideas were discussed, as well as boundaries to interventions due to feasibility and the project's scope. For instance, hiring more staff or changing labor conditions was not possible. Second, we presented unit-specific baseline results to the employees during feedback meetings with each intervention unit. Third, subsequent to those meetings, we held brainstorm sessions with each intervention unit about possible work-oriented interventions. Employees were asked for their reactions and ideas regarding the baseline results and informed about the boundaries to possible interventions. After that, we used an efficacious and democratic prioritization method to choose interventions (cf. De Jonge, Spoor, Hamers, & Bergman, 2012), resulting in a top-3 of intervention themes for each group. Fourth, we consulted the steering and project group about the top-3 intervention lists and possible actions for intervention implementation. Concerns from all stakeholders regarding urgency and feasibility were taken into consideration in determining group-specific action plans. Note that, as a consequence of this specific step, the action plans did not necessarily address all top-3 intervention themes to the same extent. Fifth, we reported the action plans to the intervention units and asked for their reactions and commitment. Because employee participation and commitment are crucial aspects for intervention success (Biron & Karanika-Murray, 2014), a certain period of time was agreed upon (e.g., 1 or 2 weeks) in which employees could react or provide input to the action plans. Finally, ultimate decisions about which unit-specific interventions would be implemented were made by the higher management, in close consultation with the employees, lower management, and researchers.

In the third and final step of the *DISCovery* method, unit-specific interventions were further developed (e.g., creating workshops or tailoring existing workshops to intervention group) and

implemented, with support of internal and external subject matter experts when necessary. The interventions were mainly targeted at increasing job resources and/or recovery that match with specific types of job demands (i.e., cognitive, emotional, or physical), depending on the unique unit profiles. In sum, based on outcomes of the PAR-approach, the exact unit-specific intervention programs were determined. Table 5.3 provides an overview of the results of the successive steps of the *DISCovery* method for each intervention group (see Appendix A for more detailed information about the interventions). Figure 5.1 depicts the approximate timeline of the measurement occasions and the implementation of the interventions.

Table 5.3. *Results of Successive Steps of the DISCovery Method for Each Intervention Group Together with the Intervention-Specific Target Variables.*

Intervention group	Step 1: Psychosocial DISC-R risk profile	Step 2: Outcomes PAR	Step 3: Intervention program	Main target variables
Nursing department	• High emotional job demands • Low emotional and physical job resources • High concentration problems	1. Inefficient work processes, no work breaks at subunit 2. Inefficient cooperation and communication 3. Inadequate physical work space and materials	• Implementation of work breaks at subunit • Job crafting • Lean management • Coaching supervisor and working group lean management	<u>General:</u> • Job resources • Detachment • Work performance • Work satisfaction <u>Group-specific:</u> • Recovery during work • Work break conditions • Concentration problems
Laboratory	• High cognitive job demands • Low cognitive, emotional, and physical job resources • Low physical detachment • Low work satisfaction • Low team performance • High emotional exhaustion	1. Dysfunctional cooperation 2. Dysfunctional communication 3. Poor physical work climate	• Analysis of departmental cooperation and communication goals • Team workshops 'Cooperation & Communication' • Follow-up workshops • Coaching supervisor	<u>General:</u> • Job resources • Detachment • Work performance • Work satisfaction <u>Group-specific:</u> • Teamwork • Emotional exhaustion
Emergency Room	• High emotional job demands • Low recovery during work • Poor work break conditions	1. Sub-optimal cooperation and communication 2. Peak workloads 3. Lack of recovery during work	• Team workshops 'Dealing with peak workloads: communication, cooperation, and recovery' • Observation of a work shift plus feedback to management • Follow-up workshops • Coaching supervisors	<u>General:</u> • Job resources • Detachment • Work performance • Work satisfaction <u>Group-specific:</u> • Recovery during work • Work break conditions • Work-home interference • Home-work interference

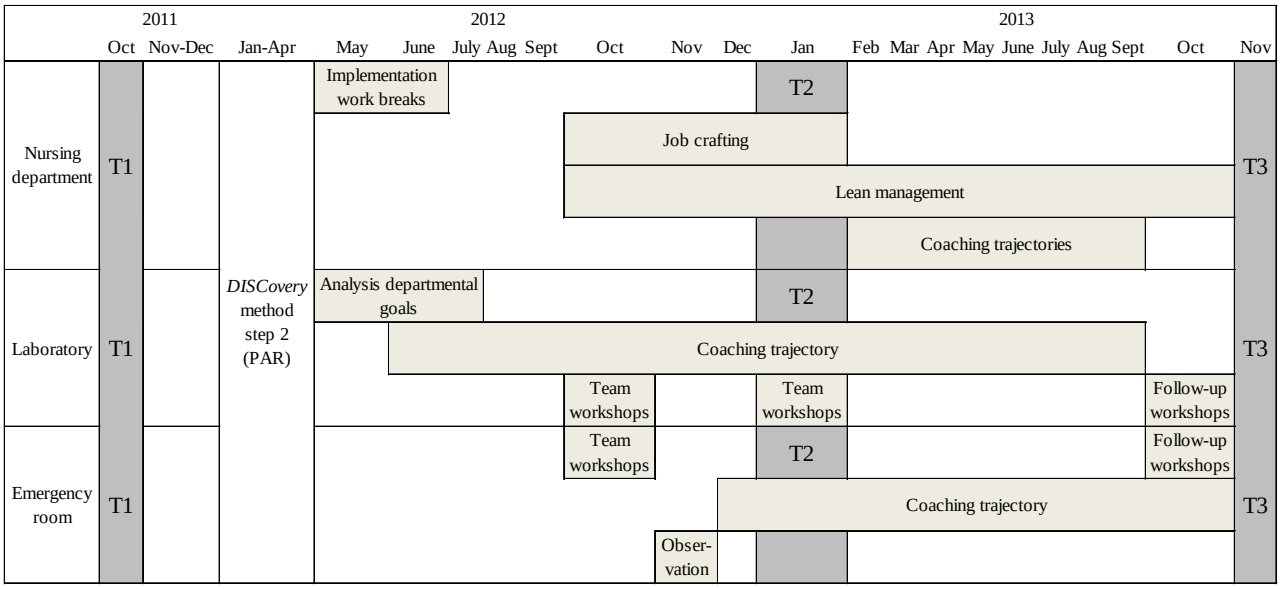

Figure 3.1. Timeline of measurement occasions, participatory action research approach (PAR), and implementation of interventions.

Measurements

Key variables with regard to the psychosocial risk diagnosis were job demands, job resources, and recovery, on the one hand (i.e., proximal target variables), and health, well-being, and performance outcomes on the other (i.e., distal target variables). After consultation with the project and steering group, we assessed some additional, central work characteristics, including work break conditions, recovery during work, teamwork, work-home and home-work interference (i.e., proximal variables). Effects were evaluated with intervention-specific target variables that were selected for each intervention group individually, based on their intervention program. Please note that target variables were not an exact reflection of the unit-specific psychosocial risk diagnosis, but of the outcomes of the entire *DISCovery* method. Each variable was measured at each occasion.

Proximal target variables: work-related characteristics

Job demands and job resources. Cognitive, emotional, and physical job demands and job resources were measured with the shortened DISC Questionnaire 3.0 (DISQ-S 3.0; De Jonge, Willemse, & Spoor, 2011). Previous versions of this questionnaire have demonstrated good psychometric properties (e.g., De Jonge, Spoor, Sonnentag, et al., 2012; Van den Tooren & de Jonge, 2008). Each DISQ-scale consists of three items, except for the cognitive job resources scales, which has one additional item due to psychometric properties in the past. All items were rated on a 5-point frequency scale ranging from 1 (never or very rarely) to 5 (very often or always). Examples

of the items for job demands are “I need to display high levels of concentration and precision at work” (cognitive; Cronbach’s α = .66), “I have to do a lot of emotionally draining work” (emotional; Cronbach’s α = .77), and “I have to perform a lot of physically strenuous tasks to carry out my job” (physical; Cronbach’s α = .82). Example items of job resources are “I have the opportunity to determine my own work method” (cognitive; Cronbach’s α = .55), “I receive emotional support from others (e.g. clients, colleagues or supervisors) when a threatening situation at work occurs” (emotional; Cronbach’s α = .88), and “I am able to use adequate technical equipment to accomplish physically strenuous tasks” (physical; Cronbach’s α = .72).

Off-job recovery. We measured off-job recovery using the DISQ-R, a recently developed scale by De Jonge, Spoor, Hamers, and Bergman (2012). This scale consists of a cognitive, emotional, and physical component of detachment after work. Each component was measured with three items, which were rated on a 5-point frequency scale, ranging from 1 (never) to 5 (always). Examples items are “After work, I put all thoughts of work aside” (cognitive; Cronbach’s α = .75), “After work, I emotionally distance myself from work” (emotional; Cronbach’s α = .76), and “After work, I shake off the physical exertion from work” (physical; Cronbach’s α = .66).

Work break conditions. Work break conditions were measured with three items assessing the quality, duration, and number of work breaks. An example item is “The quality of my work breaks is good”. Each item was rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach’s alpha was .90.

Recovery during work. Recovery during work was measured with three items, reflecting the three DISC-R dimensions: “During a work break, I think of things other than work” (cognitive), “During a work break, I emotionally distance myself from work” (emotional), and “During a work break, I shake off the physical exertion from work” (physical). Items were rated on a 5-point frequency scale ranging from 1 (never or very rarely) to 5 (very often or always). Cronbach’s alpha for this scale was .88.

Teamwork. Teamwork was measured with a scale consisting of three items of the COMPaZ (Smits, Christiaans-Dingelhoff, Wagner, Van der Wal, & Groenewegen, 2007), a well-validated Dutch version of the Hospital Survey on Patient Safety Culture of the Agency for Healthcare Research and Quality (Sorra & Nieva, 2004). An example item is “When a lot of work needs to be done quickly, we work together as a team to get the work done”. The items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach’s alpha for this scale was .86.

Work-home and home-work interference. Work-home and home-work interference (WHI and HWI) were measured with three items each of a scale developed by De Jonge, Peeters, Hamers,

Van Vegchel, and Van der Linden (2003). This well-validated scale is based on measures developed by Netemeyer, Boles, and McMurrian (1996) as well as Kopelman, Greenhaus, and Connoly (1983). Example items are "How often does it occur that you have so much to do at work that you cannot fulfill family duties at home?" (WHI; Cronbach's α = .69) and "How often does it occur that your home situation takes up time that you should have spent on your work?" (HWI; Cronbach's α = .76). Items were rated on a 5-point frequency scale, ranging from 1 (never) to 5 (always).

Distal variables: health, well-being, and performance outcomes

Concentration problems. Concentration problems were measured with four items derived from a semantic differential scale developed by Meijman (1991). The items were rated on a 5-point response scale with two extremes, for example "No concentration difficulties" vs "Concentration difficulties" and "No difficulties paying attention" vs "Attention keeps fading". Cronbach's alpha for this scale was .94.

Emotional exhaustion. Emotional exhaustion was measured with the well-validated Dutch version of the Maslach Burnout Inventory (Schaufeli & Van Dierendonck, 2000). The scale consisted of five items (e.g., "I feel emotionally drained from my work"), which were rated on a 7-point frequency scale ranging from 0 (never) to 6 (always). Internal consistency reliability (Cronbach's alpha) of this scale was .87.

Work satisfaction. Work satisfaction can be viewed as a one-dimensional and general construct, resulting from positive and negative work experiences (De Jonge, 1995). It was measured with one item: "I am satisfied with my present job". This item was rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Work performance. Individual and team work performance were assessed by asking the respondents to rate their own work performance and the work performance of their team separately on a 10-point scale ranging from 1 (very bad) to 10 (very good).

Comparability of intervention and comparison groups

Because participants could not be randomly allocated to intervention and comparison groups, we tested if the subsamples differed in baseline demographic characteristics (Time 1; see Table 1) by calculating *t*-tests and chi-square difference tests. There were no statistical differences between the paired intervention and comparison groups for gender and educational level. However, the nursing intervention group scored higher on age than the nursing comparison group ($p < .05$). Therefore, age was also included in further analyses for these specific groups as a control variable. Within the laboratory department, significant differences were found for marital status and working hours: the

percentage of married or cohabiting persons was higher for the control group than for the intervention group ($p < .001$), as well as the percentage of persons working night shifts ($p < .01$). Hence, these variables were added as control variables in the analyses for these specific groups.

With regard to the predictor and outcome variables, we did find a number of statistical differences between the intervention and comparison groups. Within the nursing department, the intervention group scored significantly higher on emotional demands, and significantly lower on physical demands, emotional resources, physical resources, cognitive detachment, and home-work interference than its comparison group. Within the laboratory department, the intervention group scored significantly lower on each dimension of job resources, as well as on teamwork, work satisfaction, and team performance than its comparison group (see Appendix B for the exact scores and corresponding *p*-values for each group). However, as intervention groups were mainly selected based on the presence of risk scores, these differences can be viewed as an inevitable result of the selection procedure. Moreover, they reaffirm the suitability of the selection of these specific intervention groups with respect to the overarching goal of optimizing job resources and recovery.

Process evaluation

Evaluation of the intervention process consisted of (1) logbooks for each participating unit, in which the direct supervisor reported important changes and events on and surrounding the unit, (2) a supplementary part of the final survey for the intervention groups, consisting of items regarding the evaluation of the intervention programs, and (3) semi-structured interviews with the supervisors and one of the employees of each participating unit. As recommended by Saunders, Evans, and Joshi (2005), the main evaluation criteria were intervention fidelity (i.e., extent to which intervention was implemented as planned), completeness (i.e., dose of the intervention delivered), exposure (i.e., extent to which participants actively engaged with materials or recommended resources), participant satisfaction (i.e., satisfaction with program and interactions with staff and/or investigators), participation rate (i.e., proportion of target population reached), recruitment (i.e., procedures used to approach and attract participants), and context (i.e., aspects of the environment that affected intervention implementation and/or study outcomes). The qualitative results from the process evaluation were used to interpret the quantitative results, as addressed in the discussion section of this paper.

Statistical analyses

We evaluated effects of the interventions by performing multilevel regression analyses with MLwiN 2.25 (Rasbash, Browne, Healy, Cameron, & Charlton, 2012). This technique has several

advantages compared to standard methods for analyzing longitudinal data (e.g., repeated-measures analysis of variance), such as the inclusion of cases with incomplete data and less restrictive missing data assumptions (Hox, 2002; Rasbash, Steele, Browne, & Goldstein, 2012). In the current study, the data can be distinguished on two levels: measurement occasions (Level 1) nested within persons (Level 2). In line with Le Blanc et al. (2007), the multilevel models for both Case 1 (i.e., nursing department) and Case 2 (i.e., laboratory) included the intervention group and the Time 2 and Time 3 measurements as dummy variables. As such, the reference categories in these multilevel models are the case-specific comparison group and Time 1. The intercept represents the expected overall outcome at Time 1 for the department (i.e., intervention and comparison group), whereas Time 2 and Time 3 refer to the overall outcome at the two follow-up measurements, respectively. The intervention group variable refers to the difference between intervention and comparison group at Time 1. Additionally, interactions between the intervention group with Time 2 and Time 3 were modeled, reflecting between-group differences in model trajectories over time. Finally, as mentioned earlier, case-specific control variables were included in the analyses. For Case 3 (i.e., emergency room) only the measurement occasion dummies were included in the multilevel model, because this case follows a within-group design.

5.3 Results

In the following sections we will discuss the most important quantitative results for each case, that is, the significant between-group differences in model trajectories over time for Case 1 and Case 2 (i.e., interaction effects), and the significant main effects of time for Case 3. These results reveal on which variables the intervention group showed different score patterns over time than its comparison group (Case 1 and 2) and the within-group changes over time (Case 3). The complete overview of the results of the multilevel analyses can be found in Appendix C.

Case 1: Nursing department

Based on the identified risk profile, the intervention program for the nursing intervention group consisted of the implementation of work breaks, job crafting, lean management, and coaching trajectories. Next to the general target variables (i.e., job resources, detachment, work satisfaction, and work performance), the group-specific target variables were recovery during work, work break conditions, and concentration problems. The group means of the intervention and comparison group within the nursing department for each of the target variables at each measurement occasion are shown in Table 5.4, as well as the variance components of the variables.

Table 5.4. *Means and Variance Components of the Target Variables for the Intervention Group and the Comparison Group in the Nursing Department.*

	Nursing intervention group			Nursing comparison group			Variance (%)	
Variable	T1	T2	T3	T1	T2	T3	Person	Occasion
General proximal target variables								
Cognitive resources	3.15	3.12	2.98	3.37	3.12	3.35	50.0	50.0
Emotional resources	3.88	3.93	4.14	4.23	3.85	4.20	57.0	43.0
Physical resources	3.11	3.24	3.27	3.56	3.25	3.53	53.5	46.5
Cognitive detachment	3.88	3.98	3.97	4.16	3.99	3.95	66.1	33.9
Emotional detachment	3.71	3.89	3.87	3.86	3.82	3.76	44.2	55.8
Physical detachment	3.52	3.56	3.72	3.53	3.55	3.58	39.5	60.5
General distal target variables								
Work satisfaction	3.79	4.00	3.84	3.88	3.85	3.86	23.9	76.1
Individual work performance	7.70	7.68	7.77	7.70	7.73	7.80	45.7	54.3
Work performance team	7.36	7.58	7.65	7.75	7.76	7.74	38.6	61.4
Group-specific target variables								
Concentration problems (D)	2.25	2.19	1.96	1.97	2.11	2.30	60.1	39.9
Recovery during work (P)	3.23	3.05	3.33	2.88	2.78	3.20	38.6	61.4
Work break conditions (P)	3.30	3.63	3.47	3.16	2.81	3.21	63.4	36.6

Note. P = proximal variable; D = distal variable; T1 = Time 1; T2 = Time 2; T3 = Time 3

The variance associated with persons (i.e., individual differences) ranged from 24-66%, whereas the remaining variance (34-76%) was associated with measurement occasions (i.e., within-person differences). Thus, overall, considerable proportions of variance in the target variables could be attributed to within-person fluctuations over time. As mentioned earlier, at baseline, the intervention group scored significantly lower than the comparison group on the target variables emotional resources, physical resources, and cognitive detachment (see also Appendix B and C). However, the multilevel models showed significant positive interaction effects for the intervention group at Time 2 for these variables, implying a positive change between Time 1 and Time 2 in emotional resources (β = .18*;* p < .05), physical resources (β = .20*;* p < .05), and cognitive detachment (β = .24*;* p < .01) for the intervention group relative to the change trajectories for the comparison group. A similar effect was found for work break conditions at Time 2 (β = .23*;* p < .01). Furthermore, the models showed a significant negative interaction effect for the intervention group at Time 3 for concentration problems (β = -.20*;* p < .05), implying a decrease in concentration problems between Time 1 and Time 3 relative to the change trajectory for the comparison group. Table 5.5 provides an overview of the significant interaction effects of this case. No significant interaction effects were found for the remaining target variables.

Table 5.5. *Overview of the Significant Multilevel Interaction Effects for the Target Variables Within the Nursing Department*

Case 1: Nursing department	Target variables	Occasion(s)	Effect size (β) of interactions (Group X Time)
Proximal outcomes	Emotional resources	T2	.18*
	Physical resources	T2	.20*
	Cognitive detachment	T2	.24**
	Work break conditions	T2	.23**
Distal outcomes	Concentration problems	T3	-.20*

Note. *$p < .05$; **$p < .01$; ***$p < .001$: Significant higher or lower scores, with Time 1 and the comparison group as reference categories.

Case 2: Laboratory

Following the risk profile for the laboratory intervention group, the intervention program for this group consisted of an analysis of departmental cooperation and communication goals, team workshops 'Cooperation & Communication', follow-up workshops, and coaching of the direct supervisor. The main target variables for this group were job resources, detachment, work satisfaction, work performance, teamwork, and emotional exhaustion. Table 5.6 shows the group means of the intervention and comparison group within the laboratory department for each of the target variables at each measurement occasion, together with the corresponding variance components. Variance associated with persons ranged from 32-77%, whereas 24-68% of the variance was associated with measurement occasions.

At baseline, the intervention group scored significantly lower on the target variables cognitive, emotional, and physical job resources, teamwork, work satisfaction, and team performance (see Appendix B and C). At Time 2, however, significant positive interaction effects were found for emotional resources ($\beta = .26$; $p < .01$), teamwork ($\beta = .22$; $p < .05$), work satisfaction ($\beta = .56$; $p < .001$), and team performance ($\beta = .29$; $p < .05$), indicating positive changes in the scores on these variables between Time 1 and Time 2 for the intervention group relative to the change trajectories for the comparison group. The positive changes in emotional resources and team performance for the intervention group extended to the next measurement occasion, as positive interaction effects were also found for these variables at Time 3 ($\beta = .26$; $p < .01$, and $\beta = .32$; $p < .05$, respectively). An overview of the significant interaction effects within this case is depicted in Table 5.7. There were no significant interaction effects for the remaining target variables. For emotional exhaustion,

this might be due to the relatively high within-person stability, with only 23% of the variance being associated with differences within persons (i.e., occasion level).

Table 5.6. *Means of the Target Variables for the Intervention Group and the Comparison Group in the Laboratory Department.*

	Laboratory intervention group			Laboratory comparison group			Variance (%)	
Variable	T1	T2	T3	T1	T2	T3	Person	Occasion
General proximal target variables								
Cognitive resources	2.80	2.78	2.63	3.22	3.25	3.18	52.0	48.0
Emotional resources	3.29	3.49	3.74	4.20	3.94	4.02	67.4	32.6
Physical resources	2.73	2.78	2.62	3.45	3.25	3.33	38.8	61.2
Cognitive detachment	3.75	3.75	3.76	3.60	3.71	3.78	55.5	44.5
Emotional detachment	3.41	3.45	3.57	3.39	3.45	3.48	53.8	46.2
Physical detachment	3.16	3.43	3.17	3.61	3.75	3.65	55.3	44.7
General distal target variables								
Work satisfaction	3.38	3.65	3.57	3.95	3.24	3.89	37.1	62.9
Individual work performance	7.82	7.41	7.50	7.53	7.47	7.56	41.5	58.5
Work performance team	6.00	6.94	6.86	7.68	7.75	7.67	32.4	67.6
Group-specific target variables								
Teamwork (P)	3.00	3.40	3.17	4.18	4.10	4.35	57.2	42.8
Emotional exhaustion (D)	2.91	2.79	2.99	2.52	2.44	2.45	76.5	23.5

Note. P = proximal variable; D = distal variable; T1 = Time 1; T2 = Time 2; T3 = Time 3

Table 5.7. *Overview of the Significant Multilevel Interaction Effects for the Target Variables Within the Laboratory Department*

Case 2: Laboratory	Target variables	Occasion(s)	Effect size (β) of interactions (Group X Time)
Proximal outcomes	Emotional resources	T2/T3	.26**/.26**
	Teamwork	T2	.22*
Distal outcomes	Work satisfaction	T2	.56***
	Team performance	T2/T3	.29*/.32*

Note. *p < .05; **p < .01; ***p < .001: Significant higher or lower scores, with Time 1 and the comparison group as reference categories.

Case 3: Emergency Room

The intervention program following the group-specific risk profile within the emergency room department included team workshops 'Dealing with peak workloads: communication, cooperation, and recovery', an observation of a work shift plus feedback to the departmental management, follow-up workshops, and coaching of the direct supervisors. In addition to the general target variables, the group-specific target variables were recovery during work, work break conditions, work-home interference, and home-work interference. The group means of the department for each of the target variables at each measurement occasion and the variance components of the variables are shown in Table 5.8. The variance that could be attributed to differences between persons ranged from 36-80%, whereas 20-64% of the variance could be attributed to differences between measurement occasions.

Table 5.8. *Means of the Target Variables for the Emergency Room Department.*

				Variance (%)	
Variable	T1	T2	T3	Person	Occasion
General proximal target variables					
Cognitive resources	3.10	3.13	3.20	38.0	62.0
Emotional resources	4.13	3.86	4.00	52.0	48.0
Physical resources	3.02	3.08	3.08	38.6	61.4
Cognitive detachment	3.95	4.06	3.98	79.7	20.3
Emotional detachment	3.81	3.90	3.67	78.6	21.4
Physical detachment	3.73	3.82	3.69	48.9	51.1
General distal target variables					
Work satisfaction	4.24	4.10	4.08	53.0	47.0
Individual work performance	7.57	7.83	7.95	62.5	37.5
Work performance team	7.47	7.72	7.68	35.8	64.2
Group-specific target variables					
Recovery during work (P)	2.30	2.60	2.79	42.1	57.9
Work break conditions (P)	2.53	2.25	2.52	65.4	34.6
Work-home interference (P)	2.63	2.74	2.51	46.0	54.0
Home-work interference (P)	1.66	1.48	1.48	43.2	56.8

Note. P = proximal variable; T1 = Time 1; T2 = Time 2; T3 = Time 3

The results showed an increase in individual work performance (β = .18*; p* < .05) and a decrease in home-work interference (β = -.18*; p* < .05) between Time 1 and Time 3. Additionally, the multilevel models showed significant positive main effects of both Time 2 and Time 3 on recovery during work (β = .17*; p* < .05, and β = .25*; p* < .01, respectively), implying an increase in the scores on this variable on each measurement occasion (see Table 5.9). No effects were found for the remaining target variables.

Table 5.9. *Overview of the Significant Multilevel Results for the Target Variables Within the Emergency Room Department*

Case 3: Emergency Room	Target variables	Occasion(s)	Effect size (β) of main effects (Time)
Proximal outcomes:	Recovery during work	T2/T3	.17*/.25***
	Home-work interference	T3	-.18*
Distal outcomes:	Individual work performance	T3	.18*

Note. *: *p* < .05, **: *p* < .01, ***: *p* < .001: Significant higher or lower scores, with Time 1 as a reference category.

5.4 Discussion

This quasi-experimental multiple-case study focused on improving health, well-being, and performance of hospital employees, by using the *DISCovery* method (De Jonge, Spoor, Hamers, & Bergman, 2012). This is a specific method for risk diagnosis and development and implementation of tailored work-oriented interventions based on the DISC-R Model (De Jonge & Dormann, 2003, 2006; De Jonge, Spoor, Sonnentag, et al., 2012) and participatory action research (PAR) principles (e.g., Dollard et al., 2008). The aim of this study was (1) to assess the effectiveness of the *DISCovery* method, and (2) to provide insight into the conditions under which tailor-made interventions succeed. We used proximal (i.e., work-related characteristics) and distal outcomes (i.e., employee health, well-being, and performance) to evaluate the effects of the interventions. Results were in line with the overall expectation, that is, positive changes were found in the intervention groups relative to the comparison groups for targeted work-related characteristics (H1), and for targeted health, well-being, and performance outcomes (H2). In all cases, effects for targeted proximal outcomes were already visible at the first follow-up measurements, whereas in two out of three cases effects on distal outcomes were visible only at the second follow-up

measurements. This is in line with the idea that proximal outcomes are more sensitive to the intervention process and may take less time to unfold than distal outcomes (cf. DeJoy et al., 2010).

The overall purpose was to influence the abovementioned range of target variables for all cases. However, for every group the actual focus differed, depending on their group-specific psychosocial risk profile and interventions. Hence, looking at each case individually, specific effects were found that were in line with the specific risk profiles and the content of different interventions. Furthermore, also timing and context of both the interventions and measurements seemed important for a proper interpretation of effects. We will first shortly discuss the results of each separate case, before moving on to a general discussion.

Case 1: Nursing department

In Case 1, the focus of the intervention program was on increasing (emotional and physical) job resources, enhancing recovery, and decreasing concentration problems. Indeed, relative to the comparison group, positive changes were visible throughout the intervention program regarding emotional and physical job resources and concentration problems, which were all part of the initial risk profile of the intervention group. In addition, similar changes were visible for cognitive detachment and work break conditions, which were also explicitly addressed within the intervention program for this group.

Most positive changes were visible in the first year of the study (Time 1 - Time 2), such as increases in job resources and cognitive detachment, as well as improved work break conditions shortly after the implementation of work breaks. The main intervention in the second year (i.e., lean management) progressed somewhat slower than planned, mainly because higher hospital management expressed their wish to first align the lean management intervention with other ongoing lean management activities within the organization. As a result, the first months of this intervention were mainly dedicated to creating an internal support network for the intervention. In addition, the coaching trajectories were started when it became apparent that both the direct supervisor of the department and the lean management working group were struggling with implementing changes in the department. Specific issues that were mentioned and consequently dealt with were resistance to change by other team members and lack of time and resources to carry out the intervention plans. As such, it is plausible that Time 3 measurements followed too soon to capture possible benefits of this intervention. However, the participants did evaluate the intervention positively and, for instance, pointed out a positive impact on the physical work space. Moreover, the decrease in concentration problems spreads over the entire intervention period (Time 1 - Time 3), which could indicate a joint result of the different interventions that were implemented

throughout the study. Finally, the participation rate of the job crafting intervention was rather low (50%). The primary reason for employees not to participate was that the workshops were organized outside regular working hours, which often interfered with their private life (e.g., childcare). Even though positive changes were visible for the targeted outcomes of this particular intervention (i.e., job resources and recovery), reaching the entire target population might have yielded more and/or stronger effects.

Case 2: Laboratory

In Case 2, the group-specific psychosocial risk profile consisted of low cognitive, emotional, and physical job resources, low physical detachment, high emotional exhaustion, and low work satisfaction and team performance. As a result of the *DISCovery* method, however, the focus of the intervention program was mainly on social and emotional work aspects (e.g., communication, teamwork). Positive changes that were found for this group were very much in line with this specific focus, that is, throughout the intervention program there was an increase in emotional resources, work satisfaction, team performance, and teamwork, relative to the comparison group.

Similar to Case 1, most positive changes for this group were visible between Time 1 and Time 2. The process evaluation indicated two possible explanations. First, in this group the participatory approach to intervention development that took place between Time 1 and Time 2 (i.e., *DISCovery* method, step 2) was explicitly mentioned as an event that started positive change. Thus, the participation itself may have had an additive positive effect on the way people perceived their work situation (Mikkelsen et al., 2000; Le Blanc et al., 2007). Second, a small minority of team members was said to have had a negative impact on the work situation for the whole team between Time 2 and Time 3, as they slowly relapsed into an old, more negative behavior pattern in that period. This might have counteracted some of the positive changes that were visible at Time 2 (e.g., work satisfaction, teamwork). However, the longer-term positive changes for emotional job resources and team performance, together with the interview outcomes, do indicate a positive effect of the entire intervention program on the work situation, in particular with respect to communication and cooperation.

Case 3: Emergency room

In Case 3, the target variables that were based directly on the risk profile were very limited, with the only risk scores being low recovery during work and poor work break conditions. Initially, the scope of the intervention program was somewhat broader, including cooperation and

communication aspects of work. However, the merger between the two emergency room units at the beginning of the study led to the adoption of successful ways of working together that were introduced by employees from the other unit. Meanwhile, dealing with peak workloads by effectively recovering during work and finding a balance between work and home gained importance. As such, for reasons of urgency and feasibility, the focus of the intervention program shifted to recovery during work and work-home balance during the course of the program. The results reflected this specific focus, with an increase in recovery during work and individual work performance, and a decrease in home-work interference, all covering the entire intervention period (Time 1 - Time 3). Results of the interviews underlined the positive changes with respect to recovery during work. No effects were found for work break conditions, most likely because the department did not have formal work breaks and ─ after a short pilot ─ chose not to implement them during the study. Although the pilot of implementing formal work breaks was not successful, progress and new solutions regarding the intervention themes were actively monitored and discussed during regular team meetings and annual employee interviews. The reason we did not find positive changes for the remaining target variables (e.g., job resources, detachment) may very well be that there was not much room for improvement with respect to those variables within this specific group (i.e., ceiling effect; see also Nielsen et al., 2006; Taris, 2000).

General discussion

The effect sizes in this study ranged from .17 to .56, which are classified as small to medium (Cohen, 1977) and in accordance with the effect sizes of most multi-modal stress management interventions (Richardson & Rothstein, 2008). Taking both quantitative and qualitative outcomes into account, specific positive changes in the work situation were found for the intervention groups, which were in line with the specific intervention programs. For Cases 1 and 2, however, it is important to realize that looking at changes over time for the intervention groups *relative* to the comparison group implies a certain dependency between the group results. For example, the fact that we found most positive effects for the intervention groups within these cases between Time 1 and Time 2 is not only due to positive changes in the intervention groups, but also to negative changes in the comparison groups in the same period. Process evaluation pointed out that this was a period in which employees were confronted with organizational changes and a flu epidemic, and where, consequently, upward trends in job insecurity and/or workload were reported. Then again, the fact that the scores of the intervention group did not reveal these trends, as opposed to the scores of the comparison groups, may indicate a positive non-specific ‘vaccination’ effect of the

interventions, with the groups that received 'treatment' being more resistant to negative external influences.

Against our expectations, in none of the cases we found effects for cognitive resources. Cognitive resources refer to the opportunity to determine a variety of task aspects and to use problem-solving skills (De Jonge, Spoor, Sonnentag, et al., 2012), which are elements that were part of different interventions (e.g., job crafting, lean management, team workshops) and the overall participatory approach towards the development and implementation of the interventions. Not finding any effects for cognitive resources might also be due to the relatively low internal consistency of the measurement scale in this study (α = .55). Because the internal consistency did not substantially improve by removing one of the items from the scale, we adhered to the original scale. Moreover, in other studies, the same scale did show satisfactory internal consistency (e.g., De Jonge, Gevers, & Dollard, 2014). For future studies, it would be recommendable to reassess and enhance the psychometric properties of this scale.

Theoretical and practical implications

The results of the current study underscore the value of both DISC-R and PAR principles for development and implementation of workplace interventions. Using the group-specific DISC-R risk profile as a starting point for idea generation regarding interventions, involving employees and management in the development and implementation of interventions, and tailoring interventions to the target groups were all highly-valued elements among the study participants, that seemed to have contributed to the success of the intervention programs. With regard to DISC-R theory, the empirical findings in this study provide support for the idea that counterbalancing high job demands with job resources and recovery can lead to positive changes in employee health, well-being, and performance outcomes. However, no strong conclusions can be drawn regarding the assumption that job resources and recovery are most effective if they correspond with the particular type of job demands (cognitive, emotional, or physical). In the current study, we used the matching principle as a heuristic for the development of the interventions, but combined it with the outcomes of the PAR approach. This is in line with Le Blanc et al. (2007), who argued that interventions should address job characteristics that are theoretically known to be related to the desired outcome variables, and with Griffiths (1999), who advocated that interventions should take place with the participation and experience of the subjects under study. The results of this study reinforce these notions, indicating a strong practical value of the DISC-R Model and lending support for the effectiveness of the *DISCovery* method.

Furthermore, the process evaluation of this study provided insight into specific conditions under which tailored workplace interventions can be successful. First, implementing interventions as initially planned (i.e., intervention fidelity) does not seem to be vital for the success of the interventions. Rather, continuously reevaluating and adjusting programs to insights that develop during the process of implementation may contribute more to the effectiveness of the program, provided that this is done in close collaboration with all stakeholders. For instance, devoting more time to creating an internal support network for interventions and shifting the focus in the content of workshops enhanced feasibility and employees' acceptance of the interventions. Thus, tailoring interventions to target groups can be continued during the implementation stage of the interventions, which is also consistent with the principles of PAR. Second, exposure of employees to the interventions relied greatly on the extent to which interventions received organizational support. A possible way to increase organizational support, besides creating explicit internal support networks, is formalizing active engagement with the intervention content. This can be done, for example, through the incorporation of intervention themes in the agenda of formal team meetings and/or annual performance appraisals, or by setting up specific employee working groups. Third, to reinforce participation of employees in interventions, intervention activities are best organized during regular work time, thus, requiring organizational facilitation and support. Finally, the current study pointed out the pivotal role of the departmental management throughout the entire implementation process, for instance, with respect to recruiting and enthusing employees, as well as managing changes in the work situation (see also Lewis, Yarker, & Donaldson-Felider, 2012). Therefore, it is highly recommendable to pay specific attention to the managerial key figures and offer individual coaching whenever possible to remedy potential implementation issues and strengthen the success of the interventions.

Limitations and future research

Although this study has several strengths, such as a mixed-method approach and a strong theoretical embeddedness, a limitation of this study is that the sample sizes are rather small, which can cause power problems in statistical analyses (i.e., not detecting differences that do exist). This is an issue common to longitudinal intervention studies, caused by the fact that intervention studies are often most meaningfully implemented at local organizational levels (Nielsen et al., 2006). In this study, tailoring interventions to relatively small organizational units inevitably called for analysis on the unit level for each separate case. Moreover, as in most longitudinal studies, part of the data was missing due to panel attrition. We dealt with this issue by analyzing our data with multilevel regression analysis, which uses all available data instead of listwise deleting cases with missing data

(Hox, 2002; Rasbash et al., 2012). Additionally, we used qualitative process evaluation as a triangulation tool to interpret quantitative results, thereby providing in depth information for each case.

Another limitation of this study is that the design is not truly experimental. The more realistic terminology 'comparison group' was selected explicitly in contrast to 'control group', as the formal requirements for real control groups were not met (cf. Scharf et al., 2008). For instance, it was not possible to randomly assign participants to the intervention and comparison groups, because the participating groups in this study are existing organizational units. Also, as mentioned earlier, the selection of intervention groups was mainly based on the presence of risk scores. Inherent to this particular selection procedure, the intervention and comparison groups were non-equivalent at baseline, with respect to the predictor and outcome variables. A possible consequence is that improvements in the intervention group and negative changes over time in the comparison groups might be (partly) due to regression towards the mean, as opposed to '(non-)treatment' (Mikkelsen et al., 2000). If this were true, however, we would expect to observe the trend of regression to the mean for the work aspects that were directly addressed by the interventions (e.g., Case 2: emotional resources) as well as for the ones that were not (e.g., Case 2: physical resources). The absence of the latter strengthens the idea that effects can be attributed to the intervention condition rather than natural fluctuations around the mean. In addition, regression to the mean would imply that particularly low or high initial scores (i.e., risk scores at Time 1) are due to random factors, rather than a reflection of the 'true' scores of the underlying concept (Taris, 2000). Thus, risk scores would be merely a result of measurement error. However, in the PAR procedure we checked if initial risk scores were recognized and acknowledged by the management and employees, to confirm whether or not the scores reflected the true work situation. If this was not the case, we did not target the intervention program at the risk factors in question. As such, we minimized the chance of regression to the mean.

An avenue for future research could be the investigation of the optimal timeframe and method for effect evaluation of tailor-made intervention programs. As became clear in the current study, tailored interventions require analysis on the level of the target group, looking at target variables and specific time frames. For instance, for some interventions it takes time to bear fruit, whereas others seem to yield results relatively quickly. Furthermore, as mentioned earlier, effects in distal outcomes (e.g., health) may take longer to unfold than proximal effects (e.g., changed work characteristics). As a consequence, both short and long time frames may not capture certain effects (see also Dormann & Van de Ven, 2014). Additionally, evaluating effects of tailored interventions may require surveys that are also tailored to a certain extent, capturing the local context and using

the daily language of the individuals under study (cf. Daniels, 2011; Nielsen, 2013). As such, the challenge would be to integrate different timeframes and the local context into a hybrid, effective, yet efficient method.

Furthermore, the results in this study were based on a rather specific health care sample. For future research it would be interesting to investigate the practical value of the *DISCovery* method in sectors and organizations other than health care. The expectation is that the effectiveness of the method does not depend on the type of work, as it is aimed at tailoring interventions to any target group. In other words, it can be seen as a generic approach that becomes more specific and targeted depending on the input of the individuals under study.

To conclude, this study indicates that the *DISCovery* method is a promising approach for optimizing psychosocial working conditions and improving health, well-being, and performance of employees in health care. As such, it provides an important contribution to bridging the gap between theoretical knowledge regarding occupational stress prevention and corresponding practical solutions.

CHAPTER 6

General Discussion

"We are continually faced with a series of great opportunities brilliantly disguised as insoluble problems."

(John W. Gardner)

This thesis presents the design, procedure, and outcomes of a research project about psychosocial risk management in health care settings through socially innovative principles of work (re)design. In health care, increasingly high demands create a tension between quality and efficiency of health care delivery on the one hand, and health, well-being, and performance of health care employees on the other. Therefore, particularly in this sector, scientifically validated solutions for job stress prevention and optimal, sustainable utilization of the workforce are badly needed.

The current research was founded on the Demand-Induced Strain Compensation Recovery (DISC-R) Model (De Jonge & Dormann, 2003, 2006; De Jonge, Spoor, Sonnentag, Dormann, & Van den Tooren, 2012). This model stresses the importance of counterbalancing high job demands with job resources and recovery from work. That is, a *balance* between job demands on the one hand, and job resources and recovery from work on the other will have positive effects on employee health, well-being, and performance-related outcomes (e.g., work satisfaction, employee creativity). In contrast, an imbalance can lead to unfavorable health, well-being, and performance outcomes, such as concentration problems and emotional exhaustion. Specifically, employees that encounter high cognitive, emotional, and/or physical demands in the workplace should have sufficient *matching* job resources and recovery opportunities to cope with their demanding jobs. That is, job resources and recovery that belong to the same domain as specific types of job demands (i.e., cognitive, emotional, and/or physical) are assumed to be most effective in counterbalancing those demands.

However, thus far, the role of recovery in the DISC-R Model remains understudied. Moreover, previous research on the DISC-R Model has mainly been of cross-sectional and fundamental nature, concentrating on static as opposed to dynamic associations between job demands, resources, recovery, and work-related outcomes (De Jonge et al., 2012; Van den Tooren, De Jonge, & Dormann, 2011). As a result, there is limited knowledge on how different elements of the DISC-R Model interact and develop over time, to what extent these relations can be explained at different levels (e.g., person level, day level, group level), and whether these relations can be redirected in practice; issues that are particularly relevant in the context of dynamic, highly demanding work environments such as hospitals and nursing homes. In this research project we conducted three empirical studies to address these gaps and to examine how the balance between different types of job demands, job resources, and recovery during and after working hours can be optimized to

improve health, well-being, and performance of health care workers. More specifically, the aims were (1) to theoretically and empirically strengthen the role of recovery in the DISC-R Model, (2) to gain insight into naturally occurring multilevel dynamics in associations between job demands, job resources, recovery, and work-related outcomes, and (3) to examine the practical value of the DISC-R Model by assessing the effectiveness of a group-level intervention method based on the DISC-R Model ('valorization issue').

Chapter 2 provided a detailed description of the study protocol. The first research aim was addressed by all three empirical studies in Chapters 3, 4, and 5 successively. The second research aim was addressed by two daily diary studies (Chapters 3 and 4). More specifically, Chapter 3 presented a study about the relation between off-job recovery and job resources at the day level as well as the person level. Chapter 4 showed a study about the effects of specific types of detachment from work on daily employee creativity. Subsequently, the third research aim was addressed in Chapter 5. This chapter presented a longitudinal quasi-experimental multiple-case intervention study, including a specific method for risk diagnosis and development and implementation of tailored work-oriented interventions (i.e., *DISCovery* method).

This final chapter provides a summary of main findings and a discussion of the results of the empirical studies. The first section (6.1) presents a brief overview of main research findings. In section 6.2, methodological strengths and limitations that should be considered when interpreting the results are discussed. The chapter continues with a discussion of (overarching) theoretical and practical implications (sections 6.3 and 6.4, respectively), and concludes with recommendations for future research and final remarks (section 6.5).

6.1 Main findings

This section briefly summarizes the most important results in this dissertation. First, the key findings of the three empirical studies are presented (i.e., Chapters 3, 4, and 5). Subsequently, based on these findings, we address the three main research aims.

Chapter 3: The relation between off-job recovery and job resources

Chapter 3 presented a daily diary study, in which 67 health care employees filled out multiple daily surveys over the course of eight days. The study examined the relation between off-job recovery and job resources at both the person level and the day level to determine whether and how the prevalence of one is associated with the prevalence of the other. Both work-related aspects are known to counteract potential negative consequences of high demands in the workplace (e.g.,

Bakker & Demerouti, 2013; De Jonge et al., 2012) and are, thus, highly relevant in the context of combating job stress. We hypothesized that previous days' detachment from work is positively related to the state of being recovered before going to work and that the state of being recovered, in turn, is positively related to one's level of job resources. Overall, results were in line with the expected relations and demonstrated that both person-level differences and, although to a seemingly lesser extent, day-level dynamics play a role in these relations. More specifically, at the person level, the results showed that individuals who in general detach more from work than others feel more recovered before work, and individuals who in general feel more recovered before work than others have a higher level of job resources at their disposal. Contrary to what was expected at the day level, the link between daily detachment from work in the evening and the daily state of being recovered at the beginning of the subsequent working day was *not* confirmed. Nonetheless, the expected positive relation between the daily state of being recovered and daily job resources was indeed supported by the results: on days that employees felt highly recovered from their last work shift before going to work, they had a higher level of job resources at their disposal during their work shift. Finally, results indicated a worse fit to our data for the reverse model with job resources predicting detachment from work, thereby supporting the current causal ordering.

Chapter 4: Effects of detachment from work on employee creativity

Chapter 4 presented a second daily diary study. In this study, daily survey data were gathered over the course of eight consecutive days from 151 health care employees. The study aimed to explore the role of different types of off-job recovery (i.e., cognitive and emotional detachment) in relation to identical types of job demands and job resources, in the prediction of day-level change in employee creativity. Employees' creative ideas are of great importance, because they can make a difference in organizational (social) innovation, problem-solving, change, and competitiveness (e.g., Amabile, 1988; Woodman, Sawyer, & Griffin, 1993). The importance of employee creativity also applies to health care organizations, particularly in the light of contemporary challenges in this sector (e.g., increasing market competition, growing personnel shortages). Within DISC-R theory, it is assumed that complete detachment from work might be detrimental for processes of learning and creativity to occur, whereas low detachment could be particularly beneficial to learning and creative behavior (De Jonge et al., 2012; De Jonge, Demerouti, & Dormann, 2014) Therefore, we expected that, on cognitively active working days (i.e., high cognitive job demands and resources), *low* cognitive detachment from work might enhance problem solving thoughts and ideas about work, and, hence, foster employee creativity. For emotionally active working days (i.e., high emotional job demands and resources), however, we expected that *high* emotional detachment might increase

positive affect, and, as such, benefit employee creativity. Conversely, the study first showed that cognitive detachment was *positively*, rather than negatively, related to day-level creativity, irrespective of the level of cognitive job demands and resources ('main effect'). Second, high emotional job demands in combination with either *low* levels of emotional detachment or high levels of emotional job resources were positively related to day-level creativity ('interaction effects'). Although this study did not support the specific hypotheses, results did indicate that detachment from work is *not* always beneficial to day-level creativity, depending on the specific job demands encountered during the working day and the specific type of detachment.

Chapter 5: Developing, implementing, and evaluating tailored workplace interventions

Chapter 5 presented a specific intervention method based on the DISC-R Model, that is, the *DISCovery* method. This method is targeted at improving employee health, well-being, and performance, by optimizing the balance between job demands, job resources, and recovery from work at the organizational unit level (i.e., group level). It consists of three parts: (1) a psychosocial risk diagnosis by assessing the (lack of) balance between job demands, job resources, and recovery during and after working hours, in combination with employee health, well-being, and performance outcomes, (2) the determination and development of tailor-made workplace interventions by means of a participatory action research (PAR) procedure, implying a close collaboration between researchers and study participants (e.g., Dollard, Le Blanc, & Cotton, 2008), and (3) the implementation of these interventions. A three-wave longitudinal, quasi-experimental, multiple-case intervention study was conducted among three departments in a general hospital. The aim of this study was (1) to assess the effectiveness of the *DISCovery* method both quantitatively and qualitatively (i.e., mixed-method approach), and (2) to provide insight into the conditions under which the method can be most effective and tailored interventions succeed. We expected that tailored work-oriented interventions would have positive effects on targeted job resources and recovery from work, and on targeted employee health, well-being, and performance outcomes for the intervention groups. We referred to job resources and recovery from work as *proximal* outcomes, as these aspects were directly targeted by the interventions and, thus, most likely to be sensitive to the intervention process (see also DeJoy, Wilson, Vandenberg, McGrath-Higgins, & Griffin-Blake, 2010). Conversely, employee health, well-being, and performance were referred to as *distal* outcomes, as it may take more time for such effects to unfold compared to the proximal outcomes (see also Taris, Kompier, Geurts, Houtman, & Heuvel, 2010; Dormann & Van de Ven, 2014).

In general, *quantitative* results were in line with the overall expectation. That is, positive

changes were found in the intervention groups, relative to their comparison groups, for targeted job resources and recovery from work (i.e., proximal outcomes), and for targeted health, well-being, and performance outcomes (i.e., distal outcomes), thereby lending support for the effectiveness of the *DISCovery* method. In addition, we did not find any effects for work-related aspects that were not directly addressed by the interventions, suggesting that effects can indeed be attributed to the intervention condition as opposed to natural fluctuations over time. The method effectiveness was further supported by the *qualitative* results. That is, results of a process evaluation that was mainly based on qualitative data (e.g., interviews, logbooks) converged with the quantitative results. Furthermore, in all cases, effects for targeted proximal outcomes were already visible at the first follow-up measurements (after one year), whereas in two out of three cases effects on distal outcomes were only visible at the second follow-up measurements (after two years). This is in line with the idea that proximal outcomes are most sensitive to the intervention process and might need less time to unfold than distal outcomes. Nevertheless, in none of the cases we found effects for cognitive resources. This was rather unexpected as different elements of cognitive resources (e.g., opportunity to determine a variety of task aspects and to use problem-solving skills) were addressed by several interventions (e.g., job crafting, lean management, team workshops) as well as by the participatory approach towards the development and implementation of the interventions.

Results of the process evaluation also provided insight into implementation conditions that contribute to the effectiveness of the *DISCovery* method. First of all, prolonged tailoring of the interventions to target groups (i.e., program adjustments based on progressive insights) during the implementation stage enhanced the feasibility and employees' acceptance of the interventions. Second, organizational support for the interventions (e.g., involvement of higher management and/or internal experts) contributed substantially to the extent to which employees actively engaged in the interventions. Third, participation rates were higher when we organized intervention activities during regular working hours. Finally, the commitment and skills of managerial stakeholders (e.g., departmental heads) with regard to recruiting and enthusing employees, as well as managing changes in the work situation, was an important condition for successful implementation of the interventions.

Conclusions concerning the three main research aims

The first research aim was to theoretically and empirically strengthen the role of recovery in the DISC-R Model. The empirical findings of this dissertation showed that recovery can be meaningfully linked to all other DISC-R elements (i.e., job demands, job resources, and work-related outcomes). More specifically, results highlight the importance of recovery from work as an

additional buffer for potential negative effects of high job demands, next to job resources. In other words, recovery from work plays an essential role in psychosocial risk management. Results also indicated, however, that it is important to distinguish between different types of recovery in combination with specific daily job demands, for instance, in predicting employee creativity. All in all, results support the added value of the inclusion of recovery in the DISC Model, implying that the extended DISC-R model is a substantially improved version of the DISC Model.

The second aim was to gain insight into naturally occurring multilevel dynamics in associations between job demands, job resources, recovery, and work-related outcomes. Results of the diary studies (Chapters 3 and 4) indicated that associations between different DISC-R elements can be explained at both the person level and the day level. In other words, persons differ in the degree to which they experience (high) job demands, job resources, and recovery, and work-related outcomes. Such individual differences may be attributable to stable trait characteristics, such as personality (e.g., Sheldon, Ryan, & Reis, 1996). However, levels of job demands, job resources, and recovery, and work-related outcomes also vary *within* individuals, such that levels of job demands or job resources are higher on some days than on others. This implies that both individual differences and changing daily circumstances should be considered in the context of optimizing the balance between job demands, job resources, and recovery.

The third aim was to examine the practical value of the DISC-R Model, by assessing the effectiveness of a group-level intervention method based on the DISC-R Model (i.e., the *DISCovery* method; Chapter 5). Results indicated that levels of job resources and recovery, as well as work-related outcomes can be positively redirected in practice at the organizational unit level. As social innovation refers to a participative way of redesigning the organization and management of work to improve individual and organizational performance and the quality of working life (cf. Pot, 2011, 2012), the *DISCovery* method can be regarded as a specific form of social innovation. Of course it can be argued that the participative step of the *DISCovery* method may in itself have had a positive effect on the way people perceived their work situation (Mikkelsen, Saksvik, & Landbergis, 2000; Le Blanc, Hox, Schaufeli, Taris, & Peeters, 2007; Westgaard & Winkel, 2011), much like the commonly known Hawthorne effect (Landsberger, 1958). Indeed it has been argued that the "special attention effect" implied in the Hawthorne effect is a viable working mechanism in the context of interventions (Semmer, 2011). However, if this was the *only* working mechanism in the current study, effects would most likely be much more general (e.g., increased work satisfaction in all intervention groups). In contrast, only finding effects for unit-specific, targeted outcomes suggests that these effects cannot exclusively be attributed to special attention. In fact, results indicate that a DISC-R risk diagnosis as a starting point for tailoring interventions to target groups

is an important step in the *DISCovery* method. That is, a DISC-R risk diagnosis provides targeted input for intervention development. Subsequently, PAR helps to translate and further fine-tune psychosocial risk profiles to target groups. As such, the participative procedure connects risk scores to concrete unit-specific issues. We may, therefore, conclude that the DISC-R Model can be used as a practical instrument for diagnoses of psychosocial working conditions to support subsequent intervention development. In other words, valorization of the model in real practice was rather successful.

6.2 Methodological considerations

Obviously, this thesis has several strengths, such as a sophisticated mixed-method design of the research project (Chapter 2), including daily diary studies with multiple daily observations (Chapters 3 and 4) and a longitudinal quasi-experimental multiple-case field study (Chapter 5), use of different statistical techniques to analyze the data (i.e., multilevel regression analyses and multilevel structural equation modeling), triangulation of data sources (Chapter 5), a profound theoretical embeddedness, and, last but not least, a strong practical relevance, also for model valorization. Despite these strengths, there are also some methodological limitations that should be considered when interpreting the results of this thesis. The main limitations concern the study design, measurement instruments, and study sample, which are discussed in the following paragraphs.

Study design

Although a quasi-experimental field study approach enhances ecological validity of the findings (Chapter 5), a limitation of this approach is that real-world organizational research settings can be subject to (unforeseen) organizational change and external influences beyond control of the researchers. Next to unexpected events, such as the ones described in the introduction of this thesis (Chapter 1), research-related actions of the comparison groups cannot be controlled by the researchers. For example, the possibility that comparison groups started (similar) interventions on their own initiative cannot be ruled out. However, by performing a process evaluation (e.g., supervisor logbooks, interviews), we were able to assess the occurrence and potential influence of such actions. Results of this evaluation indicated that spill-over effects from intervention to comparison groups were non-existent or negligible.

Furthermore, random allocation of participants to either the intervention or the comparison groups was not possible for both practical and ethical reasons. First, participating groups were

organizational units based on the existing organizational structure. Second, selection of intervention groups was mainly based on the extent to which existing units were identified as risk groups, through a psychosocial risk diagnosis (cf. *DISCovery* method) and consultation with departmental and organizational management. Inherent to this selection procedure, the intervention and comparison groups were non-equivalent at baseline regarding the predictor and outcome variables. As a consequence, positive changes in the intervention group and negative changes in the comparison groups might be (partly) due to regression towards the mean, as opposed to '(non-) treatment' (Mikkelsen et al., 2000). Hence, causal interpretations regarding intervention effects should be made with caution. It should be mentioned, though, that not finding effects for work-related aspects that were not directly addressed by the interventions, reinforces the idea that effects can be attributed to the intervention condition as opposed to natural fluctuations around the mean. In addition, overall convergence of the quantitative results (i.e., data triangulation) with qualitative results further strengthens the validation of the study outcomes. That is, we used qualitative data to examine whether survey scores reflected the 'true' work situation. For example, in the PAR procedure, we consulted the management and the employees to determine to what extent baseline risk scores were actually present and not simply a result of measurement error. If risk scores were not recognized in practice and/or if they were attributed to random factors, we did not further address them. As such, the chance of finding results due to regression to the mean in follow-up measures was diminished (Taris, 2000).

Another issue with respect to causality is that, despite the theoretical underpinnings of proposed relations and temporal sequence between measures of study variables in each empirical study, alternative explanations of the results due to other (unmeasured) factors cannot be totally ruled out. Therefore, future research could strengthen causal interpretations by focusing on confounding effects of alternative factors that were not included in this thesis (e.g., affect, self-efficacy, and need satisfaction).

Measurement instruments

First, all studies in this thesis are based on self-report measures of job demands, job resources, recovery from work, as well as self-report measures of employee health, well-being, and performance. As such, there is a possibility of common method variance (Podsakoff, MacKenzie, & Podsakoff, 2012), which may lead to overestimating the size of the relations between study variables (Semmer, Grebner, & Elfering, 2004). In the diary studies (Chapters 3 and 4), this issue was minimalized by decomposing the study variables in day-level and person-level components, hereby eliminating all between-person variance at the day level that could be attributed to individual

response tendencies (e.g., social desirability). Moreover, in all studies, self-report measurements were temporally separated, which reduces concerns about common method variance (Podsakoff et al., 2012). Finally, it can be argued that many of the variables under study represent individual perceptions (e.g., feeling recovered, level of job resources, work satisfaction) that are difficult or impossible to be rated by someone other than the concerning individual (Podsakoff et al., 2012; Spector, 2006). Moreover, meta-analytic studies have shown that self-rated health and well-being are associated with objective health outcomes such as cardiovascular mortality or longevity (e.g., Howell, Kern, & Lyubomirsky, 2007; Mavaddat, Parker, Sanderson, Mant, & Kinmonth, 2014). Another meta-analysis indicated that self-report ratings of job performance are often similar to supervisory ratings or objective performance data (Gilboa, Shirom, Fried, & Cooper, 2008). Nevertheless, future research should investigate to what extent objective health, well-being, and performance indicators can be predicted by the DISC-R Model.

Second, some of the measurement instruments consisted of single-item scales because of space limitations in the surveys and the relatively high intrusiveness of multiple daily measurements (Chapters 3 and 4) and multiple large surveys (Chapter 5) for participants. Single-item measures may jeopardize construct validity as the results may be specific to the particular item concerned. In other words, by using only one item, the construct can become rather narrow. Nevertheless, different studies have demonstrated that when the construct of interest is relatively narrow or unambiguous to respondents, a single-item measure may be appropriate (e.g., Abdel-Khalek, 2006; Rossiter, 2002; Van Hooff, Geurts, Kompier, & Taris, 2007; Wanous, Reicher, & Hudy 1997). Moreover, such measures minimize non-response and reduce data collection and data-processing costs (Bergkvist & Rossiter, 2007).

Finally, Cronbach's alpha for internal consistency of the cognitive resources scale in the intervention study (Chapter 5) was relatively low. Because removing one of the items from the scale did not substantially improve the reliability or change the results, we decided to adhere to the original scale. In previous studies, internal consistency of this scale has shown satisfactory results (e.g., De Jonge, Gevers, & Dollard, 2014; De Jonge & Peeters, 2009; Lavoie-Tremblay, Trépanier, Fernet, & Bonneville-Roussy, 2014). A few other studies, however, have indicated that scale reliability could be further improved (e.g., De Jonge et al., 2012; Van de Ven, 2011). It could be that the current scale is rather multidimensional in nature, by representing an autonomy aspect as well as an informative aspect of cognitive resources. According to Schmitt (1996), the alpha coefficient is not suitable for such measures, as the use of alpha – as an estimate of reliability – is based on the notion that the measures involved are unidimensional. For future studies, it would be recommendable to increase the number of items related to both types of cognitive resources and to

reassess the psychometric properties of this scale and its possible multidimensionality (see also Bova, De Jonge, & Guglielmi, 2013).

Study sample

The studies in this thesis have been conducted in multiple, representative health care settings (i.e., different departments in a general hospital and nursing homes) with a diverse sample (i.e., different job positions and specialties), which provides good external validity of the results with regard to other hospitals and health care institutions. Although sampling from single occupational domains can cause statistical power problems due to a lack of variance in work characteristics (Kristensen, 2005), the relatively high diversity of the current sample reduced the chance of lack of power (see also Fox, Dwyer, & Ganster, 1993). However, this particular study sample does raise questions about the generalizability of the results to other sectors and occupations. For instance, dynamics between elements of the DISC-R Model might be different for jobs that are mainly of cognitive nature (e.g., white-collar work), than for jobs that contain high levels of cognitive, emotional, as well as physical workload. On the other hand, earlier research (Van de Ven, 2011) has shown that even in very cognitively demanding jobs (i.e., IT professionals), employees are also faced with emotional and physical job demands, and that core principles of the DISC-R Model are also applicable to the technology sector. Notwithstanding, further research in other sectors and occupational groups is necessary to investigate the generalizability of the specific results in this thesis. With respect to the *DISCovery* method, a speculation is that its effectiveness does not depend on the type of work, as the method incorporates fine-tuning of the interventions to the specific work situation of the target group. Put differently, the *DISCovery* method might be seen as a generic approach, which becomes more specific and targeted depending on the input of the participants.

Another issue with respect to the study sample is that in the multiple-case intervention study the subsamples were relatively small. As described in Chapter 2, the original design was based on a sample size calculation that resulted in a required $N = 148$ ($n = 74$ for the intervention group and $n = 74$ for the comparison group) in order to detect significant intervention effects (Cohen, 1977). However, the specific approach to developing and implementing *tailor-made* interventions inherently led to a large variety of interventions addressing a number of unit-specific issues in different contexts. Because there were more differences than similarities between the four intervention units, treating them as one intervention group in the analyses was, ultimately, neither meaningful nor appropriate (cf. Nielsen, Fredslund, Christensen, & Albertsen, 2006). For example, in one of the units the focus was on recovery during work, whereas in another unit this specific theme was not included in the intervention program. As a result, possible intervention effects on

targeted variables in one unit might be leveled out by stability or negative fluctuations in the same variables in the other units. In addition, the study design differed among the participating departments, due to the previously mentioned organizational changes that took place during the research project. These considerations resulted in a multiple-case study approach, where each intervention group was treated as a separate study sample with either a between-group or a within-group study design. As a consequence, statistical power to detect possible effects of interventions within each case was reduced. Nevertheless, the fact that analyses did reveal a number of targeted intervention effects, in spite of the reduced power, is in favor of the idea that effects of tailored interventions should be assessed by looking at specific, targeted outcome variables.

6.3 Theoretical implications

From a theoretical perspective, certain implications can be made with respect to the DISC-R Model. This section first addresses implications regarding different theoretical assumptions of the DISC-R Model (i.e., balance, self-regulation, and match), followed by implications with respect to the overall theoretical model and job stress research in general.

Key assumptions of the DISC-R Model

First, the DISC-R Model proposes that there should be a balance between job demands, job resources, and recovery from work to prevent negative work-related outcomes (i.e., stress-buffering effects) and to enhance positive work-related outcomes (i.e., activation-enhancing effects). In other words, in a healthy, productive, and sustainable work situation, employees have sufficient job resources to deal with their job demands and can recover sufficiently from effort expenditure. In terms of Person-Environment (PE) fit (Edwards et al., 1998; Ostroff & Schulte, 2007), balance at work predominantly concerns a Job-Job (JJ) fit: there should be a match between different elements of the work design; that is, between job demands on the one hand, and availability of (corresponding) job resources and recovery opportunities on the other. Results in Chapter 5 support this DISC-R assumption by showing that workplace interventions aimed at increasing job resources and recovery are associated with positive changes in employee health, well-being, and performance outcomes. Furthermore, findings in Chapter 4 showed that daily work situations, in which high emotional demands were balanced by high emotional resources, are positively associated with day-level employee creativity.

In line with the above, the self-regulatory principle of the DISC-R Model proposes that high job demands can be dealt with through the availability and the *activation* of job resources. This

dissertation provides some support for the assumption that self-regulation is the underlying mechanism for the activation of job resources, by showing that the restoration of internal resources is positively related to one's ability to use job resources (Chapter 3). These findings imply that the level of job resources can to a certain extent be regulated by the employee, provided that potential job resources are available. Thus, both resources provided by the work environment (i.e., external resources) and resources that the individual brings to the work environment (i.e., internal resources) are essential for optimizing the psychosocial balance at work.

No strong conclusions, however, can be drawn with regard to the matching principle of the DISC-R Model. Although previous studies have found support for this principle (e.g., De Jonge et al., 2012b; De Jonge & Dormann, 2006), no three-way interactions between matching job demands, job resources, and detachment from work were found in Chapter 4. Two two-way interactions were found in the emotional domain, but these were tested only with a cognitive outcome. Furthermore, it should be noted that the matching principle was *not* specifically tested in the other empirical studies of this thesis as it was not part of the main research questions of those studies. Drawing on the findings in Chapter 4, a speculation is that, on a daily basis, matching job resources and detachment from work might (partly) compensate for each other in counterbalancing high job demands. Although a healthy work situation is assumed to include both job resources and recovery from work, the combination of both might be more important when dealing with high job demands in the long-term than from day-to-day. For example, on a day with high emotional demands and high emotional resources, the role of emotional detachment might be less important than on a day with high emotional demands and lower levels of emotional job resources. In this case, it would be less likely to find matching three-way interactions between job demands, job resources, and detachment from work in daily diary studies. Nevertheless, as demonstrated in Chapters 3 and 4, daily diary studies may be particularly important to reveal dynamic (day-level) processes between different DISC-R elements, which can have important implications for future studies on the DISC-R Model.

The DISC-R Model

As mentioned in previous sections of this discussion, findings of this thesis support the inclusion of *recovery* in the DISC Model. An ensuing implication for the model is a shift in its focus. Whereas job demands and job resources refer to characteristics of the work design, recovery from work refers to a process that, although it is work-related, mostly takes place after working hours (e.g., Demerouti, Bakker, Geurts, & Taris, 2009). Hence, compared to the previous version of the model, the DISC-R Model takes a broader perspective on psychosocial work conditions, which partly

intersects with the non-work domain. On the one hand, characteristics of the work design may create conditions for recovery during and after work, such as work breaks and work schedules. On the other hand, characteristics of the non-work domain (i.e., contextual factors) may influence recovery from work as well, such as demands in the home situation. Moreover, based on Chapter 3, it can be argued that recovery is more subject to individual differences, which may imply an important role for personal characteristics in the DISC-R Model. Previous research on the model, however, has indicated that job content factors are more important in predicting employee outcomes than contextual factors (e.g., occupational rewards; De Jonge, Gevers, & Dollard, 2014) and personal characteristics (e.g., coping styles; Van den Tooren, 2010). Therefore, the primary focus of the DISC-R Model should still be on *content-related* factors of the work situation, also with regard to recovery from work. Even though the employee takes a central role, the DISC-R Model is mainly a model for redesigning psychosocial work aspects that concern groups of employees through the primary work process.

A question is, however, if the current positioning of recovery in the DISC-R Model is warranted. That is, does recovery, next to job resources, function as an additional, equally important moderator in the relation between demand-induced strain and employee outcomes? Previous recovery research has shown ample evidence for the stress-buffering role of recovery from work (Sonnentag & Fritz, 2015). Chapter 3 of this thesis showed that, in addition, recovery can predict levels of job resources and, thus, may also contribute indirectly to the positive effects of job resources. Furthermore, this thesis showed that, similar to job resources, recovering through detachment from work may also have an activation-enhancing effect (Chapter 4). However, this effect seems highly content and context dependent. Sonnentag and Fritz (2015) indeed argue that effects of detaching from work may not be the same for a stressful work environment and a resourceful work environment. In the latter, employees may have positive affective experiences that call for savoring rather than detachment (see also Sonnentag & Binnewies, 2013). Based on the outcomes of Chapter 4, it can also be argued that emotionally stressful experiences require active emotion regulation as opposed to complete detachment. We may therefore conclude that recovery in general fulfils an important role in counterbalancing job demands, but that the recovery experience of detachment from work may be somewhat less functional in situations that are characterized by highly negative or positive affective experiences. Furthermore, a certain interdependency between recovery and job resources is assumed, in the sense that internal resources are needed for the activation of external (job) resources and, then again, need to be restored (see also Chapter 3). Thus, the idea that a combination of job resources and recovery can counterbalance high job demands does indeed seem warranted. Whether both elements can simultaneously moderate the relation

between demand-induced strain and employee outcomes (i.e., three-way interaction) remains to be further investigated.

Because recovering from work is preeminently a *process* that develops over relatively short time spans (see also Zijlstra & Sonnentag, 2006), another implication is that further research into the DISC-R Model may particularly benefit from (daily) diary studies. As shown in Chapters 3 and 4, this type of study can reveal the dynamic interplay between recovery and the other DISC-R elements from a process perspective. However, the current DISC-R conceptualization and operationalization of recovery as off-job detachment from work may not yet reflect the full extent and nature of recovering from work. For instance, Chapter 3 demonstrated an important role of sleep in the recovery process, and Chapter 5 indicated that recovering *during* work can also be an effective way of dealing with high demands. Perhaps a more comprehensive conceptualization of recovery lies in the final purpose of recovering from work; that is, restoring internal resources that have been depleted during work. Internal resources refer to an individuals' sense of their ability to control and impact upon their environment successfully (Hobfoll, Johnson, Ennis, & Jackson, 2003). According to DISC-R theory, individuals will generally strive to combat stress by balancing high job demands with the activation of internal (personal) or external (job) resources (De Jonge & Dormann, 2003, 2006; De Jonge et al., 2012). Thereupon, instead of detachment from work, recovery in the DISC-R Model could be conceptualized as the extent to which employees have internal resources at their disposal, regardless of the recovery strategy that is used to restore such resources (e.g., detachment during/after work, sleep). Because from a theoretical perspective *matching* internal resources are most important to buffer stress (cf. Daniels & De Jonge, 2010; De Jonge & Dormann, 2006), internal resources might be divided in a cognitive, emotional, and physical component, according to the DISC-R dimensions (cf. Kahn, 1990; Shirom, 2004). This conceptualization may help to zoom in more directly on the short-term processes through which specific job demands, job resources, recovery, and work-related outcomes are related. Yet, more research would clearly be needed to further operationalize and test this suggestion.

Furthermore, this dissertation showed a strong practical value of the DISC-R Model, specifically as a heuristic model for developing tailored workplace interventions aimed at optimizing psychosocial working conditions (Chapter 5). Where other job stress models, such as the Demand-Control Model (Karasek, 1979), the Effort-Reward Imbalance Model (Siegrist, Siegrist, & Weber, 1986), the Effort-Recovery Model (Meijman & Mulder, 1998), and the Job Demands-Resources Model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001), focus on the stress-buffering effects of either job resources or recovery from a generic point of view, the DISC-R Model provides multiple, specific clues for improving employee health, well-being, and

performance. In particular, it includes specific kinds of both job resources and recovery that can be used to counteract potential negative effects of specific job demands. By connecting specific work characteristics to energetic self-regulatory processes of employees, it provides a unique view on work redesign. Moreover, Chapter 5 demonstrated that the balance and matching principle provided specific guidelines for generating theoretically grounded ideas about work redesign. The theoretical principles of multidimensionality, balance and match were all easily understood and adopted by the participating employees and management, which underlined the model's face validity, valorization, and usefulness as a communication tool for psychosocial risk diagnosis. For instance, adopting the DISC-R perspective raised awareness among the study participants about the (lack of) availability of different kinds of job resources, recovery opportunities, and their own recovery behavior, which served as input for intervention development. In sum, the model can be used for practical and theoretical guidance in intervention studies aimed at psychosocial risk management.

Finally, a general implication regarding job stress research is that the combat of high job demands with specific and targeted job resources and recovery, as well as the combined potential of these job-stress buffers, are research venues that may help to further advance knowledge about effective psychosocial risk management. Therefore, it would be recommendable to use specific rather than generic measures of demands, resources, and recovery (see also Van den Tooren, 2010). To illustrate, the concept of social support at work can be considered as a generic measure that can refer to a cognitive resource (e.g., information provided by a colleague), an emotional resource (e.g., a colleague lending a sympathetic listening ear), or a physical resource (e.g., a colleague offering a helping hand) (Cohen & Wils, 1995). In addition, to further understand the inner dynamics of stress processes, time perspective should take a prominent role in job stress research (Dormann & Van de Ven, 2014). Examining how stressors and stress-reactions unfold over relatively short time periods (e.g., days, weeks) can reveal short-term interactions and mechanisms that may be directly targeted by workplace interventions. Because short-term processes operate within longer-term processes (Griffin & Clarke, 2011), such interventions may gradually cause sustainable, longer-term changes. As Taris et al. (2010, p. 470) once stated, "drops of water may dent a stone in time". After all, it is not primarily the acute stress reaction that is detrimental for an organism, but rather the accumulation of stress reactions over time (Meijman & Mulder, 1998; Sonnentag & Fritz, 2015). To conclude, job stress research should focus on the primary processes that connect work characteristics to employee outcomes to enhance sustainability of workplace interventions.

6.4 Practical implications

The main research question of this dissertation was how the balance between different types of job demands, job resources, and recovery from work can be optimized to improve health, well-being, and performance of health care workers. From a practical perspective, job demands often cannot easily be reduced. For example, for many organizations it is not (financially) feasible to hire more staff to divide the workload. This is particularly the case in health care, where the ageing population causes a rising demand on different types of health care and a decreasing workforce. In other words, more work has to be done with less people. Moreover, challenging job demands can also stimulate positive work-related outcomes (Crawford, LePine, & Rich, 2010; Tadić, Bakker, & Oerlemans, 2014; see also Chapter 4). Therefore, in line with findings in this thesis, the overall recommendation is optimizing job resources and recovery instead, through socially innovative principles. This implies working 'smarter' through efficient and sustainable utilization of the already available workforce of an organization (cf. Oeij, Dorenbosch, Klein Hesselink, & Vaas, 2010).This section first presents the practical implications and recommendations that arose from the person-level and day-level studies (Chapters 3 and 4), followed by those that resulted from the group-level study (Chapter 5). Finally, recommendations concerning social innovation and job redesign are discussed.

Optimizing the DISC-R balance at the person level and the day level

Revealing multilevel dynamics in associations between the different elements of the DISC-R Model has led to practical implications regarding the optimization of the balance at work at the person level and the day level. First of all, results of the two daily diary studies (Chapters 3 and 4) stress the importance of enhancing employees' (daily) recovery from work. Chapter 3 indicated that, apart from repairing negative strain effects (Geurts & Sonnentag, 2006; Demerouti et al., 2009), recovery can also function as a catalyst in the activation of job resources. Results in this chapter demonstrated that individual tendencies play an important role in this relation and that, on top of this, daily levels of job resources can be managed to a certain extent through daily recovery. Moreover, results of Chapter 4 showed that detaching from work in a cognitive way is positively associated with daily employee creativity. Thus, to enhance (daily) levels of job resources and daily employee creativity, it is recommended that employers stimulate employees' off-job recovery. For instance, organizations could offer training and counseling to their employees about how to effectively recover from work, through detaching from work, improving sleep hygiene measures (Mastin, Bryson, & Corwyn, 2006), and increasing recovery-related self-efficacy (Sonnentag & Kruel, 2006). Moreover, an important condition for effective recovery to occur is that job demands

are no longer present after work (Meijman & Mulder, 1998). In other words, to enable employees' detachment from work, employees should not be confronted with job demands during off-job hours, as opposed to the current trend of organizations' increasing expectations regarding their employees' availability during off-job hours. Possible ways for organizations and supervisors to endorse this condition are to set clear guidelines for separating work and non-work life (cf. Derks & Bakker, 2014; Sonnentag, Mojza, Binnewies, & Scholl, 2008), and to establish spatial and technological work-home boundaries (Park, Fritz, & Jex, 2011; Sonnentag, Kuttler, & Fritz, 2010). For example, employees may be encouraged to separate e-mail accounts for work and personal use, and to only access their work e-mail account during regular office hours. To illustrate, in 2011, Volkswagen agreed to stop its Blackberry servers from sending emails to employees out of office hours, as a result of complaints that staff's work and home lives were becoming blurred (BBC News, 2011). However, results in Chapter 4 also revealed that on a day with high emotional demands, *not* disregarding work-related emotions (i.e., low emotional detachment) seems to be the best strategy to produce new solutions to problems at work. Accordingly, it is recommendable for employees not to try to suppress negative work-related emotions, but to deal with them through *active and adaptive* forms of emotion regulation, such as positive reappraisal (e.g., Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross, 1998) or mindfulness (e.g., Chambers, Gullon, & Allen, 2009; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007). As such, this differentiation should be made when transmitting knowledge or training employees with regard to how to effectively detach from work and regulate emotions, especially when emotional labor is part of the day-to-day work situation.

Optimizing the DISC-R balance at the group level

Results of the multiple-case intervention study (Chapter 5) also have important practical implications. This chapter showed that, at the level of the organizational unit (i.e., group level), job resources and recovery, as well as work-related outcomes can be influenced. Overall, findings of this chapter indicate that the *DISCovery* method can result in higher levels of job resources and recovery, as well as improved health, well-being, and performance outcomes. Therefore, we encourage researchers and practitioners to use the *DISCovery* method as a means for group-level work stress prevention and optimal and sustainable utilization of the workforce. It should be stressed, however, that this implies the mere application of each step of the method. For instance, not starting with a proper analysis of risk factors and risk groups might result in *ineffective* interventions that may resemble "smoking cessation courses for non-smokers" (Kompier & Kristensen, 2000, p. 182). Thus, organizations that are seeking effective ways to prevent stress and optimize working conditions, are recommended to use *group-specific* psychosocial risk profiles

based on the DISC-R Model as a starting point for idea generation regarding tailored workplace interventions. As described earlier, this thesis has demonstrated that this particular job stress model provides multiple, specific guidelines for tailoring interventions to target groups and can serve as a useful communication tool for stress prevention and social innovation.

Next, according to the *DISCovery* method, PAR principles should be used in order to further tailor ideas for workplace interventions to the target group, heighten responsibility for the problems identified, and create employee and management support for the interventions (LaMontagne, Noblet, & Landsbergis, 2012). This implies that change agents (e.g., researchers, project leaders) should closely collaborate with study participants and stakeholders at different organizational levels in the development of interventions (e.g., Dollard et al., 2008). As demonstrated in this thesis (Chapter 5), structured collaboration can be established through regular meetings with a steering group and, if multiple organizational levels are involved, a lower-level project group in which organizational management is represented. Ways to actively involve study participants are frequent information updates that explicitly include the possibility for employees to react, feedback meetings, and brainstorm sessions in which participants are treated as 'subject matter experts'. These actions are also an integral part of the *DISCovery* method.

Furthermore, it is important to realize that failure to implement (parts of) interventions after diagnosing a group can lead to unfulfilled expectations, which may prevent future motivation and commitment of employees in workplace assessments and interventions (cf. Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991), or even have a negative impact on the work situation (e.g., Aust, Rugulies, Finken, & Jensen, 2010). To prevent implementation failure, implementation conditions should be carefully considered. Results of Chapter 5 provide a number of practical implications regarding implementation conditions that can contribute to the effectiveness of the *DISCovery* method and the success of tailored workplace interventions. First, researchers and/or organizational members in charge of the execution of the method are recommended to enhance their understanding of the group-specific work situation as much as possible, in order to maximize the level of tailoring of interventions. This can be done, for instance, by performing work floor observations (e.g., Chapter 5, Case 3), interviewing different stakeholders, and using additional (short) questionnaires about specific issues (e.g., Chapter 5, Case 2). Second, departmental managers are strongly recommended to actively integrate intervention themes and solutions into the daily work routine to increase their sustainability, for example, by discussing them regularly during management and team meetings, annual employee interviews, or by starting up specific intervention-themed employee working groups (e.g., Chapter 5, Case 1). Whenever possible, support from higher organizational management and internal organizational experts for intervention implementation and

integration is desirable to further enhance feasibility and sustainability of the interventions. For instance, in the current research, a lean management expert of the hospital was appointed to the facilitation of the lean management intervention in the nursing department (Chapter 5, Case 1). A final recommendation based on findings in this thesis is to implement multimodal interventions that aim at both employees and management because of the key role that line managers play in the implementation process (see also Biggs, Noblet, & Allisey, 2014; Lewis, Yarker, & Donaldson-Felider, 2012). For instance, good change-management practices and transformational leadership styles (e.g., charisma, intellectual stimulation, and individual consideration; Bass & Riggio, 2006) can positively influence employees' commitment to change (Herold, Fedor, Caldwell, & Liu, 2008). These leadership attributes might be enhanced by individual coaching trajectories (see also the coaching interventions in Chapter 5) or, at a higher organizational level, leadership development programs (e.g., Fitzgerald & Schutte, 2010).

Although intervention implementation is the final step of the *DISCovery* method, it is important not to regard this step as a final stage of psychosocial risk management. That is, during as well as after intervention implementation, group-level progress should be monitored as closely as possible, to reevaluate the new status quo (i.e., are risk scores still present?). Based on the outcomes of this evaluation, new follow-up actions may be determined with and for the specific target group. For instance, in the emergency department (Chapter 5, Case 3) the focus of the intervention program shifted somewhat during the course of the program as a result of ongoing evaluation of feasibility and urgency of the intervention activities. Hence, the *DISCovery* method can be seen and used as a feedback loop for organizational learning and continuous improvement of the work situation (Argyris, 1995; Mikkelsen et al., 2000). This is line with Dollard et al. (2008), who argue that PAR approaches, such as *DISCovery*, have the potential to contribute to organizational sustainability, as organizational members learn to solve self-identified problems. For example, as a consequence of the interventions in the laboratory department (Chapter 5, Case 2), different employee working groups were spontaneously started to keep improving the work situation. As such, the *DISCovery* method may also contribute to employees' lifelong learning and sustained employability, which is particularly relevant in the light of the ageing, yet decreasing workforce (see also Bohlinger & Van Loo, 2010).

Social innovation and work redesign

This thesis also has some important implications for social innovation and work redesign practices. As the previous paragraphs point out, workplace interventions to prevent stress and enhance optimal and sustainable utilization of the workforce should first of all be aimed at work-related aspects,

rather than person-related aspects. After all, improvements in the psychosocial work design (e.g., optimizing job resources and recovery opportunities) may lead to positive, sustainable employee and organizational outcomes, whereas person-oriented changes (e.g., improving individual knowledge or skills) may benefit the organization only as long as the individual is actually employed. Paradoxically, evidence suggests that there is a general reluctance to tackle work-related factors (La Montagne et al., 2012). Organizations often aim at changing behavioral aspects of employees without taking the influence of job content into account, possibly because the latter is often less apparent and/or restructuring job content is conceived as a difficult process. In this respect, the *DISCovery* method can be an important tool for creating awareness of the potential impact of the work (re)design on employee and organizational outcomes, and can enhance feasibility of redesign processes by offering a step-by-step approach. Notwithstanding, psychosocial work conditions also depend on how employees interact with their work environment and, for instance, whether they make effectively use of available job resources and recovery opportunities. Therefore, to reach optimal effectiveness, intervention programs should ideally target person-related aspects as well, at both the employee level (e.g., improving recovery-related self-efficacy) and the supervisor level (e.g., individual coaching). In short, multimodal comprehensive interventions that combine work-directed and worker-directed actions are recommended (Karanika-Murray, Biron, & Cooper, 2012).

In line with the above, research into the optimization of psychosocial work characteristics requires a process through which work redesign can actually be achieved (De Jonge, 1995). As also demonstrated in this thesis, the research and redesign process should be participative, systematic and structured to enhance the chance of achieving a significant impact (Nielsen, Randall, Holten, & González, 2010). The roots of systematic work redesign processes can already be found in earlier theorizing about organizational change management, such as the step-by-step approach to occupational stress of Kompier and Marcelissen (1990) and the so-called Plan-Do-Study-Act cycle for learning and improvement (Deming, 1993; Langley, Nolan, & Nolan, 1994). This cycle does not only offer a systematic approach to organizational change, but also states that it is necessary to be able to *predict* whether a change will result in improvement under different conditions. Put differently, change actions should address work-related characteristics that are theoretically known to be related to the desired outcome variables (Le Blanc et al., 2007).

Hence, in line with the *DISCovery* method, the inclusion of sound theoretical job characteristic models in work redesign processes is essential. By using the DISC-R Model as a theoretical framework, redesign actions can be evidence-based, specific, and targeted. Moreover, using a visualization of the DISC-R Model as a communication tool in the change process may lead to

theoretically grounded shared mental models of the stakeholders. Such mental models include cognitive schemata of working conditions, the purpose of the change, and the likely outcomes (Weick, Sutcliffe, & Obstfeld, 2005), and may drive the behaviors of the organizational change actors (Nielsen & Abildgaard, 2013). For example, having a shared mental model among a group of employees that emotional resources are important for psychological health and well-being at work, may result in those employees being more attentive to giving and receiving emotional support. To conclude, through demonstrating the active ingredients of the *DISCovery* method, this thesis fleshes out and provides guidance to social innovation and work redesign in practice.

6.5 Recommendations for future research

Although this thesis has yielded some interesting findings, further research is clearly needed to address several unanswered questions and opportunities. Next to the directions for further research mentioned in the previous sections of this general discussion, a number of avenues for future research arose from the studies reported in this thesis.

First, to our knowledge, this thesis is the first to examine the DISC-R Model from a process perspective. More sophisticated designs, such as time series (e.g., growth curve modelling), and more quasi-experimental designs (e.g., intervention studies) in other sectors than health care are needed to further generalize and strengthen the causal interpretations in this thesis in associations between the DISC-R elements. Furthermore, although the matching principle served as a heuristic for intervention development, in the current research design it was not possible (and also not the key focus) to explicitly test it in practice. That is, due to external factors that were not under control of the researchers and due to the multimodal nature of the interventions, single intervention effects within different DISC-R dimensions could not be isolated. As Kompier, Taris, and Geurts (2000) stated, “it is the paradox of “field” intervention research that those intervention [programs] that offer the best preventive potential (e.g., addressing the real problems, [multimodal] treatments directed at work and the worker), make it difficult to answer the question [what works]” (p. 386). Different types of studies (e.g., vignette studies; Van den Tooren, 2010) are needed to draw more firm conclusions on the matching principle in the context of job redesign, which may contribute to uncovering specific mechanisms that connect interventions to their outcomes.

Second, as suggested earlier in this general discussion, future research may examine the conceptualization of recovery as a multidimensional construct that involves having cognitive, emotional, and physical internal resources at one’s disposal. This multidimensionality of internal resources is also in line with the concept of psychological availability: the belief that one has the

cognitive, emotional, and physical resources to engage in work (Kahn, 1990), such as cognitive control, positive emotions, and physical fitness (see also May, Gilson, & Harter, 2004). Similarly, Shirom (2004, 2011) introduced the concept of vigor in the work domain to refer to employees' feelings that they possess cognitive liveliness, emotional energy, and physical strength – a set of interconnected affective experiences that relate to individuals' internal energetic resources. Cognitive liveliness refers to feelings of mental agility. Emotional energy refers to the feeling of being capable of emotionally investing in relationships with clients and coworkers. Finally, physical strength refers to one's feelings of high level of energy in carrying out daily tasks at work (Shirom, 2004; Shirom, Toker, Berliner, Shapira, & Melamed, 2008). Vigor in the workplace represents a temporary state rather than a personal trait and has been positively associated with job resources (Shirom, 2011). It would be particularly interesting to examine how these specific internal resources relate to specific job demands, job resources, detachment and employee outcomes For instance, cognitive job resources may help to conserve cognitive liveliness, which then again may be used to activate (other) cognitive job resources. Future research should further investigate the suggested link between state-like internal resources and external resources to determine whether there is a positive reciprocity between both work-related aspects.

Third, as recovery from work usually takes place at home, another direction for future research is the influence of the home domain within the DISC-R Model. Although this is out of scope of the current DISC-R Model, it would be interesting to know whether specific home characteristics (e.g., home demands, home resources) are related to detachment from work (see also Demerouti et al., 2009), and in what ways these relations might be associated with work-related outcomes (e.g., employee creativity, fatigue). It could be, for example, that demands in the home situation facilitate detachment from work by occupying one's attention with things other than work. However, it is also conceivable that *negative* home experiences, such as family conflicts or thinking about financial problems, might attenuate the stress-buffering effect of detachment from work (Sonnentag & Fritz, 2015).

At last, it should be noted that to date, all studies on the DISC(-R) Model have been based on a variable-centered approach (e.g., Van den Tooren, 2010; Van de Ven, 2011). This type of approach usually views individuals as homogeneous members of a group (Siltaloppi, Kinnunen, Feldt, & Tolvanen, 2012), thereby ignoring potential individual differences in interactions between job demands, job resources, recovery, and work-related outcomes. Van den Tooren (2010) dealt with this issue by examining effects of specific personal characteristics as additional moderators, but did not find such effects. An alternative approach is a person-centered approach, which is based on a dynamic view of the individual and aimed at revealing heterogeneity through differentiating and

comparing subgroups of individuals (Feldt et al., 2013; Siltaloppi et al., 2012). As Siltaloppi and colleagues (2012) point out, the difference between approaches is reflected in the statistical techniques used: for instance, correlation and regression analyses are based on the variable-centered approach, whereas profile, class, and cluster analyses match the aim of the person-centered approach. To further explore dynamics in the DISC-R Model at the individual level, it would therefore be recommendable to adopt a person-centered perspective through the application of one of the above mentioned statistical techniques. Chapters 3 and 4 of this dissertation showed that there is indeed variance in DISC-R variables that can be explained at the individual level. However, in line with the *DISCovery* method, these differences may be approached at the group level. More specifically, future research could aim at identifying subgroups of employees with similar patterns of demands, resources, and recovery, and compare these subgroups on employee health, well-being and/or performance outcomes. For example, work-related outcomes of subgroups with high resources but low recovery might be compared with those of subgroups with low resources but high recovery. This might shed light on the relative importance of job resources and recovery, as well as on potential risk groups.

6.6 Concluding remarks

In this thesis, we highlighted the role of recovering from work-related effort with respect to job stress prevention and employee creativity. Second, we revealed that both day-level and person-level dynamics are important in associations between the key elements of the DISC-R Model. Third, we demonstrated the practical and heuristic value of the DISC-R Model. In particular, we showed that job resources and recovery from work, as well as employee outcomes can be redirected in practice by using a specific group-level intervention method based on the DISC-R Model (i.e., the *DISCovery* method). The studies resulted in important theoretical implications with regard to the premises of the DISC-R Model as it stands now. Most importantly, the inclusion of recovery from work in the model seems warranted and of added value. In addition, the results provided specific practical guidelines for how to optimize the balance between job demands, job resources, and recovery in order to improve health, well-being, and performance of employees in health care. Because health care organizations have to deal with increasingly high job demands, such scientifically well-validated solutions for improving psychosocial work conditions are critical. Overall, the thesis contributes to bridging the gap between theoretical knowledge and practical applications regarding psychosocial risk management, by shedding light on dynamics between elements of the DISC-R Model from a process and redesign perspective. Although further research

opportunities are abundant, a particularly important future challenge may be to focus more closely on the specific mechanisms that connect interventions to their outcomes. Such insights may further improve the explanatory power of job stress theories and, as such, contribute to the optimal tailoring of work redesign interventions; interventions that can make the difference between stressful and challenging working conditions. To conclude, this thesis entails an essential step in the valorization of the DISC-R Model and provides guidance to realizing a balanced, sustainable psychosocial work situation in today's practice.

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APPENDIX A

Description of Interventions

Table A.1. *Description of Interventions*

Intervention group	**Intervention**	**Description**
Nursing	1. Implementation of work breaks	Formal daily work breaks of 30 minutes were implemented at the daycare subunit of this department, in addition to the already existing formal daily work breaks within the rest of the department.
	2. Job crafting	Job crafting refers to the actions employees take to shape, mold, and redefine their jobs (Wrzesniewski & Dutton, 2001, p. 180). In this particular study, job crafting was aimed at increasing job resources and enhancing recovery from work. The intervention was based on an existing framework for job crafting training (Van den Heuvel, Demerouti, & Peeters, 2012) and facilitated by an external trainer and the researchers. It consisted of the following three steps: 1. An initial workshop, in which participants learned about the basic principles of job crafting and set personal job crafting goals; 2. A 4-week period during which participants worked on reaching their personal job crafting goals and received a weekly e-mail as a reminder of their goals; 3. A final reflection meeting, in which participants reflected upon their goals, shared tips and experiences with each other, and decided what to keep working on in the future.
	3. Lean management	Lean management is an improvement approach that, in the context of health care, consists of eliminating waste (e.g., interruptions, delays, mistakes) to improve the flow of patients, information or goods (De Souza, 2009). Five employees of the department volunteered to be part of a working group lean management. The task of this group was to initiate lean management within the department and to involve other team members in this process. Additionally, an internal lean management expert carried out observations at the department and, subsequently, reported the observed inefficiencies in the daily working process and areas of improvement to both departmental management and working group. In joint agreement among the involved parties, different lean management tools (i.e., 5S, kaizen, idea board) were selected to initiate lean management within the department. Monthly working group meetings were organized together with the researchers and internal content and process experts, in order to support the working group. During these meetings the overall progress, difficulties, and next action steps were discussed. Also, additional support meetings were planned when necessary.
	4. Coaching trajectories	An external coach provided individual coaching to the direct supervisor of the intervention group and joint coaching sessions to the working group lean management.

Laboratory	1.	Analysis departmental goals	An in depth analysis of departmental goals and ambitions (specifically regarding cooperation and communication) was carried out by the researchers together with an external consultant, using a supplementary tailored questionnaire. The results of this analysis were presented to the departmental management and used as input for the team workshops.
	2.	Team workshops	A first round of team workshops about goals, communication, and cooperation was organized for the whole team, including the departmental management. External trainers facilitated the workshops. During these workshops, small working groups were initiated to deal with specific problems (e.g., physical work climate). In the second round of team workshops, participants reflected upon the progress of both the working groups and the team in general, with respect to communication and cooperation.
	3.	Follow-up workshops	Follow-up workshops were organized to reflect once again on the progress of both the working groups and the team in general, with respect to communication and cooperation.
	4.	Coaching trajectory	An external coach provided individual coaching to the direct supervisor of the intervention group.
Emergency Room	1.	Team workshops	Team workshops “Dealing with peak loads: communication, cooperation, and recovery” were organized by the researchers together with an external trainer, with an emphasis on recovery during work. Participants shared experiences and tips about how to recover during work and discussed communication and cooperation issues that arose with respect to individual recovery strategies (e.g., work and work break alignment).
	2.	Observation	One of the researchers observed the team during a full work shift and, subsequently, provided feedback to the departmental management about the observed communication, cooperation, and especially the recovery behavior of the team members.
	3.	Coaching trajectory	An external coach provided joint coaching sessions for the two direct supervisors of the intervention group.
	4.	Follow-up workshops	Follow-up workshops were organized to reflect upon (changes in) the participants’ recovery behavior. Participants shared tips and experiences with each other, and decided what to keep working on in the future.

APPENDIX B

Baseline Means and Standard Deviations of Study Variables for All Participating Groups

Appendix B

Table B.1. *Baseline Means and Standard Deviations of Study Variables for All Participating Groups*

	Department									
	Nursing				Laboratory				Emergency Room	
Variables	IG		CG		IG		CG		IG	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Cognitive demands	4.43	0.46	4.35	0.33	4.18	0.39	4.33	0.46	4.49	0.41
Emotional demands	3.21*	0.46	2.84*	0.70	2.59	0.59	2.49	0.45	3.17	0.55
Physical demands	3.18*	0.90	3.94*	0.65	3.02	1.01	2.61	0.37	3.73	0.75
Cognitive resources	3.15	0.58	3.37	0.44	2.80*	0.57	3.21*	0.53	3.10	0.59
Emotional resources	3.88*	0.51	4.23*	0.67	3.29***	0.73	4.20***	0.56	4.13	0.63
Physical resources	3.11*	0.63	3.56*	0.65	2.73**	0.64	3.45**	0.70	3.02	0.66
Cognitive detachment	3.88**	0.38	4.16**	0.40	3.75	0.65	3.60	3.61	3.95	0.42
Emotional detachment	3.71	0.48	3.86	0.54	3.41	0.52	3.39	0.55	3.81	0.58
Physical detachment	3.52	0.55	3.53	0.65	3.16	0.76	3.61	0.60	3.73	0.66
Recovery during work	3.23	0.80	2.88	0.66	3.35	0.79	3.56	0.70	2.30	1.00
Concentration problems	2.25	1.03	1.97	0.79	1.71	0.52	2.16	0.83	1.69	0.72
Emotional exhaustion	2.55	1.07	2.72	0.85	2.91	1.10	2.52	0.96	2.37	0.57
Work satisfaction	3.79	1.10	3.88	0.70	3.38*	1.02	3.95*	0.40	4.24	0.68
Individual work performance	7.70	0.61	7.70	0.68	7.82	0.53	7.53	0.77	7.57	0.69
Team performance	7.36	1.25	7.75	0.72	6.00**	1.59	7.68**	0.58	7.47	0.65
Work break conditions	3.30	0.84	3.16	0.71	3.47	0.91	3.79	0.45	2.53	1.12
Teamwork	4.15	0.46	4.35	0.46	3.00***	0.69	4.18***	0.39	3.92	0.49
Work-home interference	2.52	0.62	2.68	0.66	2.51	0.68	2.67	0.60	2.63	0.58
Home-work interference	1.26*	0.41	1.59*	0.54	1.65	0.49	1.81	0.57	1.66	0.57

Note. Means are tested with t-tests (horizontal comparisons). The contrast is: 'Intervention group (IG)' vs 'Control group (CG)'. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$: significantly higher (lower) means.

APPENDIX C

Multilevel Models for Change Over Time and Intervention Effects

Table C.1. *Multilevel Models for Change Over Time and Intervention Effects Within the Nursing Department*

	Outcome variable											
	Cognitive resources		Emotional resources		Physical resources		Cognitive detachment		Emotional detachment		Physical detachment	
Variable	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	3.36***	0.09	4.24***	0.11	3.54***	0.11	4.12***	0.08	3.80***	0.09	3.49***	0.10
Time and Intervention												
Intervention group	-0.18	0.13	-0.36*	0.17	-0.36*	0.17	-0.27*	0.12	-0.10	0.13	0.00	0.15
Time 2	-0.23*	0.10	-0.41**	0.12	-0.30*	0.12	-0.16*	0.08	0.05	0.10	0.07	0.13
Time 3	0.00	0.10	-0.07	0.11	-0.01	0.11	-0.10	0.07	-0.13	0.09	0.14	0.12
Intervention Group X Time 2	0.16	0.15	0.35*	0.17	0.38*	0.19	0.31**	0.12	0.16	0.15	0.01	0.19
Intervention Group X Time 3	-0.19	0.14	0.30	0.16	0.04	0.17	0.19	0.11	0.16	0.14	0.04	0.17
Control variables												
Age	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	-0.00	0.00	0.00	0.01
Variance components												
Individual	0.14***	0.04	0.28***	0.06	0.21***	0.05	0.15***	0.03	0.11***	0.03	0.15***	0.04
Occasion	0.13***	0.02	0.16***	0.02	0.18***	0.03	0.07***	0.01	0.13***	0.02	0.21***	0.03
	Work satisfaction		Individual work performance		Team performance		Concentration problems		Recovery during work		Work break conditions	
Variable	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	3.83***	0.15	7.68***	0.10	7.76***	0.15	1.93**	0.14	2.88**	0.12	3.13**	0.12
Time and Intervention												
Intervention group	-0.05	0.22	-0.05	0.15	-0.39	0.22	0.41	0.22	0.34	0.18	0.19	0.18
Time 2	-0.03	0.21	0.00	0.12	-0.01	0.19	0.09	0.16	-0.08	0.15	-0.30*	0.12
Time 3	0.04	0.19	0.11	0.11	-0.02	0.18	0.29*	0.15	0.30*	0.14	0.08	0.11
Intervention Group X Time 2	0.24	0.31	0.05	0.18	0.33	0.27	-0.28	0.24	-0.09	0.23	0.51**	0.19
Intervention Group X Time 3	0.03	0.28	0.01	0.17	0.27	0.26	-0.50*	0.22	-0.26	0.21	0.08	0.17
Control variables												
Age	0.00	0.01	0.01	0.01	0.01	0.01	-0.02*	0.01	0.00	0.01	0.00	0.01
Variance components												
Individual	0.19*	0.08	0.17***	0.04	0.28**	0.09	0.42**	0.10	0.17**	0.06	0.33**	0.07
Occasion	0.56***	0.08	0.19***	0.03	0.46***	0.07	0.31**	0.05	0.29**	0.04	0.19**	0.03

Note. Time 1 and the comparison group are reference categories.* $p < .05$; ** $p < .01$; *** $p < .001$.

Table C.2. *Multilevel Models for Change Over Time and Intervention Effects Within the Laboratory Department*

	Outcome variable											
	Cognitive resources		Emotional resources		Physical resources		Cognitive detachment		Emotional detachment		Physical detachment	
Variable	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	3.31***	0.26	4.16***	0.41	3.52***	0.37	3.33***	0.34	3.12***	0.32	3.00***	0.37
Time and Intervention												
Intervention group	-0.06	0.24	-0.81*	0.36	-0.65	0.36	0.17	0.30	0.11	0.29	-0.02	0.34
Time 2	-0.01	0.13	-0.30*	0.13	-0.20	0.21	0.10	0.13	0.04	0.13	0.08	0.15
Time 3	-0.03	0.13	-0.21	0.12	-0.12	0.20	0.19	0.13	0.10	0.12	0.03	0.15
Intervention Group X Time 2	-0.08	0.19	0.52**	0.19	0.19	0.30	-0.04	0.19	0.01	0.18	0.26	0.22
Intervention Group X Time 3	-0.19	0.19	0.51**	0.19	-0.05	0.30	-0.20	0.19	0.01	0.19	-0.02	0.23
Control variables												
Marital status	-0.31	0.17	-0.06	0.26	-0.06	0.24	0.01	0.22	-0.02	0.21	-0.28	0.24
Irregular shift (excl. Night)	-0.38	0.22	0.07	0.40	-0.14	0.30	0.33	0.28	0.25	0.27	0.43	0.31
Nightshift	-0.02	0.25	-0.04	0.34	-0.06	0.35	0.26	0.33	0.27	0.31	0.67	0.36
Variance components												
Individual	0.08**	0.03	0.24**	0.08	0.12	0.06	0.17**	0.05	0.15**	0.05	0.20**	0.07
Occasion	0.15**	0.03	0.14***	0.03	0.34***	0.06	0.14***	0.03	0.14***	0.03	0.20***	0.04

	Work satisfaction		Individual work performance		Team performance		Teamwork		Emotional exhaustion	
Variable	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	4.60***	0.37	7.13***	0.35	8.25***	0.40	4.48***	0.27	3.47***	0.59
Time and Intervention										
Intervention group	-0.72*	0.34	0.49	0.31	-1.72***	0.38	-1.34***	0.25	-0.04	0.51
Time 2	-0.70***	0.16	-0.06	0.16	0.08	0.27	-0.09	0.15	-0.02	0.16
Time 3	-0.08	0.16	0.01	0.16	-0.04	0.26	0.18	0.15	0.02	0.16
Intervention Group X Time 2	1.09***	0.24	-0.28	0.23	0.82*	0.39	0.44*	0.22	-0.17	0.24
Intervention Group X Time 3	0.29	0.24	-0.30	0.23	0.91*	0.39	-0.00	0.22	0.01	0.24
Control variables										
Marital status	-0.19	0.24	-0.15	0.22	-0.35	0.25	0.05	0.17	0.43	0.37
Irregular shift (excl. Night)	-0.42	0.30	0.41	0.28	-0.30	0.32	-0.21	0.21	-1.11*	0.49
Nightshift	-0.65	0.35	0.41	0.33	-0.56	0.37	-0.32	0.25	-1.02	0.57
Variance components										
Individual	0.17**	0.06	0.15**	0.06	0.05	0.08	0.06	0.03	0.60***	0.16
Occasion	0.23***	0.04	0.22***	0.04	0.62***	0.11	0.20***	0.04	0.22***	0.04

Note. Time 1 and the comparison group are reference categories.* $p < .05$; ** $p < .01$; *** $p < .001$.

Table C.3. *Multilevel Models for Change Over Time Within the Emergency Room Department*

	Outcome variable											
	Cognitive resources		Emotional resources		Physical resources		Cognitive detachment		Emotional detachment		Physical detachment	
Variable	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	3.09***	0.07	4.09***	0.10	3.02***	0.09	3.91***	0.08	3.78***	0.09	3.71***	0.09
Time												
Time 2	0.04	0.09	-0.17	0.12	0.07	0.12	0.06	0.07	0.06	0.07	0.11	0.11
Time 3	0.10	0.09	-0.05	0.12	0.07	0.11	0.11	0.06	-0.04	0.07	0.02	0.10
Variance components												
Individual	0.09**	0.03	0.22**	0.07	0.13**	0.05	0.26***	0.06	0.28***	0.06	0.17**	0.06
Occasion	0.13***	0.02	0.20***	0.04	0.21***	0.04	0.06***	0.01	0.08***	0.01	0.18***	0.03

	Work satisfaction		Individual work performance		Team performance		Recovery during work		Work break conditions		Work-home interference		Home-Work interference	
Variable	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	4.26***	0.11	7.65***	0.11	7.50***	0.11	2.31***	0.14	2.53***	0.14	2.65***	0.10	1.68***	0.09
Time														
Time 2	-0.15	0.13	0.20	0.11	0.23	0.14	0.33*	0.17	-0.16	0.15	0.08	0.11	-0.20	0.11
Time 3	-0.14	0.12	0.27*	0.11	0.18	0.13	0.49**	0.16	0.02	0.14	-0.15	0.11	-0.22*	0.10
Variance components														
Individual	0.28***	0.08	0.30***	0.08	0.17*	0.07	0.40**	0.13	0.56***	0.15	0.18**	0.06	0.16**	0.05
Occasion	0.24***	0.05	0.18***	0.03	0.30***	0.06	0.44***	0.08	0.30***	0.06	0.19***	0.04	0.17***	0.03

Note. Time 1 is reference category. * $p < .05$; ** $p < .01$; *** $p < .001$.

SUMMARY

Balance at Work: Discovering Dynamics in the Demand-Induced Strain Compensation Recovery (DISC-R) Model

This thesis presents the design, procedure, and outcomes of a research project about psychosocial risk management in health care settings through socially innovative principles of work (re)design. In health care, increasingly-high job demands create a tension between quality and efficiency of health care delivery on the one hand, and employee health, well-being, and performance on the other. Therefore, particularly in this sector, scientifically validated solutions for job stress prevention and optimal, sustainable utilization of the workforce are badly needed.

The current research is founded on the Demand-Induced Strain Compensation Recovery (DISC-R) Model. This model stresses the importance of counterbalancing high job demands with job resources and recovery from work. That is, a *balance* between job demands on the one hand, and job resources and recovery from work on the other can have positive effects on employee health, well-being, and performance-related outcomes (e.g., work satisfaction, employee creativity). In contrast, an imbalance can lead to unfavorable health, well-being, and performance outcomes, such as concentration problems and emotional exhaustion. More specifically, employees that encounter high cognitive, emotional, and/or physical demands in the workplace should have sufficient *matching* job resources and recovery opportunities to cope with their demanding jobs. That is, job resources and recovery that belong to the same domain as specific types of job demands (i.e., cognitive, emotional, and/or physical) are assumed to be most effective in counterbalancing high demands.

In this dissertation the DISC-R Model is used as a theoretical framework for psychosocial risk management. The main research question is how the balance between different types of job demands, job resources, and recovery during and after working hours can be optimized to improve health, well-being, and performance of health care employees. To address this question, a deeper understanding of the DISC-R Model from both a theoretical and a heuristic point of view is needed. Although the DISC-R Model has generally received a reasonable amount of empirical support, different gaps and shortcomings in previous research on the model can be identified. In particular, the role of recovery in the DISC-R Model remains understudied. Moreover, previous studies on the DISC-R Model have mainly been of a cross-sectional and/or fundamental nature, concentrating on

static as opposed to dynamic associations between job demands, resources, recovery, and work-related outcomes. As a consequence, it is still unclear how different elements of the DISC-R Model interact and develop over time, to what extent these relations can be explained at different levels (e.g., person level, day level, group level), and whether these relations can be redirected in practice; issues that are particularly relevant in the context of dynamic, highly demanding work environments such as health care institutions. In line with the identified gaps, the aims of this dissertation are (1) to theoretically and empirically strengthen the role of recovery in the DISC-R Model, (2) to gain insight into naturally occurring multilevel dynamics in associations between job demands, job resources, recovery, and work-related outcomes, and (3) to examine the practical value of the DISC-R Model by assessing the effectiveness of a group-level intervention method based on the DISC-R Model ('valorization issue'). An overall multi-method research project was designed, containing multiple daily diary studies as well as a longitudinal intervention study in health care institutions in the Netherlands. The study protocol that guided the content of the thesis to a large extent is described in *Chapter 2* of this thesis.

Chapter 3 presents a daily diary study, in which 67 health care employees filled out multiple daily surveys over the course of eight days. The study examined the relation between off-job recovery and job resources at both the person level and day level. Both work-related aspects are known to counteract potential negative consequences of high demands in the workplace and are, thus, highly relevant in the context of combating job stress. Results indicated that off-job recovery and job resources are positively related, and that person-level differences as well as day-level dynamics play a role in this relation. More specifically, results showed that individuals who detach more from work than others feel more recovered before work, and individuals who feel more recovered before work than others report a higher level of job resources. In addition, employees reported a higher level of job resources on days that they felt highly recovered before going to work.

Chapter 4 presents a second daily diary study. In this study, daily survey data were gathered over the course of eight days from 151 health care employees. This study explored the role of different types of off-job recovery (i.e., cognitive and emotional detachment) in combination with identical types of job demands and job resources, in the prediction of day-level change in employee creativity. Employees' creative ideas are of great importance, because they can make a difference in organizational (social) innovation, problem-solving, change, and competitiveness. Results of the study showed that cognitive detachment is *positively*, rather than negatively, related to day-level creativity, irrespective of the level of cognitive job demands and resources ('main effect'). Second, emotional job demands in combination with either *low* levels of emotional detachment or high

levels of emotional job resources were positively related to day-level creativity ('interaction effects'). In short, the study indicated that detachment from work is *not* always beneficial to day-level creativity, depending on the specific job demands encountered during the working day and the specific type of detachment.

Chapter 5 presents a specific intervention method based on the DISC-R Model, that is, the *DISCovery* method. This method is targeted at improving employee health, well-being, and performance, by optimizing the balance between job demands, job resources, and recovery from work at the level of the organizational unit (i.e., group level). A three-wave longitudinal, quasi-experimental, multiple-case intervention study was conducted among three departments in a general hospital. The aim of this study was (1) to assess the effectiveness of the *DISCovery* method quantitatively and qualitatively, and (2) to provide insight into the conditions under which the method can be most effective and tailored interventions succeed. In general, *quantitative* results showed positive changes in the intervention groups, relative to their comparison groups, for targeted job resources and recovery from work as well as for targeted health, well-being, and performance outcomes, thereby lending support for the effectiveness of the *DISCovery* method. The method effectiveness was further supported by the *qualitative* results. That is, results of a process evaluation that was mainly based on qualitative data converged with the quantitative results. Results of the process evaluation also provided insight into implementation conditions that contribute to the effectiveness of the *DISCovery* method. First, prolonged tailoring of the interventions to target groups (i.e., program adjustments based on progressive insights) during the implementation stage enhanced the feasibility and employees' acceptance of the interventions. Second, organizational support for the interventions contributed substantially to the extent to which employees actively engaged in the interventions. Third, participation rates were higher when intervention activities were organized during regular working hours. Finally, commitment of managerial stakeholders and their skills with regard to recruiting and enthusing employees as well as managing changes in the work situation were important conditions for successful implementation of the interventions.

This thesis addresses three main research objectives. First, it highlights the role of recovering from work-related effort with respect to job stress prevention and employee creativity. Second, it reveals that both person-level differences and day-level dynamics are important in associations between the key elements of the DISC-R Model. Third, it demonstrates the practical and heuristic value of the DISC-R Model. In particular, it shows that job resources and recovery from work, as well as employee outcomes can be redirected in practice by using a specific group-level intervention method based on the DISC-R Model (i.e., the *DISCovery* method). The studies resulted in important theoretical implications with regard to the premises of the DISC-R Model as it stands

now. Most importantly, the inclusion of recovery from work in the model seems warranted and of added value. In addition, the results provided specific practical guidelines for how to optimize the balance between job demands, job resources, and recovery in order to improve health, well-being, and performance of employees in health care. Overall, the thesis contributes to bridging the gap between theoretical knowledge and practical applications regarding psychosocial risk management, by shedding light on dynamics between elements of the DISC-R Model from both a process and redesign perspective. To conclude, it entails an essential step in the valorization of the DISC-R Model and provides guidance to realizing a balanced, sustainable psychosocial work situation in today's practice.

SAMENVATTING
(Summary in Dutch)

Balance at Work: Discovering Dynamics in the Demand-Induced Strain Compensation Recovery (DISC-R) Model

De kracht van een organisatie zit in de mensen die er werken. Om succesvol te zijn en te blijven, hebben organisaties baat bij werknemers die gezond zijn, goed presteren, hun werk met plezier doen en dit op de lange termijn kunnen volhouden. Hoe zorgt een organisatie ervoor dat haar medewerkers 'duurzaam inzetbaar' zijn? Hoe zorgen werknemers ervoor dat ze op een goede en gezonde manier kunnen blijven werken tot aan hun pensioen? Dat is de uitdaging van de toekomst: investeren in optimale en duurzame inzetbaarheid van het arbeidspotentieel. Deze dissertatie richt zich op deze uitdaging vanuit een arbeids- en organisatiepsychologisch perspectief. Het doel van het onderzoek is het minimaliseren van werkstress en het bevorderen van duurzame inzetbaarheid van medewerkers, door middel van herontwerp en optimalisatie van de psychosociale werkomgeving.

Achtergrond

Psychosociale factoren in de werkomgeving hebben de afgelopen decennia in Nederland een prominente rol gekregen. Onder psychosociale factoren in de werkomgeving verstaan we werkaspecten die betrekking hebben op de manier waarop het werk georganiseerd en gemanaged wordt, op de sociale verhoudingen en op de taakinhoud. Deze factoren hangen nauw samen met de gezondheid, het welbevinden en het presteren van werknemers. Een ‘gezonde’ psychosociale werkomgeving, zoals voldoende regelmogelijkheden en een goed sociaal klimaat, kan bijdragen aan een duurzaam en productief arbeidsleven. Ongunstige psychosociale werkomstandigheden daarentegen (bijvoorbeeld gebrek aan collegiale steun en overmatige werkdruk) kunnen leiden tot werkstress, arbeidsontevredenheid en verzuim, met hoge personeelskosten en productieverlies tot gevolg. Bovendien vormen ze een gevaar voor de duurzame inzetbaarheid van werknemers. Om te zorgen dat werknemers zo lang mogelijk gezond blijven, goed presteren en hun werk met plezier doen, is het dus essentieel dat de psychosociale werkomstandigheden zo gunstig mogelijk zijn.

De gezondheidszorg is een sector waarin (ongunstige) psychosociale werkomstandigheden een groot risico vormen voor de gezondheid en het welbevinden van werknemers. Ziekenhuizen en verpleeghuizen moeten steeds efficiënter werken om de zorgkwaliteit te handhaven en te

bevorderen alsook kosten te reduceren. Dat komt door actuele uitdagingen binnen de zorgsector, zoals verhoogde marktwerking, concurrentie en kwaliteitseisen. Tegelijkertijd leidt de vergrijzing tot een toename in de vraag naar zorg en een afname in het arbeidspotentieel. Al deze veranderingen zorgen voor een hogere belasting van het zorgpersoneel, waardoor het risico op werkstress toeneemt. Dit kan resulteren in hogere verzuimcijfers, verminderde arbeidsprestaties en een afname in patiëntveiligheid. Het spanningsveld tussen enerzijds kwaliteit en efficiëntie van zorgverlening en anderzijds gezondheid, welbevinden en arbeidsprestaties van zorgverleners roept om wetenschappelijk gevalideerde maatregelen voor het tegengaan van werkstress en het optimaal en duurzaam inzetten van het arbeidspotentieel. Deze thema's staan daarom centraal in deze dissertatie.

Theoretisch kader

Binnen de arbeids- en organisatiepsychologie zijn verschillende theoretische werkstressmodellen ontwikkeld. Deze modellen richten zich op het voorspellen en verklaren van het verband tussen enerzijds psychosociale werkkenmerken en anderzijds de gezondheid en het welbevinden van werknemers. Een van deze theoretische werkstressmodellen besteedt specifiek aandacht aan psychosociale werkbelasting binnen de dienstensector, waar de zorgsector onder valt. Dit is het zogeheten Demand-Induced Strain Compensation Recovery (DISC-R) Model. Dit model veronderstelt dat gezondheid, welbevinden en prestaties van werknemers verklaard kunnen worden aan de hand van drie werkkenmerken: (1) taakeisen, (2) hulpbronnen in het werk en (3) herstel van arbeid. Deze kenmerken zijn vervolgens weer onder te verdelen in een cognitieve ('hoofd'), emotionele ('hart') en fysieke ('hand') component. Taakeisen zijn alle dingen die op het werk gedaan moeten worden en die mentale, emotionele en/of fysieke inspanning van de werknemer vergen. Voorbeelden hiervan zijn een complex probleem of een hoge mate van precisie (cognitieve taakeisen), conflicten of confrontatie met agressie of lijden (emotionele taakeisen), zware objecten tillen of lang moeten staan (fysieke taakeisen). Werkgerelateerde hulpbronnen zijn werkaspecten die kunnen helpen bij het omgaan met taakeisen, zoals beschikbare informatie (cognitieve hulpbron), emotionele steun van collega's (emotionele hulpbron), of ergonomische hulpmiddelen (fysieke hulpbron). Herstel van arbeid wordt binnen het DISC-R Model gedefinieerd als het volledig cognitief, emotioneel en fysiek loskomen van inspanningen op het werk. Dit wordt ook wel psychologische loskoppeling of – in de Angelsaksische literatuur – 'detachment' genoemd. Voorbeelden hiervan zijn het richten van de gedachten op iets anders dan op het werk (cognitief herstel), het afstand nemen van negatieve werkgerelateerde emoties (emotioneel herstel) en het afschudden van fysieke inspanningen (fysiek herstel).

Het DISC-R Model berust op een generiek balansprincipe: er moet een balans zijn tussen taakeisen enerzijds en hulpbronnen en herstel anderzijds. Als die balans goed is, dan kan dat leiden tot allerlei positieve uitkomsten, zoals arbeidstevredenheid, werkmotivatie en creativiteit van werknemers. Wanneer er echter niet voldoende hulpbronnen en herstel tegenover de taakeisen staan, kan dit leiden tot negatieve uitkomsten, zoals concentratieproblemen, emotionele uitputting en fysieke klachten. Een verbijzondering van het balansprincipe is het zogeheten matchingsprincipe van het DISC-R Model: taakeisen, hulpbronnen, herstel en werkgerelateerde uitkomsten zijn sterker aan elkaar gerelateerd als ze binnen dezelfde dimensie vallen. Zo zullen hoge cognitieve taakeisen in combinatie met een gebrek aan cognitieve hulpbronnen en cognitief herstel primair leiden tot mentale (stress)reacties. Hetzelfde geldt voor de emotionele en fysieke dimensie van het DISC-R Model. Volgens het model werkt het matchingprincipe op basis van functionele zelfregulatie. Bij deze vorm van zelfregulatie wordt aangenomen dat werknemers over het algemeen geneigd zijn om allereerst *matchende* hulpbronnen en herstel in te zetten, en pas daarna minder matchende of zelfs niet-matchende hulpbronnen en herstel. Een concreet voorbeeld is een situatie waarin een verpleegkundige geconfronteerd wordt met een stervende patiënt (emotionele taakeis). Om emotionele uitputting te voorkomen, is de activatie van *emotionele* hulpbronnen (bijvoorbeeld) emotionele steun van collega's) en *emotioneel* herstel (bijvoorbeeld afstand nemen van negatieve emoties) het meest functioneel en voor de hand liggend. Zijn emotionele hulpbronnen niet aanwezig, dan kan de werknemer op zoek gaan naar alternatieve, minder goed passende hulpbronnen, zoals informatie van een leidinggevende hoe het beste te handelen in een dergelijke situatie (cognitieve hulpbron). Kortom, het DISC-R Model veronderstelt dat een gebalanceerde mix van matchende taakeisen, hulpbronnen en herstel negatieve werkgerelateerde uitkomsten kan tegengaan en positieve werkgerelateerde uitkomsten kan bevorderen.

Onderzoeksvraag en doelstellingen

In deze dissertatie wordt het DISC-R Model als theoretisch raamwerk gebruikt voor werkstresspreventie en optimale en duurzame inzet van het arbeidspotentieel. De kernvraag is hoe de balans tussen verschillende soorten taakeisen, hulpbronnen en herstel tijdens en na het werk geoptimaliseerd kan worden om de gezondheid, het welbevinden en de prestaties van medewerkers in de zorg te verbeteren. Om de kernvraag te kunnen beantwoorden is meer inzicht in het DISC-R Model nodig vanuit een theoretisch en een heuristisch perspectief. Ook al is er tot op heden empirische steun voor het DISC-R Model, bestaande studies hebben verschillende tekortkomingen. In de eerste plaats is de precieze rol van herstel binnen het DISC-R Model nog onderbelicht. Het is bijvoorbeeld nog onduidelijk hoe herstel zich verhoudt ten opzichte van hulpbronnen, en of herstel

ook ten goede komt aan prestatie-uitkomsten van medewerkers. In de tweede plaats is het meeste onderzoek naar het DISC-R Model cross-sectioneel van aard. Omdat dit type onderzoek een 'momentopname' laat zien van de werksituatie, kunnen oorzaak en gevolg in relaties tussen verschillende elementen van het DISC-R Model niet onderscheiden worden. Bijvoorbeeld, leidt hoge werkdruk nu tot meer gezondheidsklachten, of leiden meer gezondheidsklachten tot een negatievere kijk op de hoogte van de werkdruk? Hierdoor is nog grotendeels onduidelijk hoe taakeisen, hulpbronnen, herstel en werkgerelateerde uitkomsten met elkaar samenhangen en zich ontwikkelen in de loop van de tijd. Verder blijft het de vraag in hoeverre deze relaties op verschillende niveaus verklaard kunnen worden, zoals op afdelingsniveau (verschillen tussen afdelingen), persoonsniveau (verschillen tussen individuen) en dagelijks niveau (verschillen van dag tot dag). Bijvoorbeeld, ervaren sommige werknemers over het algemeen meer taakeisen, hulpbronnen of herstel dan anderen? En ervaren werknemers op sommige dagen meer taakeisen, hulpbronnen of herstel dan op andere dagen? In de derde plaats zijn de meeste studies naar het DISC-R Model fundamenteel van aard. Door het gebrek aan praktijkonderzoek resteert de vraag of en hoe DISC-R elementen doelgericht beïnvloed kunnen worden in de alledaagse praktijk ter ondersteuning van een gezond psychosociaal werkklimaat. Bovengenoemde kwesties zijn juist relevant binnen de context van dynamische, veeleisende werkomgevingen zoals de gezondheidszorg, en vormen daarom de basis van de onderzoeksdoelstellingen in deze dissertatie. De doelstellingen luiden als volgt:

1. Het theoretisch en empirisch versterken van de rol van herstel in het DISC-R Model;
2. Inzicht krijgen in de dynamiek tussen taakeisen, hulpbronnen, herstel en werkgerelateerde uitkomsten, op verschillende niveaus (individuele verschillen en dagelijkse omstandigheden);
3. Het onderzoeken van de praktische waarde van het DISC-R Model als basis voor een interventiemethodiek op afdelingsniveau.

Met deze doelstellingen in het achterhoofd is een omvangrijk onderzoeksproject in de gezondheidszorg opgezet, gefinancierd door ZonMw. Dit project bestaat uit meerdere studies met dagelijkse metingen gedurende een korte periode ('dagboekstudies') en een interventieonderzoek met herhaalde metingen. Deze dissertatie is grotendeels gebaseerd op dit onderzoeksproject. Hoofdstuk 2 biedt een gedetailleerde beschrijving van het onderzoeksontwerp van dit project. Vervolgens presenteren hoofdstukken 3, 4 en 5 drie empirische studies die ingaan op de eerder genoemde doelstellingen. In alle drie de studies speelt herstel een belangrijke rol, waarmee alle drie de hoofstukken bijdragen bij aan de eerste doelstelling om meer inzicht te krijgen in de rol van

herstel in het DISC-R Model. Hoofdstukken 3 en 4 gaan daarnaast specifiek in op de tweede doelstelling om inzicht te krijgen in de dynamiek tussen de verschillende elementen van het DISC-R Model. Hoofdstuk 3 betreft een dagboekstudie naar de relatie tussen hulpbronnen en herstel, waarbij zowel de rol van individuele verschillen als dagelijkse omstandigheden onderzocht wordt. Hoofdstuk 4 gaat over de effecten van verschillende soorten herstel op de dagelijkse creativiteit van werknemers. Tot slot gaat Hoofdstuk 5 in op de derde doelstelling om de praktische waarde van het DISC-R Model te onderzoeken. Dit hoofdstuk geeft de resultaten weer van een interventiestudie gericht op het optimaliseren van de psychosociale werksituatie bij verschillende onderzoeksgroepen. Centraal in dit hoofdstuk staat een specifieke methode voor het herontwerpen en optimaliseren van de psychosociale werkomgeving (de *DISCovery* methodiek).

Belangrijkste bevindingen

Hoofdstuk 3 betreft een dagboekstudie waarin 67 ziekenhuismedewerkers over een periode van acht dagen meerdere vragenlijsten per dag hebben ingevuld. In deze studie is het verband onderzocht tussen herstel en hulpbronnen, zowel op persoonsniveau als op dagelijks niveau. Dat wil zeggen dat er gekeken is naar verschillen *tussen* personen (individuele verschillen) en naar verschillen *binnen* personen (dagelijkse verschillen) in de mate waarin ze herstel en hulpbronnen rapporteren. Zowel herstel als hulpbronnen kunnen de potentiële negatieve consequenties van hoge taakeisen op het werk tegengaan en zijn daarom uiterst relevant voor het bevorderen van positieve werkuitkomsten en het bestrijden van werkstress. De resultaten van deze studie laten zien dat er bovendien een positief verband bestaat tussen herstel en hulpbronnen, waarbij individuele verschillen en – in iets mindere mate – dagelijkse dynamiek een rol spelen. Deze studie laat concreet zien dat personen die beter loskomen van hun werk dan anderen zich ook beter hersteld voelen bij aanvang van de volgende dienst. Tevens blijkt dat personen die zich bij aanvang van de volgende dienst beter hersteld voelen dan anderen ook meer hulpbronnen rapporteren. Bovendien tonen de bevindingen aan dat werknemers, op dagen dat ze zich goed hersteld voelen voordat ze aan een nieuwe dienst beginnen, meer hulpbronnen rapporteren dan op andere dagen.

In Hoofdstuk 4 wordt verslag gedaan van een tweede dagboekstudie. In dit onderzoek hebben 151 ziekenhuis- en verpleeghuismedewerkers meerdere vragenlijsten ingevuld dagelijks gedurende acht dagen. Deze studie richtte zich op de rol van twee verschillende soorten herstel (cognitief en emotioneel loskomen van het werk) in combinatie met *matchende* taakeisen en hulpbronnen, bij het voorspellen van dagelijkse fluctuaties in de creativiteit van werknemers. Creativiteit is van groot belang, ook in de gezondheidszorg, omdat vernieuwende ideeën over werkaspecten bijdragen aan (sociale) innovatie, het probleemoplossend vermogen en de concurrentiepositie van organisaties. De

resultaten laten een positief verband zien tussen cognitief loskomen van het werk en dagelijkse creativiteit van werknemers, ongeacht de mate van cognitieve taakeisen en hulpbronnen op diezelfde dag. Daarnaast laat de studie zien dat een hoge mate van emotionele taakeisen in combinatie met een hoge mate van emotionele hulpbronnen positief gerelateerd is aan dagelijkse creativiteit. Dit geldt ook voor de combinatie van een hoge mate van emotionele taakeisen en een *lage* mate van emotioneel loskomen van het werk. De resultaten wijzen er dus op dat loskomen van het werk niet altijd gunstig is voor de creativiteit van werknemers. Of dit daadwerkelijk zo is, is afhankelijk van de specifieke taakeisen van die dag en de specifieke manier van loskomen van het werk. De onderzoeksbevindingen suggereren dat cognitief loskomen van het werk, door in vrije tijd niet meer aan het werk te denken, altijd bevorderlijk is voor creativiteit. Echter, op dagen met hoge emotionele taakeisen blijkt het *niet* compleet afstand nemen van werk-gerelateerde emoties de beste strategie voor het komen tot creatieve (probleemoplossende) ideeën.

Hoofdstuk 5 geeft de resultaten weer van een interventieonderzoek in een algemeen ziekenhuis. De deelnemende afdelingen, onderverdeeld in interventie- en vergelijkingsgroepen, werden over een periode van twee jaar gevolgd met behulp van herhaalde vragenlijstmetingen. Binnen deze studie is een specifieke interventiemethodiek toegepast die gebaseerd is op het DISC-R Model, de zogeheten *DISCovery* methodiek. Dit is een sociaal innovatieve methodiek, gericht op het verbeteren van gezondheid, welbevinden en prestaties van medewerkers, waarbij de balans tussen taakeisen, hulpbronnen en herstel op afdelingsniveau (i.e., groepsniveau) wordt geoptimaliseerd. De methodiek bestaat uit drie stappen: (1) een diagnose van psychosociale risicofactoren op basis van het DISC-R Model, (2) de bepaling en ontwikkeling van op maat gemaakte werkplekinterventies door middel van een participatieve onderzoeksprocedure, en (3) de implementatie van deze interventies. Het doel van de interventiestudie was om (1) de effectiviteit van de *DISCovery* methodiek zowel kwantitatief als kwalitatief te toetsen, en (2) inzicht te bieden in contextuele factoren die bijdragen aan de effectiviteit van de methodiek en het succes van de interventies. Over het algemeen laten de kwantitatieve resultaten positieve veranderingen zien bij de interventiegroepen, afgezet tegen de vergelijkingsgroepen, voor specifieke psychosociale werkkenmerken en voor specifieke uitkomsten op het gebied van gezondheid, welbevinden en prestaties. Deze veranderingen zijn in lijn met de specifieke thema's waar de interventies zich per groep op hebben gericht en ondersteunen daarom de effectiviteit van de *DISCovery* methodiek. Uit een procesevaluatie die vooral gebaseerd is op kwalitatieve data, zoals logboeken en interviews, blijkt dat kwalitatieve resultaten in grote mate convergeren met kwantitatieve data. Daarmee wordt de effectiviteit van de methodiek verder ondersteund. Resultaten van de procesevaluatie geven ook inzicht in *contextuele* factoren die bijdragen aan de effectiviteit van de methodiek en het succes van

de interventies. Ten eerste is gebleken dat het verder op maat maken van de interventies tijdens de implementatiefase, door middel van aanpassingen aan het interventieprogramma gebaseerd op voortschrijdend inzicht, bevorderlijk is voor de haalbaarheid en het draagvlak van interventies bij de medewerkers. Ten tweede heeft steun vanuit de organisatie voor interventies, zoals de betrokkenheid van het hoger management en van interne experts, bijgedragen aan de mate van actieve betrokkenheid van medewerkers bij de interventies. Ten derde bleek de deelname aan de interventieactiviteiten die plaatsvonden tijdens reguliere werktijden hoger te zijn dan erbuiten. Tot slot bleek de betrokkenheid van belanghebbende leidinggevenden en hun vermogen om werknemers te werven, te enthousiasmeren en te begeleiden bij het doorvoeren van veranderingen in de werksituatie, een belangrijke conditie voor het succesvol implementeren van de interventies.

Conclusies op basis van de onderzoeksdoelstellingen

De eerste doelstelling van deze dissertatie is het theoretisch en empirisch versterken van de rol van herstel in het DISC-R Model. De resultaten van de drie studies beschreven in deze dissertatie tonen aan dat herstel betekenisvol gerelateerd kan worden aan de andere DISC-R elementen (taakeisen, hulpbronnen en werkgerelateerde uitkomsten). Meer specifiek benadrukken de resultaten het belang van herstel als ‘voorwaarde’ voor het activeren van hulpbronnen en als buffer, naast hulpbronnen, voor de potentiële negatieve effecten van hoge taakeisen. Met andere woorden, herstel speelt een essentiële rol in psychosociaal risicomanagement. Resultaten wijzen er ook op dat herstel op verschillende manieren gelinkt kan worden aan de dagelijkse creativiteit van werknemers, namelijk door onderscheid te maken in het type herstel en door rekening te houden met specifieke dagelijkse taakeisen. Kortom, de resultaten van deze dissertatie ondersteunen de toegevoegde waarde van de integratie van herstel in het DISC-R Model.

De tweede doelstelling van deze dissertatie is het verkrijgen van inzicht in de dynamiek tussen taakeisen, hulpbronnen, herstel en werkgerelateerde uitkomsten op verschillende niveaus. Resultaten van de dagboekstudies (Hoofdstukken 3 en 4) wijzen erop dat relaties tussen verschillende DISC-R elementen zowel op persoonsniveau als op dagelijks niveau verklaard kunnen worden. Personen verschillen in de mate waarin ze taakeisen, hulpbronnen, herstel en werkgerelateerde uitkomsten ervaren. Deze verschillen kunnen worden toegewezen aan stabiele persoonskenmerken (bijvoorbeeld persoonlijkheid). Er zijn echter ook verschillen zichtbaar *binnen* personen. Op sommige dagen ervaart men bijvoorbeeld meer taakeisen en hulpbronnen dan op andere dagen. Dit impliceert dat voor het optimaliseren van de balans tussen taakeisen, hulpbronnen en herstel, rekening moet worden gehouden met zowel individuele verschillen als dagelijks

wisselende omstandigheden. Met andere woorden, de ‘optimale balans’ kan verschillen per individu, maar ook van dag tot dag.

De derde doelstelling van deze dissertatie is het onderzoeken van de praktische waarde van het DISC-R Model als basis voor een interventiemethodiek op groepsniveau (*DISCovery* methodiek; Hoofdstuk 5). Resultaten laten zien dat de mate van hulpbronnen en herstel, evenals werkgerelateerde uitkomsten in positieve zin beïnvloed kunnen worden op afdelingsniveau. Het is mogelijk dat de participatieve benadering van de *DISCovery* methodiek zelf al een positief effect heeft op de manier waarop mensen hun werksituatie ervaren. Echter, als dit “speciale aandacht effect” het enige werkende interventiemechanisme zou zijn, dan zouden de interventie-effecten hoogstwaarschijnlijk veel algemener zijn. Het feit dat de resultaten *afdelingsspecifieke* effecten laten zien voor *doelgerichte* en *specifieke* uitkomsten, suggereert dat deze effecten niet exclusief zijn toe te schrijven aan speciale aandacht. Sterker nog, de resultaten wijzen erop dat de DISC-R risicodiagnose als uitgangspunt voor het op maat maken van interventies voor specifieke doelgroepen een belangrijke stap is in de *DISCovery* methodiek. De DISC-R risicodiagnose levert doelgerichte input voor interventieontwikkeling, terwijl de participatieve procedure is ingezet om deze afdelingsspecifieke input te vertalen en verder af te stemmen naar en met de doelgroep. De conclusie is daarom dat het DISC-R Model gebruikt kan worden als praktisch instrument voor het diagnosticeren van psychosociale werkomstandigheden, ten behoeve van de daaropvolgende interventieontwikkeling.

Samengevat biedt deze dissertatie inzicht in de dynamiek tussen elementen van het DISC-R Model vanuit een proces- en herontwerpperspectief. De bevindingen hebben belangrijke theoretische implicaties voor de uitgangspunten van het DISC-R Model. Ook bieden ze specifieke praktische richtlijnen voor het optimaliseren van de balans tussen taakeisen, hulpbronnen en herstel, om zodoende gezondheid, welbevinden en prestaties van medewerkers in de zorg te verbeteren. Deze richtlijnen hebben betrekking op het optimaliseren van de dagelijkse en individuele balans, alsook de balans op afdelingsniveau. Deze dissertatie draagt bij aan het overbruggen van de kloof tussen theoretische kennis en praktische toepassingen met betrekking tot psychosociaal risicomanagement, en levert als zodanig een bijdrage aan het tegengaan van werkstress en het optimaal en duurzaam inzetten van het arbeidspotentieel. Kortom, deze dissertatie vormt een essentiële stap in de verdere valorisatie van het DISC-R Model en biedt veelbelovende handvatten aan onderzoekers en practitioners op het gebied van psychosociaal risicomanagement, zodat (zorg)organisaties met vertrouwen de uitdagingen van de toekomst tegemoet kunnen gaan.

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Irene M. W. Niks was born on March 4th, 1987 in Zuidlaren in the Netherlands. In 2004, she completed her pre-university education (VWO) at Willem Lodewijk Gymnasium in Groningen. After a gap year of working and traveling, she started studying Psychology at Utrecht University. During the Bachelor program, she studied a semester abroad at Universidad de Guadalajara in Mexico. She obtained her Master's degree 'Cum Laude' in Work and Organizational Psychology at Utrecht University in 2010. For a brief period she worked at the HR department of a multinational company, until she started her research at the department of Industrial Engineering & Innovation Sciences at Eindhoven University of Technology in June 2011. This dissertation is the result of her PhD research on psychosocial risk management in health care settings. Her work has been published in and is currently under review at high-quality ISI rated journals. The resulting paper of the study in Chapter 5 has won the 'Best Paper Award' at the ICOH-WOPS 2014 Congress in Adelaide, Australia, as well as at the WAOP 2014 Congress in Utrecht, the Netherlands.

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