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Job demands, job resources, and self-regulatory behavior: Exploring the issue of match /
by Marieke van den Tooren
– Eindhoven: Technische Universiteit Eindhoven, 2010. – Proefschrift. –

A catalogue record is available from the Eindhoven University of Technology Library
ISBN: 978-90-386-2416-7
NUR: 771

Keywords: job demands / job resources / match / DISC Model / self-regulatory behavior / active coping / regulatory focus

Printed by Proefschriftmaken.nl

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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. C.J. van Duijn, voor een commissie aangewezen door het College voor Promoties in het openbaar te verdedigen op woensdag 9 februari 2011 om 16.00 uur

door

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geboren te Gouda

Dit proefschrift is goedgekeurd door de promotor:

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Copromotor:
prof.dr. C. Dormann

Contents

Chapter 1

General Introduction

'... a theory, like a child, must be allowed to develop through contact with the world – both the world as found in theory-related research data and the world as found within those scientists who are the theory's parents and extended family. The purpose of such world contact is to learn what a theory is and what it is not.' (Higgins, 2006, p. 549)

Since the 1980s, the world of work is rapidly changing. Through downsizing, technological innovations, and the greater need for flexibility in terms of functions and skills, work is imposing increased demands on workers (EU-OSHA, 2007; 2010). One of the most significant trends since the 1980s is 'work intensification'. The intensification of work is particularly characterized by a high workload and work pressure, and affects all developed countries, all sectors of industry, and all occupational categories. Work intensification can be explained by a reduction in working hours, working at higher speed (i.e. work has to be carried out faster), de-staffing, and increased market pressure (EFILWC, 2002; EU-OSHA, 2007). In addition to work intensification, the actual nature of work has changed as well. More specifically, besides the persistence of the traditional, mainly physical exposure factors, workers are more and more exposed to cognitive factors (e.g. the increasing use of information and communication technology) and emotional factors (e.g. due to the rise of the service sector, more workers come into close contact with clients or patients on a regular basis) (EFILWC, 2002). Both work intensification and changes in work itself are considered to be important sources of *job-related strain*, or *job strain* for short (EU-OSHA, 2007).

Job strain is a generic term for disturbed physical or psychological functioning caused by the job. Generally speaking, workers can experience job strain at a cognitive level (e.g. deficits in attention, information processing, (working) memory), at an emotional level (e.g. irritability, anxiety, burnout), or at a physical level (e.g. headache, back problems, heart problems) (EFILWC, 2007). In 2005, 31% of the European workforce indicated that their job affected their health and well-being. The most reported symptoms of job strain were backache (25%) and muscular pains (23%). Other symptoms of job strain such as psychological problems affected 22% of the European workers (EU-OSHA, 2007; 2009). At a national level, 22% of the Dutch workers attributed the complaints that had caused sick leave to their jobs (TNO, 2009). In line with the EU findings, in 2008 musculoskeletal problems were the most common diagnosis among workers who suffered from an occupational disease (42%). A much smaller group of Dutch workers were diagnosed with psychological complaints (17%). Most of them (79%) suffered from overwork and burnout. However, a reversed pattern was shown at the sector level; workers in the service sector (e.g. education and health care) were

diagnosed more often with psychological complaints than with musculoskeletal problems. For instance, in education, 84% of the diagnoses concerned psychological complaints (NCvB, 2009). In all, one may conclude that 20% to 30% of the workers were affected by job strain.

Though characteristics of the job may trigger job strain, the role of workers themselves in the development of job strain should not be ignored. For instance, research suggests that workers who believe they have the strength or energy to change a stressful situation at work will perform better than workers who believe that their energy level is currently insufficient to be successful (cf. Clarkson, Hirt, Jia, & Alexander, 2010). In other words, workers' perceptions, appraisals, and decisions in stressful situations at work may play an important role in the development of job strain. In addition, personal characteristics could explain why some workers experience job strain and others do not, even if they are exposed to the same work environment (Cooper, Dewe, & O'Driscoll, 2001). For instance, certain personal characteristics could either inhibit or strengthen job strain by, respectively, facilitating or inhibiting workers to activate job resources.

Although job strain firstly affects workers' quality of work and life, it also affects organizations and society. For instance, the Dutch workers who attributed the complaints that caused sick leave to their work were absent longer and more frequent (absent rate 8.3%) than workers on sick leave who did not attribute their complaints to their work (absent rate 3.8%) (TNO, 2009). Koningsveld, Zwinkels, Mossink, Thie, and Abspoel (2004) calculated that societal costs of absenteeism and disability in the Netherlands amounted to 12 billion euros in 2001. Though there has been a decrease in the sickness absence rate (5.5% to 4.3%) and the number of disability allowances (981.000 to 834.000) between 2001 and 2009 (CBS, 2010), it is worth mentioning that the largest costs concerned work-related sick leave and disability, which were mainly caused by musculoskeletal disorders (43%) and psychological disorders (40%). Each of these disorders accounted for 22% (3 billion euros) of the total societal costs of absenteeism and disability. In addition to these direct costs due to sick leave and work disability, organizations and society are also faced with hidden consequences of job strain such as lost productivity, loss of knowledge and skills, counterproductive work behavior, and disturbed relations (cf. de Jonge, Dormann, & van den Tooren, 2008).

In sum, job strain is a major concern in the Netherlands and other industrialized countries, as the price that has to be paid for job strain is high, both literally and figuratively. Therefore, it is of great importance to identify the key factors that contribute to job strain. These factors could be job characteristics, but workers themselves may play a significant role as well (Cooper et al., 2001; Taris, Kompier, & Wielenga-Meijer, 2006). This thesis focuses

on the relation between job characteristics, worker characteristics, and worker health and well-being. Specifically, this thesis aims (1) to identify whether particular combinations of job characteristics are of special importance in determining worker health and well-being, and (2) to clarify the role of workers themselves in the establishment of the relation between these particular combinations of job characteristics and worker health and well-being.

1.1 Job strain: a theoretical perspective

In the field of Industrial and Organizational psychology, several job stress models have been developed to gain a better understanding of the relation between job characteristics and worker health and well-being. Examples of prominent job stress models are the Demand-Control (DC) Model (Karasek, 1979), the Effort-Reward Imbalance (ERI) Model (Siegrist, 1996), and the Job Demand-Resources (JDR) Model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). According to each of these job stress models, job strain can be explained by two distinct classes of job characteristics: *job demands* and *job resources*. Job demands are work-related tasks that require effort. Examples of job demands are solving complex problems, lifting heavy objects, or dealing with aggressive clients. Job resources, on the other hand, are work-related assets (i.e. opportunities, data, people, things) that can be employed to deal with job demands. Examples of job resources are job autonomy (i.e. the opportunity to determine the order and method of one's work activities), emotional support from colleagues, or technical equipment (Box 1.1).

Box 1.1. *Definition of job demands, job resources, and job strain*
Job demands: work-related tasks that require effort.
Job resources: work-related assets (i.e. opportunities, data, people, things) that can be employed to deal with job demands.
Job strain: disturbed physical or psychological functioning caused by the job.

A central tenet of the DC Model, the ERI Model, and the JDR Model is that job resources can moderate the relation between job demands and worker health and well-being such that workers who are faced with high job demands and have sufficient job resources to deal with these job demands will experience less job strain than workers with the same level of job demands but with insufficient job resources to deal with their demanding job. In other words, job strain can be explained by an *interaction* between job demands and job resources. In case of such an 'interaction effect', the total 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 (i.e. '1 + 1 = 3'). Interaction effects in which high job resources mitigate the adverse effects of high job demands on worker health and well-being are also known as *stress-buffering effects*, and can be tested by examining multiplicative interaction terms between job demands and job resources (i.e. job demands × job resources) in the prediction of job strain. Stress-buffering effects of job resources will be the main focus of this thesis when examining the effect of particular combinations of job demands and job resources in the prediction of worker health and well-being.

Matching hypothesis

While there is ample empirical evidence for the DC Model, the ERI Model, and the JDR Model regarding the main effects of job demands and job resources (i.e. an increase in job demands or an decrease in job resources independently increases job strain), there is a lack of converging evidence for the stress-buffering effect of job resources (Bakker & Demerouti, 2007; de Lange, Taris, Kompier, Houtman, & Bongers, 2003; van Vegchel, de Jonge, Bosma, & Schaufeli, 2005). One statistical/methodological explanation for the mixed results is that interaction effects between job demands and job resources are generally more difficult to detect than main effects of job demands and job resources. Such power problems are particularly likely to occur in small samples as well as in homogeneous samples that lack variance on the demand and resource variables (de Jonge & Kompier, 1997; Kristensen, 1995).

In addition to the size and nature of the sample, it has been argued that the probability of finding stress-buffering effects of job resources is affected by the conceptualization and operationalization of job demands and job resources. That is, the *specificity* with which job demands and job resources are measured, and the extent to which specific types of job resources are *matched* to specific types of job demands could determine the extent to which stress-buffering effects of job resources are observed (de Jonge, van Vegchel, Shimazu, Schaufeli, & Dormann, 2010; Sargent & Terry, 1998). The idea that stress-buffering effects of job resources are largely dependent on the match between specific types of job demands and job resources finds expression in the *matching hypothesis* (Cohen & McKay, 1984). According to the matching hypothesis, stress-buffering effects of job resources are most likely to occur if specific types of job resources are matched to specific types of job demands, that is, if the job resources measured are those that are most relevant for the job demands a worker is faced with (e.g. Cohen & Wills, 1985; Cutrona & Russell, 1990; Sargent & Terry, 1998).

For instance, a worker who has to move heavy boxes will probably benefit more from a trolley than from a colleague who offers a shoulder to cry on. However, though this may seem logical, in many empirical studies such specific combinations of job demands and job resources are not presented as a priori hypotheses (Viswesvaran, Sanchez, & Fisher, 1999). Instead, usually job demands and job resources are measured at a global level, and combined at random. As a result, job resources are not always well-suited to deal with job demands, and therefore less likely to operate as a stress buffer. The matching hypothesis will serve as a leitmotiv for the studies in the present thesis.

The matching hypothesis from a broader perspective

'Match' and equivalent concepts like 'fit', 'correspondence', and 'congruence' are common notions in the field of Industrial and Organizational psychology. For instance, in work settings, much research has been conducted on Person-Environment (P-E) fit theory (Morley, 2007). The basic premise of P-E fit theory is that when characteristics of the person and the work environment fit together people will experience more positive outcomes such as job satisfaction and improved performance, and less negative outcomes such as strain and turnover intentions (Ostroff & Schulte, 2007). Under the umbrella of P-E fit theory, distinctions have been made between person-job (P-J) fit, person-person (P-P) fit, person-group (P-G) fit, and person-organization (P-O) fit (Kristof-Brown, Zimmerman, & Johnson, 2005; Ostroff & Schulte, 2007). An example of P-J fit is when workers' knowledge, skills, and abilities are commensurate with what the job requires (e.g. demands-abilities fit). Similarly, there is a fit between the person and the job when a worker's needs, desires, and preferences are met by the job that is performed (e.g. needs-supplies fit). In case of P-P fit, one can think of a fit in personality, goals, or values between workers and co-workers, between supervisors and subordinates, or between applicants and recruiters. These examples of fit also apply to P-G fit, except that P-G fit focuses on the compatibility between individuals and their work group or team. Finally, P-O fit occurs when there is a congruence between the values and goals of the person and those of the organization (Kristof-Brown et al., 2005).

Because it was not totally clear what exactly constituted the fit between the person and the environment, Muchinsky and Monahan (1987) proposed two distinct conceptualizations of P-E fit: *supplementary fit* and *complementary fit*. Whereas supplementary fit exists if characteristics of the individual and the work environment are similar (P-P fit, P-G fit, and P-O fit), in case of complementary fit, an individual's characteristics fill a gap in the work

environment, and vice versa (P-J fit). In other words, in case of supplementary fit, one can think of two identical puzzle pieces (e.g. similar goals), whereas in case of complementary fit, there are two different puzzle pieces that fit each other perfectly (e.g. demands and abilities).

In line with the matching hypothesis, in this thesis, 'match' is conceptualized in terms of complementary fit. That is, in case of a match between job demands and job resources, resources are not similar to demands, but complementary (e.g. physical job resources provide the physical power that is needed to deal with a physically demanding job). Though P-J fit and match both concern complementary fit, what mainly distinguishes P-J fit from the notion of match in the matching hypothesis is that P-J fit concerns the compatibility between person characteristics and characteristics of the job, whereas the matching hypothesis is merely job-oriented and concerned with Job-Job (J-J) fit: the compatibility between different aspects of job design, that is, the compatibility between job demands and job resources (Daniels & de Jonge, 2010). Nonetheless, as will be explained, P-J fit will play an important part in this thesis when the role of workers themselves in the establishment of the relation between particular combinations of job characteristics and worker health and well-being is clarified. Both J-J fit and P-J fit will be further elaborated on from the theoretical framework of this thesis: the Demand-Induced Strain Compensation (DISC) Model (de Jonge & Dormann, 2003; 2006).

1.2 Theoretical framework: the DISC Model

The DISC Model is a job stress model that, on the one hand, integrates principles of the DC Model and the ERI Model, and, on the other hand, elaborates on these models by adding two innovative principles, namely *multi-dimensionality of constructs* and the *triple match principle* (de Jonge & Dormann, 2003; de Jonge et al., 2008). With respect to the first principle, multi-dimensionality of constructs, the DISC Model distinguishes three specific types of job demands, job resources, and job strain. Specifically, the model proposes that demands, resources, and strain are either *cognitive*, *emotional*, or *physical* in nature (Hockey, 2000; de Jonge & Dormann, 2003) (Box 1.2). As far as the triple match principle is concerned, the DISC Model proposes that stress-buffering effects of job resources occur more often if specific types of resources are matched to specific types of demands. There exists an optimal complementary fit between specific types of job demands and job resources if the type of job resources belongs to the same domain as the type of job demands workers need to deal with. For instance, it is proposed that workers who are faced with high physical job

demands (e.g. moving heavy objects) are least likely to experience back pain if they have sufficient physical job resources (e.g. a trolley) to deal with their physically demanding job.

Box 1.2. *Specific domains of job demands, job resources, and job strain*

Cognitive domain

Job demands: work-related tasks that require cognitive effort (e.g. finding solutions for complex problems).

Job resources: informational support (e.g. information from handbooks) and job autonomy (i.e. the opportunity to determine the order and method of one's work activities).

Job strain: disturbed cognitive functioning (e.g. deficits in information processing).

Emotional domain

Job demands: work-related tasks that require emotional effort (e.g. anger control during interpersonal transactions).

Job resources: emotional support (e.g. a listening ear from colleagues or supervisors).

Job strain: disturbed emotional functioning (e.g. burnout).

Physical domain

Job demands: work-related tasks that require physical effort (e.g. using muscular power to move heavy objects).

Job resources: instrumental support (e.g. physical help from colleagues), technical equipment (e.g. a chain saw), and ergonomic aids (e.g. an adjustable chair).

Job strain: disturbed physical functioning (e.g. back pain, heart problems).

Similarly, it is proposed that cognitive job resources (e.g. information from handbooks) are most likely to mitigate the effect of high cognitive job demands (e.g. solving complex problems) on mental fatigue, whereas emotional job resources (e.g. a listening ear from colleagues) are most likely to mitigate the effect of high emotional job demands (e.g. being angry with a rude customer) on emotional exhaustion. To a certain extent, the triple match principle is similar to the earlier matching hypothesis proposed by Cohen and McKay (1984). However, contrary to the 1984 matching hypothesis, the triple match principle also emphasizes the importance of a match between job demands and job strain and between job resources and job strain (Frese, 1999; de Jonge & Dormann, 2003). The core proposition of the triple match principle is that the likelihood of finding stress-buffering effects of job resources increases as the level of match between demands, resources, and strain increases. In other words, stress-buffering effects of job resources are most likely to occur when all job

stress constructs (i.e. job demands, job resources, and job strain) belong to the same domain (triple match), less likely to occur when two out of three job stress constructs belong to the same domain (double match), and least likely to occur when demands, resources, and strain all belong to a different domain (non-match)[1].

1.3 Research problem and research aim

The studies in the current thesis result from two key assumptions underlying the DISC Model that have not been tested before, or have only been tested partly. The first assumption is that matching job resources are more functional (i.e. useful) resources than non-matching job resources to deal with specific types of demanding situations at work. This assumption is also known as the matching hypothesis and serves as a leitmotiv for the studies in the present thesis. The second assumption is that people who are faced with a specific type of demanding situation at work, are generally inclined to use matching job resources to deal with these job demands. In order to test these assumptions, five studies have been designed that together make up a triptych. Each part of the triptych addresses its own research problem and aim.

Part 1. The functionality of matching job resources

Except for three overviews of empirical evidence for triple matches (see Daniels & de Jonge, 2010; de Jonge & Dormann, 2003; de Jonge et al., 2008), there exists no complete overview of empirical evidence for the triple match principle including evidence for triple matches, double matches, and non-matches. It is therefore unclear whether matching job resources are more functional resources than non-matching job resources to deal with specific types of demanding situations at work. The first aim of this thesis is to examine this key assumption underlying the DISC Model by means of a review of 29 DISC studies.

A second key assumption underlying the DISC Model is that workers show *functional self-regulatory behavior*. That is, the DISC Model implicitly assumes that workers who are faced with a specific type of demanding situation at work are generally inclined to use functional matching job resources to deal with these job demands. One may wonder, however, whether

[1] In addition to the stress-buffering effect of job resources, which will be the main focus of this thesis, the DISC Model also proposes optimal conditions for worker activation (e.g. learning, growth, creativity, and performance) if there is a balanced mixture of high (but not overwhelming) job demands and matching job resources. In other words, job resources may not only operate as a stress buffer, but could also strengthen the relation between job demands and positive outcomes. In Chapter 2, the key principles of the DISC Model will be further elaborated on.

workers are indeed inclined to activate matching job resources. In fact, one can think of various reasons why workers are *not* inclined to use matching job resources. Most obvious, for workers to use matching job resources these should be accessible to them. If workers have no access to matching job resources, these resources can and will not be used. However, even if matching job resources are accessible, workers may not always be alert to their availability in the work environment (cf. Baron & Boudreau, 1987; Gibson, 1979). And even if they are aware of the availability of matching job resources, it may still be possible that workers do not perceive these job resources as the most relevant assets to deal with the highly demanding situation at work concerned. For instance, as part of the prevailing organizational norm (cf. Krahé, 1992), workers may have been taught that emotional support from colleagues and supervisors serves as a panacea against various types of job demands, and that, when being faced with cognitive and physical job demands, corresponding types of job resources are of minor importance. Finally, even if workers are aware of the availability of matching job resources and perceive these resources as relevant assets to deal with their demanding job, they may still have certain personal characteristics that hinder them to activate matching job resources, or to use any job resources at all. For instance, personal characteristics could affect the extent to which workers are inclined to actively cope with stressful situations at work (de Rijk, Le Blanc, Schaufeli, & de Jonge, 1998), as well as the extent to which they would like to save their job resources for future use (cf. Higgins, 1997; Hobfoll, 1989; 2001). So, in sum, matching job resources may be available in the work environment (i.e. J-J fit), but to operate as a stress buffer there should be a complementary fit between the worker and the job (i.e. P-J fit). That is, there should be a complementary fit between (1) matching job resources and worker self-regulation processes (i.e. workers are aware of the availability of matching job resources, consider them as relevant, and decide to actually use them), and (2) matching job resources and worker personal characteristics (i.e. workers have personal characteristics that facilitate them to activate matching job resources).

Based on the foregoing, we may conclude that it is by no means sure that workers will show functional self-regulatory behavior (i.e. activate matching job resources). As a result, the occurrence of stress-buffering effects of job resources remains uncertain, which restricts the explanatory power of the DISC Model. Therefore, it is of great importance to enhance our understanding of the self-regulation processes involved in the activation of job resources, and to examine the facilitating/inhibiting role of personal characteristics regarding resource investment. Accordingly, in the second part of the triptych, the focus will be on the complementary fit between job resources and worker self-regulation processes (i.e. alertness

to available job resources, evaluation of the relevance of job resources, and decision making regarding the actual use of job resources), while in the third part of the triptych, the focus will be on the complementary fit between job resources and worker personal characteristics (i.e. specific active coping styles and regulatory focus).

Part 2. Functional self-regulatory behavior: opening up the black box of job stress

So far, the self-regulation processes involved in the activation of job resources are still part of the 'black box' of job stress (cf. Taris et al., 2006). That is, as job stress models typically focus on *what* causes job strain, without considering *why* it causes job strain, the self-regulation processes that connect the input (i.e. interaction between job demands and job resources) to the output (i.e. health and well-being) remain unclear. The second aim of this thesis is therefore to open up the black box of job stress (Figure 1.1). Specifically, two studies have been designed that examine participants' beliefs about the accessibility and relevance of matching and non-matching job resources as well as their decision to use matching and non-matching job resources in different types of demanding situations at work. It is hypothesized that people generally opt for matching job resources, both in terms of relevance and use, and that they are particularly inclined to use non-matching job resources as a supplement to matching job resources rather than as a substitute for matching job resources.

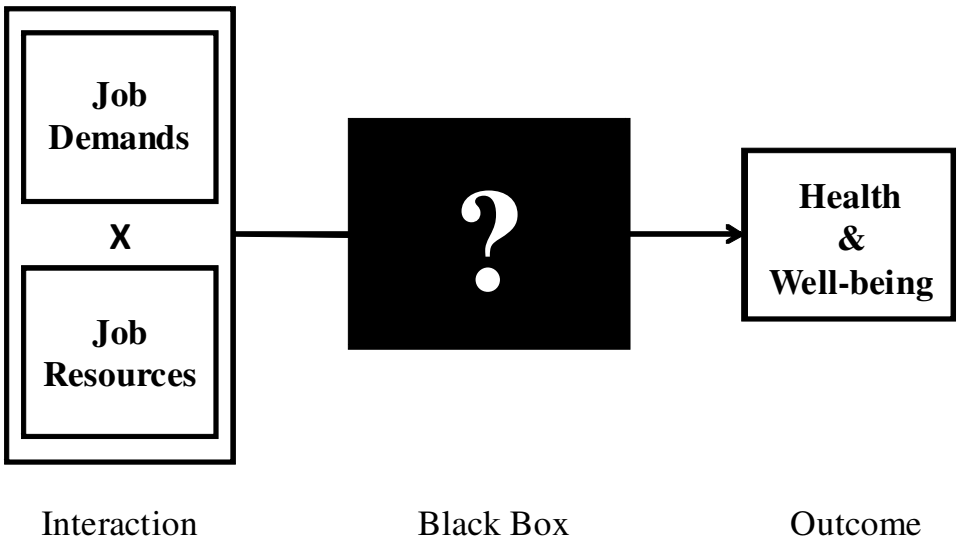


Figure 1.1. *Black box of job stress*

Part 3. Functional self-regulatory behavior: the role of personal characteristics

Though studies that open up the black box of job stress may enhance our understanding of the self-regulation processes involved in the activation of job resources, it remains unclear to what extent personal characteristics facilitate/inhibit the activation of job resources. If personal characteristics facilitate/inhibit the activation of job resources, individual differences in personal characteristics will be expressed in the actual use of job resources and, as a result, in the number and types of stress-buffering effects of job resources that are found for the individuals involved. In other words, workers' personal characteristics will moderate the stress-buffering effect of job resources (Figure 1.2). The third aim of this thesis is to investigate the moderating effect of two personal characteristics that are likely to affect the mobilization of job resources during stressful situations at work. More specifically, two studies have been designed to examine whether workers who differ on, respectively, active coping style (Latack & Havlovic, 1992) or regulatory focus (Higgins, 1997) also differ on the number and types of stress-buffering effects of job resources that are found for these individuals. It is hypothesized that stress-buffering effects of job resources are more likely to occur for workers who have a high active coping style (versus low active coping style), and for workers who are promotion focused (versus prevention focused). In case of active coping style, P-J fit is not restricted to having a high active coping style (versus low active coping style), but will be further specified to the different resource domains (i.e. cognitive, emotional, and physical resources). There is an optimal P-J fit if workers have a high active

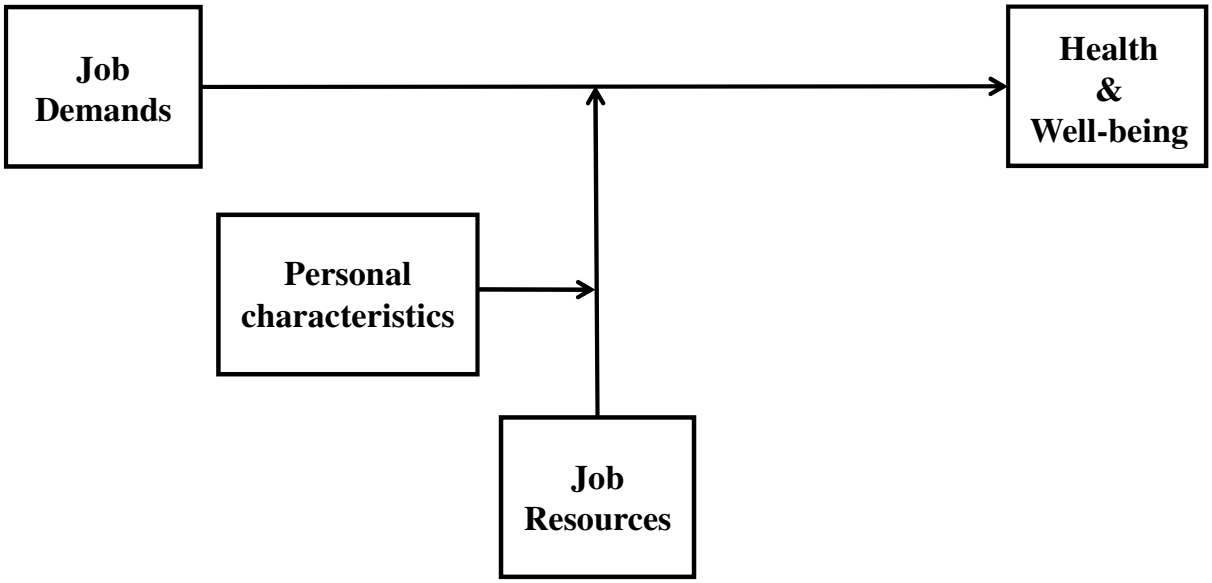


Figure 1.2. *Moderating effect of personal characteristics*

coping style that belongs to the same domain of functioning as the type of job resources concerned (e.g. a high cognitive active coping style is complementary to cognitive job resources).

1.4 Overview of the thesis

This thesis consists of seven chapters. In *Chapter 2*, a thorough overview of the background, key principles, and theoretical underpinnings of the DISC Model is provided, along with new and extended empirical evidence for the triple match principle and the matching hypothesis. The aim of the next four chapters is to open up the black box of job stress (Chapters 3 and 4), and to investigate the moderating effect of personal characteristics on the stress-buffering effect of job resources (Chapters 5 and 6). More specifically, in *Chapter 3*, a vignette study is presented in which the perceived accessibility and relevance of matching and non-matching job resources are examined, along with the decision to use matching and non-matching job resources in different types of demanding situations at work. *Chapter 4* describes a second vignette study that merely focuses on the decision to use matching and non-matching job resources. This chapter elaborates on a question that is raised in Chapter 3, namely whether people merely use non-matching job resources as a substitute for matching job resources, or as a supplement to matching job resources. *Chapter 5* describes a longitudinal survey study. In this study, it is examined whether specific active coping styles (i.e. cognitive, emotional, and physical active coping styles) moderate the stress-buffering effect of job resources on the longitudinal relation between job demands and job strain. In addition, in *Chapter 6*, a daily diary study is presented that examines whether regulatory focus moderates the within-person stress-buffering effect of job resources on the short-term relation between job demands and job strain (i.e. at day level). Finally, *Chapter 7* presents a general discussion of Chapters 2 to 6, including an overview of the most important findings of the thesis, and a discussion of the methodological limitations and the theoretical and practical implications of the studies. The chapter concludes with recommendations for future research and some final remarks.

Chapter 2

The Demand-Induced Strain Compensation Model: Background, Key Principles, Theoretical Underpinnings, and New and Extended Empirical Evidence

This chapter is largely based on:

Tooren, M. van den, Jonge, J. de, & Dormann, C. (2010). The Demand-Induced Strain Compensation Model: Background, key principles, theoretical underpinnings, and extended empirical evidence. *Manuscript submitted for publication*.

2.1 Introduction

Research on job stress has concentrated on identifying characteristics of the work environment that may relate to worker health, well-being, and performance. Specifically, it has been proposed that these job-related outcomes can be explained by two distinct job characteristics: job demands and job resources (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Karasek, 1979; Siegrist, 1996). Job demands are work-related tasks that require effort. Examples of job demands are finding solutions for complex problems, lifting heavy objects, or dealing with aggressive clients. Job resources are work-related assets that can be employed to deal with job demands. Examples of job resources are job autonomy, emotional support from colleagues, and technical equipment. Because job demands can often not be reduced, the idea of increasing job resources instead is appealing to current working life. As a result, several theoretical models have been developed to explain the role of job resources in the job stress process (cf. Cooper, 1998; Kahn & Byosiere, 1992). Most of these frameworks focus on additive and moderating effects of job resources. In case of additive effects, job resources independently impact job outcomes, whereas in case of moderating effects, job resources moderate the relation between job demands and job outcomes. That is, the effect of job demands on job outcomes depends on the level of job resources.

While there seems to be little debate about additive effects of job resources, there is a lack of converging evidence for moderating effects of job resources (e.g. Cooper, Dewe, & O'Driscoll, 2001; van der Doef & Maes, 1999; Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010; de Lange, Taris, Kompier, Houtman, & Bongers, 2003). One important explanation for why studies have often failed to find moderating effects of job resources may be that researchers usually tend to treat job demands and job resources as global and one-dimensional constructs, obscuring the differential impact of specific components (e.g. Viswesvaran, Sanchez, & Fisher, 1999). In reaction to this practice, several researchers have advocated the idea of multi-dimensional constructs and match. More specifically, under the heading of the *matching hypothesis* (Cohen & McKay, 1984), it has been argued that *specific* types of job demands and job resources should be *matched* to show moderating effects of job resources (e.g. Cohen & Wills, 1985; Cutrona & Russell, 1990; Sargent & Terry, 1998). Here, match refers to a complementary fit between job demands and job resources, whereby job resources provide the optimal power or strength that is needed to deal with the job demands concerned. The more specific job demands and job resources are measured, the better they can be matched. For instance, if workers need to move heavy objects, instrumental support from colleagues will provide the optimal power needed to deal with the physically demanding job

in question. Other forms of social support, like a listening ear from colleagues, seem less helpful in this situation. Because physical job resources show a complementary fit to physical job demands, it follows that physical job resources are most likely to mitigate the adverse effect of high physical job demands on worker health and well-being.

The necessity to focus on specific types of job demands and job resources has also been emphasized by changes in work itself. Specifically, due to new developments in working life, such as the increasing use of information and communication technology (ICT), and the rise of the human service sector in which workers come into close contact with clients or patients on a regular basis, many workers nowadays experience high levels of cognitive and emotional job demands. For instance, the latest report of the European Foundation for the Improvement of Living and Working Conditions (EFILWC) shows that, in 2005, 47% of the European workers experienced cognitive job demands, 40% experienced emotional job demands, and 35% experienced physical job demands (EFILWC, 2007). In other words, besides the traditional, physically strenuous jobs, workers today are more and more confronted with psychological (i.e. cognitive and emotional) job demands, which often are accompanied by substantial, sometimes hidden costs (e.g. burnout, sickness absence, work disability, lost productivity, and counterproductive work behavior). To improve our understanding of how specific job resources moderate the relation between today's job demands and job outcomes, de Jonge and Dormann (2003; 2006) developed the Demand-Induced Strain Compensation (DISC) Model.

Demand-Induced Strain Compensation Model

The DISC Model is premised on four key principles: (1) multi-dimensionality of concepts, (2) the triple match principle, (3) the compensation principle, and (4) the balance principle (de Jonge & Dormann, 2003; 2006). These basic principles will be discussed in more detail below.

1. Multidimensionality of concepts: At a very basic level, job demands, job resources, and job outcomes are either cognitive, emotional, or physical in nature (Hockey, 2000; de Jonge & Dormann, 2003). As far as job demands are concerned, the DISC Model distinguishes cognitive job demands that primarily impinge on mental processes (e.g. solving complex problems), emotional job demands that refer to the effort needed to deal with job-inherent emotions (e.g. feeling threatened by an aggressive patient) and/or organizationally desired emotions (e.g. staying friendly to a rude customer) during interpersonal transactions, and (3)

physical job demands that primarily impinge on the musculoskeletal system (e.g. moving heavy objects). In a similar vein, the DISC Model distinguishes cognitive job resources that refer to the opportunity to control one's own work activities (i.e. job control) and to consult sources of information and expertise (e.g. information from handbooks), emotional job resources that refer to emotional support from colleagues and/or supervisors (e.g. a listening ear from colleagues), and physical job resources that refer to instrumental support from colleagues and/or supervisors, technical equipment, and ergonomic aids (e.g. a trolley). Finally, the DISC Model distinguishes cognitive, emotional, and physical job outcomes, which can be either negative (e.g. concentration problems, emotional exhaustion, and physical complaints) or positive (e.g. creativity, emotional strength, and physical strength).

2. Triple match principle: To a certain extent, the triple match principle is similar to the matching hypothesis. However, in addition to the match between job demands and job resources as proposed by the matching hypothesis, the triple match principle also emphasizes the importance of a match between job demands and job outcomes and between job resources and job outcomes. More specifically, the triple match principle proposes that moderating effects of job resources on the relation between job demands and job outcomes are most likely and will be most pronounced when job demands, job resources, and job outcomes all match. Because moderating effects are strongest when there is a match between all three job stress constructs, this idea of match is referred to as a *triple match*. An example of a triple match is a situation in which emotional job resources mitigate the relation between emotional job demands and emotional exhaustion. In addition to triple matches, the DISC Model also distinguishes two kinds of 'double matches', which are weaker in terms of match (only two out of three constructs match) and thus less likely to occur than triple matches. For instance, though it is assumed that emotional demands are most likely to affect emotional outcomes, there may also be an association between emotional demands and cognitive outcomes that is moderated by emotional resources (de Jonge, Le Blanc, Peeters, & Noordam, 2008). Although this kind of double match is known as the matching hypothesis, in the context of the triple match principle it is usually referred to as a *double match of common kind*. That is, there is a match between job demands and job resources, while the outcome variable comprises a deviant component. In a similar vein, there could be a double match between job demands and job outcomes when job resources comprise a deviant component (e.g. an association between emotional demands and emotional outcomes that is moderated by cognitive resources), or a double match between job resources and job outcomes when job demands

comprise a deviant component (e.g. an association between emotional demands and physical outcomes that is moderated by physical resources). This idea of match is referred to as a *double match of extended kind* as it goes beyond what is commonly proposed in the literature (cf. Frese, 1999). Finally, moderating effects of job resources are supposed to be weakest and least likely to occur in case of a *non-match* – that is, when job demands, job resources and job outcomes are all different in nature (e.g. an association between emotional demands and cognitive outcomes that is moderated by physical resources). In sum, the triple match principle proposes that the likelihood of finding moderating effects of job resources increases as the level of match between demands, resources, and outcomes increases. Specifically, moderating effects of job resources are proposed to be strongest in case of triple matches, less strong in case of double matches, and least strong in case of non-matches.

3. Compensation principle: The compensation principle proposes that the adverse effects of high job demands on worker health and well-being can be counteracted if workers have sufficient job resources to deal with their demanding work tasks. Job resources that match job demands are most likely to counteract these negative effects. For instance, it is proposed that workers who are confronted with high physical job demands (e.g. moving heavy objects) are least likely to experience health problems (e.g. back pain) if they have sufficient physical job resources (e.g. a trolley) to deal with their physically demanding job. If workers have insufficient physical job resources at their disposal, health problems are more likely to occur. The compensation principle is illustrated in Figure 2.1.

4. Balance principle: The balance principle proposes optimal conditions for worker activation (e.g. learning, growth, creativity, and performance) if there is a balanced mixture of high (but not overwhelming) job demands and matching job resources. For instance, workers who need to solve complex problems are most likely to experience creativity if they have sufficient cognitive job resources (e.g. the opportunity to take mental breaks) to deal with their cognitively demanding job. If workers have insufficient cognitive job resources at their disposal, creativity is less likely to occur. The balance principle is illustrated in Figure 2.2.

Figure 2.1. *Illustration of the compensation principle*.

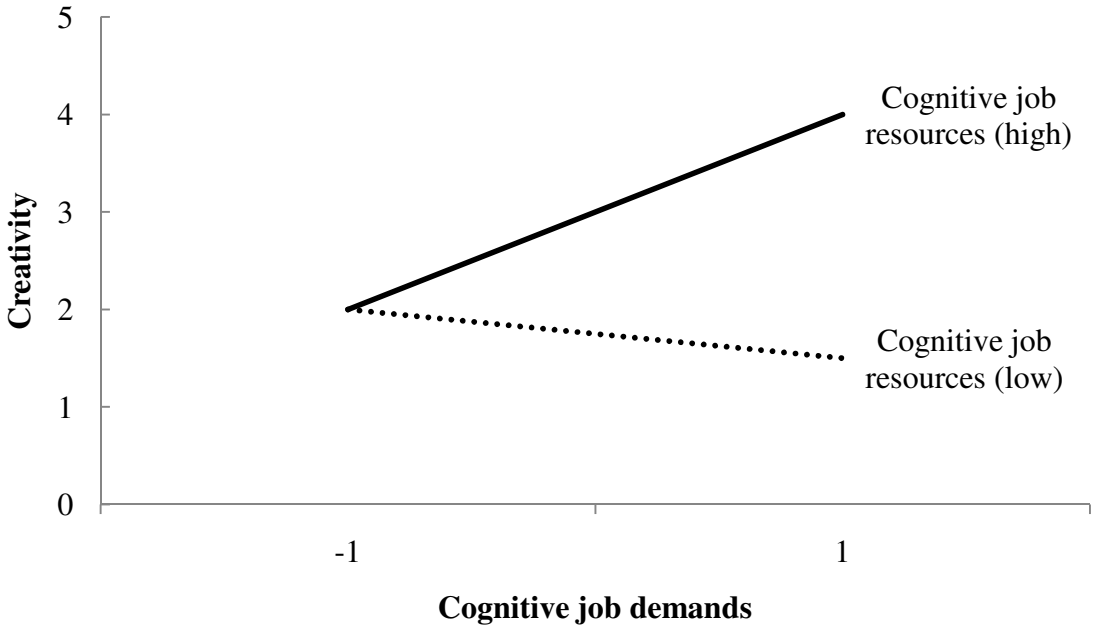


Figure 2.2. *Illustration of the balance principle*.

Functional homeostatic regulation theory

The DISC Model has been theoretically based on functional homeostatic regulation processes (de Jonge & Dormann, 2006; de Jonge, Dormann, & van den Tooren, 2008; Daniels & de Jonge, 2010). The function of homeostatic regulation processes is to regulate the demands imposed on a system (e.g. the human body) in order to maintain the system's equilibrium. This function can be accomplished through the activation of appropriate resources. Consider, for instance, the area of immune functioning. When a particular virus enters the human body, the immune system is known to activate specific resources (i.e. specific T- and B-cells) that fit or 'match' the virus infection concerned. During evolution, it has turned out that through the activation of these matching resources, the immune system is able to combat the demands (i.e. virus) imposed on the human body, and to maintain the system's equilibrium. In contrast, non-matching resources (i.e. T- and B-cells that do not match the virus infection concerned) have proven to be dysfunctional and are, hence, unlikely to be activated (Lekander, 2002).

The general idea underpinning functional homeostatic regulation processes can be transferred to organizational settings (cf. Karoly, 1993; Vancouver, 2000). Specifically, functional homeostatic regulation at work involves self-regulation processes the function of which is to deal with states of physical or psychological imbalance induced by job demands (cf. Pomaki & Maes, 2002). Similar to homeostatic regulation in the immune system and nervous system, the DISC Model proposes that workers activate functional, corresponding resources to mitigate the adverse effects of specific high job demands. Internal, matching resources are most powerful to deal with specific high job demands, matching job resources are less powerful, and non-matching job resources are least powerful. For instance, when being faced with high emotional job demands (e.g. remaining friendly to a rude customer), an emotional self-regulation ability is likely to be quite helpful. When workers lack this internal emotional resource, an external emotional resource (i.e. an emotional job resource) such as emotionally supportive colleagues may do an almost similarly effective job (cf. Hobfoll, 2001). If emotional job resources are unavailable, other job resources can be useful to some extent, such as information provided by a supervisor about how to handle a certain troublesome customer (note that, in organizational settings, non-corresponding types of job resources are not dysfunctional per se). Accordingly, the DISC Model proposes that high job demands are first dealt with by attempting to turn to easily available matching internal resources. If these internal resources are unavailable or considered insufficient, a demand for matching job resources is created. Through lifelong learning processes that bear most resemblance to operant conditioning (Skinner, 1969), workers have learned that homeostasis

can best be strived for through the use of functional matching job resources rather than less functional non-matching job resources. Only if functional matching job resources are unavailable, workers search for other, less functional, job resources. They will then use even those job resources that do not closely correspond to the type of job demands concerned (cf. Vohs, Baumeister, & Ciarocco, 2005).

Testing the DISC Model

Because the DISC Model predicts job outcomes from job demands and job resources, regression analytical techniques are the most obvious method of data analysis to examine the principles of the DISC Model (cf. Field, 2009). The DISC Model can be tested by examining standardized multiplicative interaction terms between matching demands and resources (e.g. emotional demands × emotional resources) versus non-matching demands and resources (e.g. emotional demands × physical resources) in the prediction of different types of job outcomes (i.e. cognitive, emotional, or physical outcomes). If the job outcomes are negative, that is, in case of 'strain' (e.g. concentration problems, emotional exhaustion, and physical complaints), it concerns a test of the compensation principle. If the job outcomes are positive, that is, in case of 'activation' (e.g. active learning, emotional strength, and physical strength), it concerns a test of the balance principle. A complete test of the DISC Model (testing either the compensation principle, the balance principle, or both) includes three different types of demands, resources, and outcomes (i.e. cognitive, emotional, and physical). As there are nine different multiplicative interaction terms that can be tested in the prediction of three different types of outcomes, a complete examination of the DISC Model comprises a test of 27 possible moderating effects. In total, the DISC Model distinguishes three triple matches, six double matches of common kind, twelve double matches of extended kind, and six non-matches. Table 2.1 presents an overview of all possible matches.

Because the large number of multiplicative interaction terms (nine) could cause both power problems and multicollinearity when included in one single analysis, the DISC Model is usually tested by means of two separate analyses (see e.g. de Jonge & Dormann, 2006). The first analysis includes the three multiplicative interaction terms between *matching* job demands and job resources (e.g. cognitive demands × cognitive resources), resulting in a test of nine possible moderating effects (i.e. three triple matches and six double matches of common kind). The second analysis contains the six multiplicative interaction terms between *non-matching* job demands and job resources (e.g. cognitive demands × emotional resources),

Table 2.1. *Overview of all possible triple matches, double matches, and non-matches*

Triple Match	Double Match of Common Kind	Double Match of Extended Kind	Non-Match
CD × CR → CO	CD × CR → EO	CD × ER → CO	CD × ER → PO
ED × ER → EO	CD × CR → PO	CD × ER → EO	CD × PR → EO
PD × PR → PO	ED × ER → CO	CD × PR → CO	ED × CR → PO
	ED × ER → PO	CD × PR → PO	ED × PR → CO
	PD × PR → CO	ED × CR → CO	PD × CR → EO
	PD × PR → EO	ED × CR → EO	PD × ER → CO
		ED × PR → EO	
		ED × PR → PO	
		PD × CR → CO	
		PD × CR → PO	
		PD × ER → EO	
		PD × ER → PO	

Note. CD = cognitive demands ED = emotional demands PD = physical demands CR = cognitive resources ER = emotional resources PR = physical resources CO = cognitive outcomes EO = emotional outcomes PO = physical outcomes

CD × CR → CO = interaction between cognitive job demands and cognitive job resources in the prediction of cognitive job outcomes

resulting in a test of eighteen possible moderating effects (i.e. twelve double matches of extended kind and six non-matches). To identify a particular triple match, double match, or non-match, its respective moderating effect should be meaningful (i.e. statistically significant at $\alpha \leq .05$). For instance, to identify a physical triple match, the multiplicative interaction term between physical job demands and physical job resources in the prediction of physical outcomes should be statistically significant. If a statistically significant moderating effect is in line with the compensation principle (i.e. job resources buffer the relation between demands and strain) or the balance principle (i.e. job resources strengthen the relation between demands and worker activation), it is called a theoretically *valid* triple match, double match, or non-match. If a statistically significant moderating effect contradicts the compensation principle (i.e. job resources strengthen strain) or balance principle (i.e. job resources diminish worker activation), it is called a theoretically *non-valid* triple match, double match, or non-match.

Review

In the remainder of this chapter, the triple match principle and the matching hypothesis will be examined by means of a review of 29 DISC studies. As far as the triple match principle is concerned, it will be investigated whether the likelihood of finding valid moderating effects of job resources increases as the level of match between demands, resources, and outcomes increases. In line with the triple match principle, it is proposed that:

Hypothesis 1: Valid moderating effects of job resources are most likely to occur in case of triple matches, less likely to occur in case of double matches, and least likely to occur in case of non-matches.

As regards the matching hypothesis, it will be investigated whether matching job resources are more functional resources than non-matching job resources to deal with specific types of demanding situations at work. In line with the matching hypothesis, it is hypothesized that:

Hypothesis 2: Valid moderating effects of job resources are more likely to occur if there is a match between specific types of job demands and job resources than if there is a non-match between specific types of job demands and job resources.

Hypothesis 2 will be tested on a global level and on a specific level. On the global level, no distinction will be made between the three specific domains of job demands and job resources (i.e. cognitive, emotional, and physical demands and resources). More specifically, it will be investigated whether interaction effects between matching demands and resources are more likely to occur than interaction effects between non-matching demands and resources. Our aim is to examine the extent to which the proposed functionality of matching job resources holds *in general*. By contrast, on the specific level, we will examine the extent to which cognitive, emotional, and physical job resources moderate the relation between each of the different types of job demands (i.e. cognitive, emotional, and physical demands) and job outcomes. For instance, it will be investigated whether cognitive job resources are more likely to moderate the relation between cognitive job demands and job outcomes than emotional or physical job resources. Here, our aim is to examine the extent to which the proposed functionality of matching job resources holds for each type of demanding job.

Hypotheses 1 and 2 will be tested for the overall DISC Model (i.e. no distinction will be made between the compensation principle and the balance principle), for the compensation principle (i.e. the stress-buffering effect of job resources), and for the balance principle (i.e. the activation-enhancing effect of job resources).

2.2 Method

Study selection

Studies on the DISC Model were identified by consulting our own 'database' of DISC studies, and by approaching other researchers of whom we knew they were or had been involved in research on the DISC Model. All empirical contributions (i.e. papers, theses, reports, and conference contributions) that could be traced were initially selected for the review. Theoretical discussions of the DISC Model that referred to 'old' empirical findings to found the theoretical assertions made were excluded in advance (e.g. book chapters, key note contributions, seminars, and invited lectures). In addition, because this chapter is a prelude to Chapters 3 to 6, papers and conference contributions related to the empirical studies of this thesis were also omitted. In total, 51 DISC studies were selected (status on February 1st, 2010):

- 5 published papers (international journals)
- 3 published papers (national journals)

- 1 paper in press (international journals)
- 2 papers submitted for publication (international journals)
- 1 paper in preparation
- 17 master's theses
- 5 bachelor's/honor's theses
- 3 reports
- 14 conference contributions (1 contribution was included twice as it reported on a cross-sectional and a longitudinal study that had been conducted on the same data).

Next, we cleared our initial selection of 51 DISC studies by applying two exclusion criteria. The first criterion concerned the inclusion of *third variables*. As we aimed for studies in which a pure test of the DISC Model had been conducted (i.e. a test of the DISC Model including job demands, job resources, and job outcomes only), studies were excluded from the review if a third variable (e.g. personal characteristics) had been included in the DISC analyses and no separate analyses without this third variable had been provided. In total, in 7 DISC studies a third variable had been included and these studies were hence excluded from the review (i.e. 1 paper in preparation, 2 master's theses, 2 bachelor's theses, and 2 reports).

The second exclusion criterion concerned *overlap in data*. Studies showing overlap in data (either partly or completely) were treated as follows:

1. Cross-sectional studies and longitudinal studies were considered different, so no steps were taken if there was overlap in data between cross-sectional and longitudinal studies.
2. Studies including different outcome variables were considered different, so no steps were taken if there was overlap in data between studies in which different outcome variables had been included.
3. If studies did show overlap in outcome variables, either the least prominent study or the outcome variables from the least prominent study were excluded from the review. Studies considered most prominent (a) to least prominent (i) were:
    a) published papers / papers in press (international journals)
    b) published papers / papers in press (national journals)
    c) papers submitted for publication (international journals)
    d) papers submitted for publication (national journals)
    e) papers in preparation
    f) master's theses
    g) bachelor's/honor's theses

h) reports

i) conference contributions

This ranking is based on the (supposed) quality, extensiveness, and traceability of the studies (e.g. a conference contribution might be of good quality, but is usually not very extensive (in terms of information provided) and often hard to trace).

Due to overlap in data, 11 of the 44 remaining DISC studies were excluded (i.e. 1 master's thesis and 10 conference contributions). In addition, five positive cognitive outcome variables were excluded. These outcome variables belonged to three different studies (i.e. 1 published paper (national journal), 1 master's thesis, and 1 conference contribution).

Finally, irrespective of the two exclusion criteria, 4 DISC studies were excluded from the review because (1) we had serious doubts about the scientific quality of the studies (i.e. 2 master's theses), or (2) in the studies job resources had been measured in relation to hypothetical work settings, whereas job demands and job outcomes had both been assessed in relation to real work settings (i.e. 1 bachelor's thesis and 1 conference contribution).

In total, we excluded 22 studies, resulting in a final database of 29 DISC studies (i.e. 5 published papers (international journals), 3 published papers (national journals), 1 paper in press (international journal), 2 papers submitted for publication (international journals), 12 master's theses, 2 honor's theses, 1 report, and 3 conference contributions). Table 2.2 presents an overview of these 29 DISC studies. Besides information on the sample, country, design, and type of demands and resources included in the study, information is provided on the number of valid triple matches, double matches of common kind, double matches of extended kind, and non-matches that had been found compared to the number of matches that had been tested in the respective studies.

Evaluation criteria

Generally speaking, conclusions about the DISC Model can be drawn with more certainty as tests of the DISC Model become more comprehensive. In addition, it can be argued that the higher the methodological quality of the 29 DISC studies, the less biased the results and the more firm conclusions can be drawn with respect to the DISC Model (cf. de Lange et al., 2003). Therefore, each of the 29 DISC studies was evaluated on the basis of four evaluation criteria (i.e. test DISC Model, design, measures, and data analysis). The last three evaluation criteria were chosen in such a way that they relate to those aspects that are decisive for the methodological quality of the DISC studies, that is, causality, reliability, and statistics. Table 2.3 presents an overview of the four evaluation criteria and their rating possibilities. For each

Table 2.2. *Overview of empirical evidence for the DISC Model (N = 29)*

Study	**Sample**	**Country**	**Design**	**Demands**	**Resources**	**Outcomes**	**TM**	**DMc**	**DMe**	**NM**
de Bruin et al.	390 workers	NED	cross-sectional	CD	CR	CO –	X	X	n.a.	n.a.
(2007)				ED	ER	EO –	X	X	n.a.	n.a.
				PD	PR	PO –	X	X	n.a.	n.a.
							0/3	0/6	n.a.	n.a.
van Bussel et al.	240 workers	NED	cross-sectional	CD	CR	CO + (2x)	X	n.a.	n.a.	n.a.
(2007)	(recreation resort)			ED	ER	CO –	X	n.a.	n.a.	n.a.
				PD	PR	EO +	X	n.a.	n.a.	n.a.
						EO –	X	n.a.	n.a.	n.a.
						PO +	X	n.a.	n.a.	n.a.
						PO –	X	n.a.	n.a.	n.a.
							0/7	n.a.	n.a.	n.a.
Chrisopoulos et al.	179 police officers	AUS	longitudinal	CD	CR	CO –	CCC	X	CPC	X
(2010)			(two-wave)	ED	ER	EO –	X	CCE	CEE	X
				PD	PR	PO –	X	X	PCP	X
							1/3	1/6	3/12	0/6
Da Silva (2009)	348 workers	SA	cross-sectional	CD	CR	CO – (4x)	CCC	n.a.	n.a.	n.a.
	(service and non-service jobs)			ED	ER	EO – (3x)	EEE	n.a.	n.a.	n.a.
							2/7	n.a.	n.a.	n.a.

Table 2.2. (*continued*)

Study	Sample	Country	Design	Demands	Resources	Outcomes	TM	DMc	DMe	NM
Davis & Dollard (2003)	135 workers	AUS	cross-sectional	CD	CR	CO +	X	X	X	X
				ED	ER	EO –	X	X	X	X
				PD	PR	PO –	X	X	X	CEP
							0/3	0/6	0/12	1/6
Deschaght (2006)	244 bank workers	BEL	cross-sectional	CD	CR	CO +	X	EEC	n.a.	n.a.
				ED	ER	EO – (2x)	EEE	X	n.a.	n.a.
				PD	PR	PO –	X	EEP	n.a.	n.a.
							1/4	2/8	n.a.	n.a.
Dormann et al. (2009)	597 service workers	GER	longitudinal (two-wave)	ED (4x)	ER (2x)	EO –	EEE EEE	n.a.	n.a.	n.a.
							2/8	n.a.	n.a.	n.a.
de Grauw (2003)	698 workers (two mental health institutions)	NED	cross-sectional	CD	CR	CO + (2x)	X	X	n.a.	n.a.
				ED	ER	EO –	X	X	n.a.	n.a.
				PD	PR	PO +	X	X	n.a.	n.a.
							0/4	0/8	n.a.	n.a.

Table 2.2. (*continued*)

Study	**Sample**	**Country**	**Design**	**Demands**	**Resources**	**Outcomes**	**TM**	**DMc**	**DMe**	**NM**
Haeslich et al. (2003)	50 doctors and 263 nurses (general hospital)	GER	cross-sectional (two studies)	CD ED PD	CR ER PR	CO +	CCC CCC	EEC EEC PPC	n.a.	n.a.
						EO –	EEE EEE	CCE CCE PPE PPE	n.a.	n.a.
						PO –	PPP PPP	CCP EEP	n.a.	n.a.
							6/6	9/12	n.a.	n.a.
Halik & Dollard (2003)	102 call center workers	AUS	cross-sectional	CD ED PD	CR ER PR	EO –	X	X	n.a.	n.a.
							0/1	0/2	n.a.	n.a.
Hoek & Walsem-Reedeker (2004)	347 retail trade workers	NED	cross-sectional	CD ED (2x) PD	CR ER PR	CO + EO – PO –	X EEE X	X X X	n.a. n.a. n.a.	n.a. n.a. n.a.
							1/4	0/8	n.a.	n.a.

Table 2.2. (*continued*)

Study	**Sample**	**Country**	**Design**	**Demands**	**Resources**	**Outcomes**	**TM**	**DMc**	**DMe**	**NM**
de Jonge & Dormann (2006)	280 and 267 nursing home workers	NED	longitudinal (two-wave; two studies)	CD	CR	CO +	X	X	CEC	X
				ED	ER	EO –	EEE	PPE	PEE	X
									CEE	
				PD	PR	PO –	PPP	CCP	PEP	X
							2/6	2/12	4/24	0/12
de Jonge et al. (2004)	471 and 405 nursing home workers	NED	cross-sectional (two studies)	CD	CR	CO +	CCC	X	n.a.	n.a.
							CCC			
				ED	ER	EO –	EEE	CCE	n.a.	n.a.
				PD	PR	PO –	PPP	CCP	n.a.	n.a.
							4/6	2/12	n.a.	n.a.
de Jonge et al. (2008)	826 health care workers (test group and validation group)	NED	cross-sectional (cross-validation; results reported for test group)		CR	CO + (2x)	n.a.	EEC	ECC	n.a.
				ED (3x)	ER			EEC		
						EO –	EEE	n.a.	X	n.a.
							1/3	2/6	1/9	n.a.

Table 2.2. (*continued*)

Study	**Sample**	**Country**	**Design**	**Demands**	**Resources**	**Outcomes**	**TM**	**DMc**	**DMe**	**NM**
de Jonge & Peeters (2009)	54 health care workers and co-workers (matched)	NED	cross-sectional (results reported for workers and co-workers)	CD ED PD	CR ER PR	CO – (2x)	X 	PPC PPC	X 	PEC PEC
							0/2	2/4	0/8	2/4
de Jonge et al. (2006)	826 health care workers (test group and validation group)	NED	cross-sectional (cross-validation; results reported for test group and validation group)	ED (3x)	CR ER	CO +	n.a.	EEC	X	n.a.
							n.a.	1/6	0/6	n.a.
Martens (2008)	246 workers (car industry)	BEL	cross-sectional	CD ED PD	CR ER PR	PO – (5x)	PPP 	EEP EEP	X 	X
							1/5	2/10	0/20	0/10
Nel (2009)	348 workers (service and non-service jobs)	SA	cross-sectional	CD ED	CR ER	CO + (2x) EO + (2x)	X EEE	n.a. n.a.	n.a. n.a.	n.a. n.a.
							1/4	n.a.	n.a.	n.a.

Table 2.2. (*continued*)

Study	**Sample**	**Country**	**Design**	**Demands**	**Resources**	**Outcomes**	**TM**	**DMc**	**DMe**	**NM**
Peßler (2005)	229 nursing home workers	GER	cross-sectional	CD ED PD	CR ER PR	CO + EO – PO –	X X X	X X X	X X X	X X X
							0/3	0/6	0/12	0/6
Plasschaert (2004)	830 health care workers	BEL	cross-sectional	CD ED	CR (2x) ER	CO + (2x) EO – (2x)	X EEE EEE	X X	n.a. n.a.	n.a. n.a.
							2/6	0/6	n.a.	n.a.
Raemdonck (2009)	372 workers (soft drinks company)	BEL	cross-sectional	CD ED PD	CR ER PR	CO – (2x)	X	X	X	X
							0/2	0/4	0/8	0/4
van den Tooren & de Jonge (2008)	69 nursing home workers	NED	cross-sectional	CD ED PD	CR ER PR	CO + EO – PO –	X X PPP	X PPE X	X PEE X	X X X
							1/3	1/6	1/12	0/6

Table 2.2. (*continued*)

Study	**Sample**	**Country**	**Design**	**Demands**	**Resources**	**Outcomes**	**TM**	**DMc**	**DMe**	**NM**
Van Boven (2007)	207 IT specialists	BEL	cross-sectional	CD	CR	CO – (2x)	X	n.a.	n.a.	n.a.
							0/2	n.a.	n.a.	n.a.
Van de Ven &	1533 workers	BEL	cross-sectional	CD	CR	CO –	CCC	X	X	X
Vlerick (2009)	(technology sector)			ED	ER	EO –	EEE	PPE	X	X
				PD	PR	PO –	PPP	X	X	CEP
							3/3	1/6	0/12	1/6
Van de Ven et al.	207 IT specialists	BEL	cross-sectional	CD	CR	CO + (2x)	CCC	X	n.a.	n.a.
(2008)				ED	ER					
				PD	PR					
							1/2	0/4	n.a.	n.a.
Van Sele (2009)	516 civil servants	BEL	cross-sectional	CD	CR	CO + (4x)	CCC	X	X	EPC
				ED	ER					EPC
				PD	PR	CO –	CCC	EEC	X	X
							2/5	1/10	0/20	2/10
Veris (2008)	194 workers	BEL	cross-sectional	CD	CR	CO – (3x)	CCC	X	ECC	X
	(recruitment and			ED	ER					
	selection company)			PD	PR					
							1/3	0/6	1/12	0/6

Table 2.2. (*continued*)

Study	Sample	Country	Design	Demands	Resources	Outcomes	TM	DMc	DMe	NM
Vermeulen & Vlerick (2006)	776 beginning teachers	BEL	cross-sectional	CD ED PD	CR ER PR	CO + (2x)	X	X	n.a.	n.a.
							0/2	0/4	n.a.	n.a.
Vermeulen & Vlerick (2006)	776 beginning teachers	BEL	longitudinal (two-wave)	CD ED PD	CR ER PR	CO +	X	X	n.a.	n.a.
							0/1	0/2	n.a.	n.a.

Note. AUS = Australia BEL = Belgium GER = Germany NED = Netherlands SA = South Africa
CD = cognitive demands ED = emotional demands PD = physical demands CR = cognitive resources ER = emotional resources PR = physical resources
CO = cognitive outcomes EO = emotional outcomes PO = physical outcomes
ED (4x) = study tested four different measures of emotional job demands CO – = negative cognitive outcome CO + = positive cognitive outcome
TM = triple matches DMc = double matches of common kind DMe = double matches of extended kind NM = non-matches
CEP = interaction between cognitive job demands and emotional job resources in the prediction of physical outcomes X = no valid matches were found
n.a. = not applicable (match was not tested) 1/3 = one out of 3 tested matches was valid

Table 2.3. *Criteria for evaluating the quality of DISC studies*

Criteria	**Insufficient (*)**	**Sufficient (**)**	**Good (***)**
Test DISC Model	incomplete: neither all matches (i.e. TM, DMc, DMe, and NM) nor all types of demands, resources, and outcomes (i.e. cognitive, emotional, physical) have been tested	incomplete: either all matches (i.e. TM, DMc, DMe, and NM) or all types of demands, resources, and outcomes (i.e. cognitive, emotional, physical) have been tested	complete: all matches (i.e. TM, DMc, DMe, and NM) and all types of demands, resources, and outcomes (i.e. cognitive, emotional, physical) have been tested
Design	cross-sectional	longitudinal (≥ 2 measures)	longitudinal (≥ 2 measures) *and* controlled for baseline/earlier outcome measures
Measures	insufficient information and/or unacceptable measures	acceptable measures	good measures
Data analysis	correlational research	univariate regression	multivariate regression

Note. TM = triple matches DMc = double matches of common kind DMe = double matches of extended kind NM = non-matches
Unacceptable measures: *less* than 8 out of 9 scales have 3 or more items and an alpha ≥ .70. acceptable measures: 8 out of 9 scales have 3 or more items and an alpha ≥ .70. good measures: 100% scales have 3 or more items and an alpha ≥ .70.

criterion, a study could be rated from *insufficient* (one star) to *good* (three stars), resulting in a sum score of at least four stars to a maximum of twelve stars. Based on the total number of stars obtained, studies were labeled as low quality studies (4 to 6 stars), moderate quality studies (7 to 9 stars), or high quality studies (10 to 12 stars). The four evaluation criteria and their rating possibilities are discussed in more detail below.

Test DISC Model

The first criterion concerns the test of the DISC Model. To be able to draw firm conclusions about the DISC Model, a complete test of the DISC Model is desirable. That is, in studies preferably all types of demands, resources, and outcomes (i.e. cognitive, emotional, and physical) are included, and all possible matches (i.e. triple matches, double matches of common kind, double matches of extended kind, and non-matches) are examined. Studies that had examined the complete DISC Model were rated as good. If studies had not examined the complete DISC Model, they were rated as sufficient if they had either included all types of demands, resources, and outcomes, or examined all possible matches. Studies were rated as insufficient if neither all types of demands, resources, and outcomes had been included, nor all possible matches had been examined.

Design

The second criterion concerns the design of the study. Because cross-sectional designs are not well-suited to make causal inferences about the relation between job characteristics and outcomes (Taris & Kompier, 2003), studies with a cross-sectional design were rated as insufficient. Although longitudinal designs allow for stronger conclusions concerning possible causal relations between job characteristics (x_1) on outcomes (y_2) may be carried by the stability of the dependent variable, thereby overestimating the strength of the relation between x_1 and y_2. Therefore, longitudinal designs were rated as either sufficient or good, depending on whether y_1 had been partialled out from the relation between x_1 and y_2 (cf. Zapf, Dormann, & Frese, 1996).

Measures

The third evaluation criterion deals with the reliability of the measures included in the DISC studies. The higher the reliability of the measures, the more likely it is that we will find similar results if a study is repeated. Studies were rated as good if all measures (100%) consisted of at least three items and had an alpha of .70 or higher. We choose these specific

values because three items are a prerequisite to calculate the internal consistency of a scale, while an alpha of .70 is a widely acknowledged cut-off score to assess whether a scale is reliable or not (Stangor, 2007). For a complete test of the DISC Model, one needs at least nine variables, that is, three different types of demands, resources, and outcomes (i.e. cognitive, emotional, and physical). Though it is preferable that all measures consist of three or more items and have an alpha of .70 or higher, measures were still considered acceptable if one out of nine scales consisted of less than 3 items or had an alpha lower than .70. Therefore, studies in which eight out of nine scales (i.e. 88.9%) consisted of at least three items and had an alpha of .70 or higher were rated as sufficient. If a study provided insufficient information concerning the number of items or the reliabilities of the measures, or if less than eight out of nine scales had three or more items and an alpha of .70 or higher, the study was rated as insufficient.

Data analysis

The fourth evaluation criterion concerns the method of analysis. To study the DISC Model, there are generally three different methods of data analysis: correlational research, univariate regression, and multivariate regression. An advantage of univariate regression in comparison to correlational research is that univariate regression enables us to predict one variable (y) from another (x), whereas correlational research only provides information on the strength of the association between x and y (i.e. correlations tell us nothing about the predictive power of variables). Multivariate regression has an additional advantage to univariate regression as multivariate regression enables us to predict more than one variable simultaneously (which reduces the chance of making Type I errors), and takes account of any correlations between the outcome variables that otherwise would get lost (Field, 2009). Therefore, studies were rated as good if multivariate regression techniques had been used to examine the DISC Model. Studies in which the DISC Model had been examined by means of univariate regression techniques were rated as sufficient, while studies in which only correlational research had been used were rated as insufficient.

Data analysis

To test our hypotheses for the overall DISC Model, we did a number of calculations on the data in Table 2.2. Specifically, to test Hypothesis 1, we calculated the total number of valid triple matches (abbreviated TM), double matches of common kind (abbreviated DMc), double matches of extended kind (abbreviated DMe), and non-matches (abbreviated NM) that had

been found in the 29 DISC studies, and we did the same for the tested TM, DMc, DMe, and NM. Next, we added the total number of valid DMc and DMe as well as the total number of tested DMc and DMe, which resulted in a total number of valid and tested double matches of both kinds (i.e. 'double matches', abbreviated DM). Finally, we divided the total number of valid TM, DM, and NM by the total number of tested TM, DM, and NM to calculate the percentage of valid TM, DM, and NM that had been found in the 29 DISC studies.

To test Hypothesis 2 on the global level, we added the total number of valid TM and DMc and the total number of tested TM and DMc to calculate the total number of valid and tested moderating effects of job resources that match job demands. Similarly, we added the total number of valid DMe and NM and the total number of tested DMe and NM to calculate the total number of valid and tested moderating effects of job resources that did not match job demands. Based on these total numbers of valid and tested moderating effects, we calculated the percentage of valid moderating effects of matching job resources and the percentage of valid moderating effects of non-matching job resources that had been found in the 29 DISC studies.

On the specific level, we tested Hypothesis 2 by calculating the total number of valid interaction effects and the total number of tested interaction effects between (1) cognitive job demands and each of the three specific types of job resources (i.e. cognitive job demands × cognitive job resources, cognitive job demands × emotional job resources, and cognitive job demands × physical job resources), (2) emotional job demands and each of the three specific types of job resources (i.e. emotional job demands × cognitive job resources, emotional job demands × emotional job resources, and emotional job demands × physical job resources), and (3) physical job demands and each of the three specific types of job resources (i.e. physical job demands × cognitive job resources, physical job demands × emotional job resources, and physical job demands × physical job resources). Next, for each interaction effect (nine in total), we divided the total number of valid interactions by the total number of tested interactions to calculate the percentage of valid interaction effects that had been found in the 29 DISC studies.

Calculations were repeated for tests of the compensation principle (i.e. including moderating effects of job resources in the prediction of negative outcomes only) and tests of the balance principle (i.e. including moderating effects of job resources in the prediction of positive outcomes only). Finally, z-tests were conducted to determine whether the percentages of valid moderating effects were significantly different from each other (Moore & McCabe, 1999).

2.3 Results

Quality of the DISC studies

Table 2.4 presents the evaluation of the 29 studies on the DISC Model. Note that only two studies could be labeled as high quality studies (6.9%). Nine studies (31.0%) could be labeled as moderate quality studies, while more than half of the DISC studies were categorized as low quality studies (18 studies, 62.1%). If we take a closer look at the ratings per criterion, it becomes clear that the large number of low quality studies can be largely explained by two methodological criteria, that is, design and measures. On these criteria, the 29 DISC studies obtained 37 and 42 stars, respectively. This is 42.5% and 48.3%, respectively, of the total number of stars that could have been obtained. With respect to the design of the studies, only four DISC studies had used a longitudinal design (and controlled for baseline outcome measures). The other 25 DISC studies had used a cross-sectional design and were hence rated as insufficient. As far as the measures are concerned, there were only four studies in which all measures consisted of at least three items and had an alpha of .70 or higher. In addition, only five DISC studies had acceptable measures, while 20 DISC studies had unacceptable measures and were hence rated insufficient. None of the 29 DISC studies provided insufficient information. In contrast to the criteria design and measures, the 29 DISC studies obtained 62 stars for the methodological criterion data analysis, which is 71.3% of the total number of stars that could have been obtained. The finding that the 29 DISC studies scored much higher on this criterion than on the other two methodological criteria can be explained by the fact that none of the 29 DISC studies had used correlational research. Instead, in four studies multivariate regression techniques had been used and in 25 DISC studies the DISC Model had been examined by means of univariate regression techniques.

In addition to the methodological criteria design, measures, and data-analysis, the 29 DISC studies obtained 53 stars for the criterion test DISC Model, which is 60.9% of the total number of stars that could have been obtained. Only in six studies had all types of demands, resources, and outcomes been included, and had all possible matches been examined. In the other 23 DISC studies an incomplete test of the DISC Model had been conducted. That is, in 12 studies either all types of demands, resources, and outcomes had been included, or all possible matches had been examined, while in 11 studies neither all types of demands, resources, and outcomes had been included, nor all possible matches had been examined.

Table 2.4. *Evaluation of 29 studies on the DISC Model*

Study	**Test DISC Model**	**Design**	**Measures**	**Data analysis**	**Total score**	**Quality label**
de Bruin et al. (2007)	**	*	***	**	8	moderate
van Bussel et al. (2007)	**	*	*	**	6	low
Chrisopoulos et al. (2010)	***	***	***	***	12	high
Da Silva (2009)	*	*	*	**	5	low
Davis (2003)	***	*	**	**	8	moderate
Deschaght (2006)	**	*	*	**	6	low
Dormann et al. (2009)	*	***	***	**	9	moderate
de Grauw (2003)	**	*	*	**	6	low
Haeslich et al. (2003)	**	*	*	**	6	low
Halik (2003)	*	*	*	**	5	low
Hoek & Walsem-Reedeker (2004)	**	*	**	**	7	moderate
de Jonge & Dormann (2006)	***	***	*	***	10	high
de Jonge et al. (2004)	**	*	*	**	6	low
de Jonge et al. (2008)	*	*	*	***	6	low
de Jonge & Peeters (2009)	**	*	*	**	6	low
de Jonge et al. (2006)	*	*	*	***	6	low
Martens (2008)	**	*	*	**	6	low
Nel (2009)	*	*	*	**	5	low

Table 2.4. (*continued*)

Study	**Test DISC Model**	**Design**	**Measures**	**Data analysis**	**Total score**	**Quality label**
Peßler (2005)	***	*	***	**	9	moderate
Plasschaert (2004)	*	*	*	**	5	low
Raemdonck (2009)	**	*	*	**	6	low
van den Tooren & de Jonge (2008)	***	*	**	**	8	moderate
Van Boven (2007)	*	*	*	**	5	low
Van de Ven & Vlerick (2010)	***	*	**	**	8	moderate
Van de Ven et al. (2008)	*	*	*	**	5	low
Van Sele (2009)	**	*	**	**	7	moderate
Veris (2008)	**	*	*	**	6	low
Vermeulen & Vlerick (2006)[a]	*	*	*	**	5	low
Vermeulen & Vlerick (2006)[b]	*	***	*	**	7	moderate
Total	53	37	42	62		

Note. * insufficient ** sufficient *** good

[a] cross-sectional [b] longitudinal

In sum, it can be concluded that the 29 DISC studies obtained the highest ratings for the criterion data analysis. Less high ratings were obtained for the criterion test DISC Model, while the lowest ratings were obtained for the criteria design and measures, respectively.

Hypotheses testing: overall DISC Model

To tests whether the likelihood of finding moderating effects of job resources increases with the number of matching variables (Hypothesis 1), we compared the percentages of valid triple matches, valid double matches and valid non-matches (Table 2.5, Figure 2.3). As expected, results revealed that valid moderating effects of job resources were more likely to occur in case of triple matches than in case of double matches ($z = 4.47$; $p < .01$) or non-matches ($z = 3.40$; $p < .01$). However, contrary to our expectations, valid moderating effects of job resources were equally likely to occur in case of double matches as in case of non-matches ($z = 0.59$; $p = .55$). Therefore, Hypothesis 1 is only partly supported. Subsequently, it was tested whether valid moderating effects of job resources are more likely to occur if there is a match between specific types of job demands and job resources than if there is no such match (Hypothesis 2). On the global level (Table 2.5, Figure 2.4), results supported Hypothesis 2 ($z = 4.71$; $p < .01$). On the specific level (Table 2.5, Figure 2.5), however, Hypothesis 2 was only partly supported. Specifically, in a cognitively demanding job, valid moderating effects of matching cognitive job resources were more likely to occur than valid moderating effects of non-matching physical job resources ($z = 2.27$; $p < .05$), but equally likely to occur as valid moderating effects of non-matching emotional job resources ($z = 0.69$; $p = .49$). In an emotionally demanding job, valid moderating effects of matching emotional job resources were more likely to occur than valid moderating effects of non-matching cognitive job resources ($z = 2.89$; $p < .01$) and non-matching physical job resources ($z = 2.22$; $p < .05$). Finally, in a physically demanding job, valid moderating effects of matching physical job resources were more likely to occur than valid moderating effects of non-matching cognitive job resources ($z = 2.29$; $p < .05$), but equally likely to occur as valid moderating effects of non-matching emotional job resources ($z = 0.73$; $p = .47$). Note that valid moderating effects of non-matching job resources were particularly likely to occur in case of emotional job resources.

Table 2.5. *The prevalence of valid moderating effects of job resources for the overall DISC Model, the compensation principle, and the balance principle*

	Overall			**Compensation principle**			**Balance principle**		
	# valid	# tested	% valid	# valid	# tested	% valid	# valid	# tested	% valid
Hypothesis 1									
Triple Matches (TM)	32	108	29.6%	25	73	34.3%	7	35	20.0%
Double Matches of Common kind (DMc)	26	160	16.3%	19	99	19.2%	7	61	11.5%
Double Matches of Extended kind (DMe)	10	167	6.0%	8	119	6.7%	2	48	4.2%
Double Matches (DMc + DMe)	36	327	11.0%	27	218	12.4%	9	109	8.3%
Non-Matches (NM)	6	76	7.9%	4	58	6.9%	2	18	11.1%
Hypothesis 2									
Matching demands and resources (TM + DMc)	58	268	21.6%	44	172	25.6%	14	96	14.6%
Non-matching demands and resources (DMe + NM)	16	243	6.6%	12	177	6.8%	4	66	6.1%
Specification results Hypothesis 2									
Cognitive demands × Cognitive resources	18	89	20.2%	12	58	20.7%	6	31	19.4%
Cognitive demands × Emotional resources	5	38	13.2%	4	29	13.8%	1	9	11.1%
Cognitive demands × Physical resources	1	38	2.6%	1	29	3.5%	0	9	0.0%
Emotional demands × Cognitive resources	2	53	3.8%	1	32	3.1%	1	21	4.8%
Emotional demands × Emotional resources	25	107	23.4%	18	66	27.3%	7	41	17.1%
Emotional demands × Physical resources	2	38	5.3%	0	29	0.0%	2	9	22.2%
Physical demands × Cognitive resources	1	38	2.6%	1	29	3.5%	0	9	0.0%
Physical demands × Emotional resources	5	38	13.2%	5	29	17.2%	0	9	0.0%
Physical demands × Physical resources	15	72	20.8%	14	48	29.2%	1	24	4.2%

Note. # valid = number of valid moderating effects of job resources # tested = number of tested moderating effects of job resources % valid = percentage of valid moderating effects of job resources

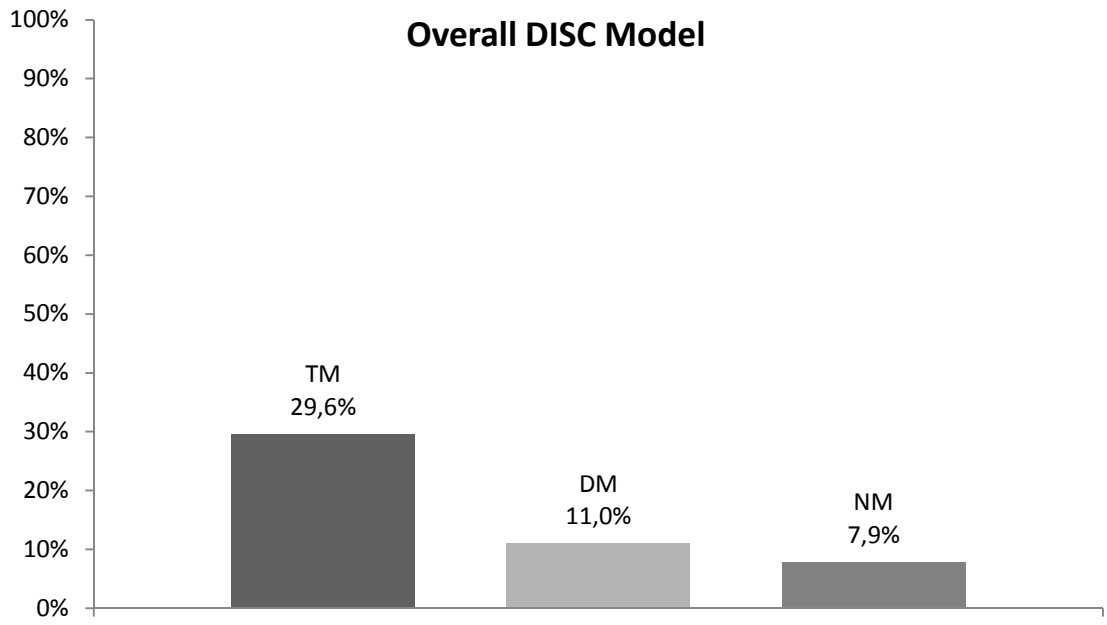


Figure 2.3. *Percentage of valid triple matches, double matches, and non-matches for the overall DISC Model.*

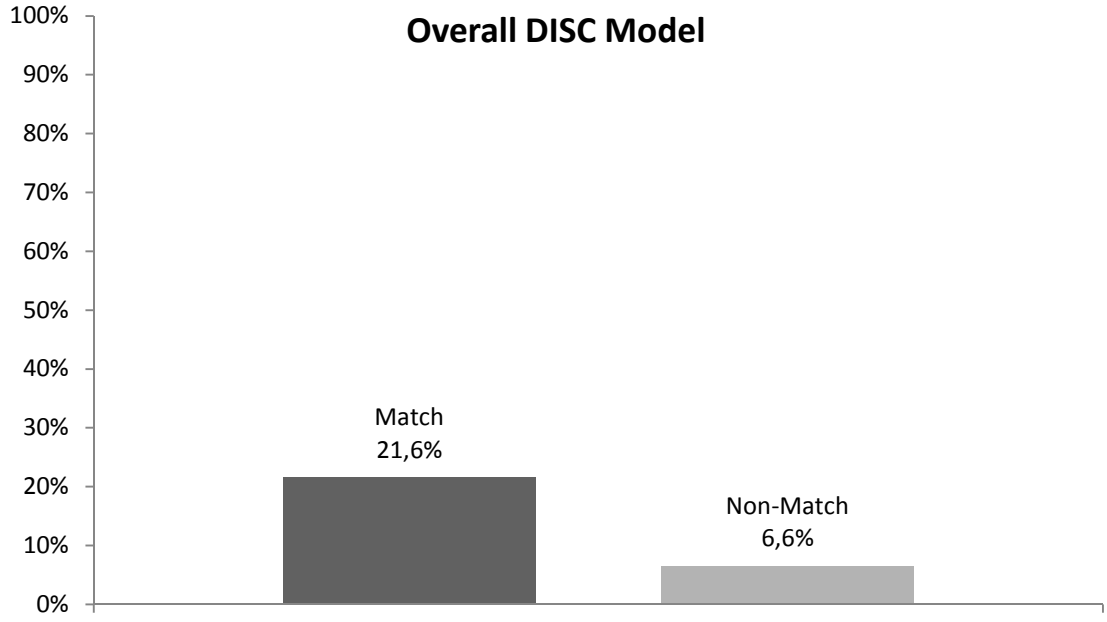


Figure 2.4. *Percentage of valid moderating effects of job resources that match job demands (match) and that do not match job demands (non-match) for the overall DISC Model.*

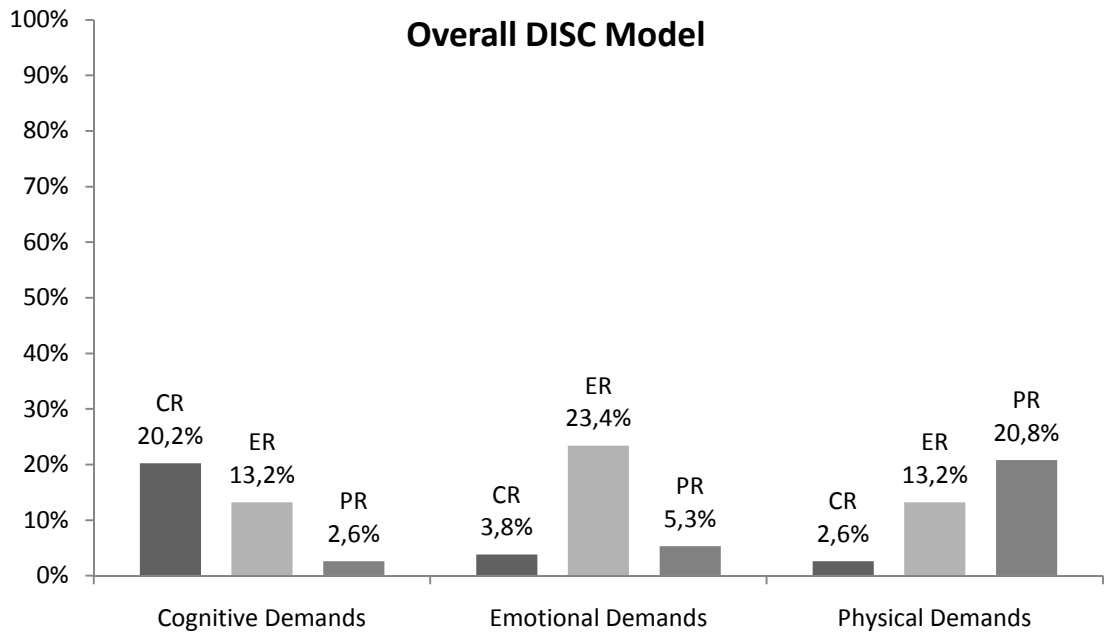


Figure 2.5. *Percentage of valid moderating effects of cognitive (CR), emotional (ER), and physical (PR) job resources on the relation between each of the different types of job demands and job strain for the overall DISC Model.*

Hypotheses testing: compensation principle

If we take a look at the compensation principle, results are largely in line with the findings for the overall DISC Model. Specifically, when we compared the percentages of valid triple matches, valid double matches and valid non-matches (Table 2.5, Figure 2.6), results revealed that valid stress-buffering effects of job resources were more likely to occur in case of triple matches than in case of double matches ($z = 4.04$; $p < .01$) or non-matches ($z = 3.53$; $p < .01$). However, in case of double matches and non-matches, valid stress-buffering effects of job resources were equally likely to occur ($z = 0.94$; $p = .35$). Hypothesis 1 is therefore only partly supported. Tests of Hypothesis 2 on the global level (Table 2.5, Figure 2.7) confirmed that valid stress-buffering effects of job resources are more likely to occur in case of a match between specific types of job demands and job resources than in case there is no such match ($z = 4.64$; $p < .01$). However, on the specific level (Table 2.5, Figure 2.8), Hypothesis 2 was only partly supported. More precisely, in a cognitively demanding job, valid stress-buffering effects of matching cognitive job resources were equally likely to occur as valid stress-buffering effects of non-matching emotional job resources ($z = 0.49$; $p = .62$) and non-matching physical job resources ($z = 1.81$; $p = .07$). In an emotionally demanding job, valid stress-buffering effects of matching emotional job resources were more likely to occur than

valid stress-buffering effects of non-matching cognitive job resources (z = 2.56; p < .05) and non-matching physical job resources (z = 2.84; p < .01). Finally, in a physically demanding job, valid stress-buffering effects of matching physical job resources were more likely to occur than valid stress-buffering effects of non-matching cognitive job resources (z = 2.46; p < .05), but equally likely to occur as valid stress-buffering effects of non-matching emotional job resources (z = 0.90; p = .37). Note that valid stress-buffering effects of non-matching job resources were particularly likely to occur in case of emotional job resources.

Hypotheses testing: balance principle

For the balance principle, we found somewhat different results than for the overall DISC Model and the compensation principle. Specifically, when we compared the percentages of valid triple matches, valid double matches and valid non-matches (Table 2.5, Figure 2.9), results revealed that valid activation-enhancing effects of job resources were equally likely to occur in case of triple matches and double matches (z = 1.61; p = .11), triple matches and non-matches (z = 0.43; p = .67), and double matches and non-matches (z = 0.05; p = .96). These findings contradict Hypothesis 1. Tests of Hypothesis 2 on the global level (Table 2.5, Figure 2.10) and the specific level (Table 2.5, Figure 2.11) were neither in line with our predictions. Specifically, on the global level, results revealed that valid activation-enhancing effects of job resources were equally likely to occur in case of a match between specific types of job demands and job resources as in case there was no such match (z = 1.44; p = .15). On the specific level, it was shown that, in a cognitively demanding job, valid activation-enhancing effects of matching cognitive job resources were equally likely to occur as valid activation-enhancing effects of non-matching emotional job resources (z = 0.07; p = .94) and non-matching physical job resources (z = 0.90; p = .37). In a similar vein, in case of emotional job demands, valid activation-enhancing effects of matching emotional job resources were equally likely to occur as valid activation-enhancing effects of non-matching cognitive job resources (z = 0.97; p = .33) and non-matching physical job resources (z = 0.12; p = .91). Finally, in a physically demanding situation at work, valid activation-enhancing effects of matching physical job resources were equally likely to occur as valid activation-enhancing effects of non-matching cognitive job resources (z = 0.52; p = .60) and non-matching emotional job resources (z = 0.52; p = .60).

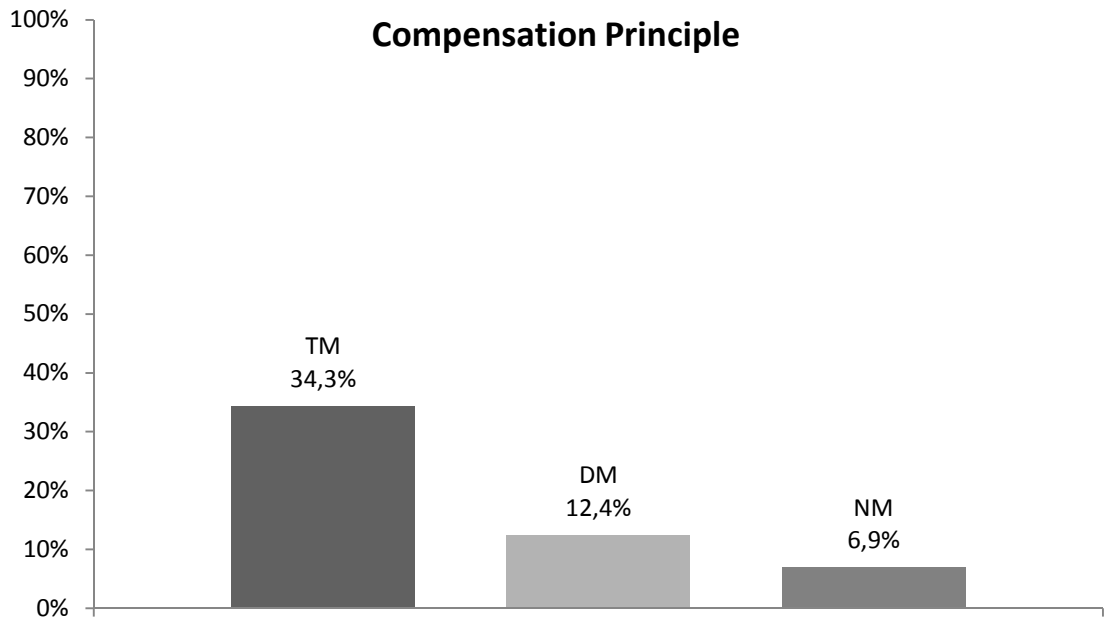


Figure 2.6. *Percentage of valid triple matches, double matches, and non-matches for the compensation principle*.

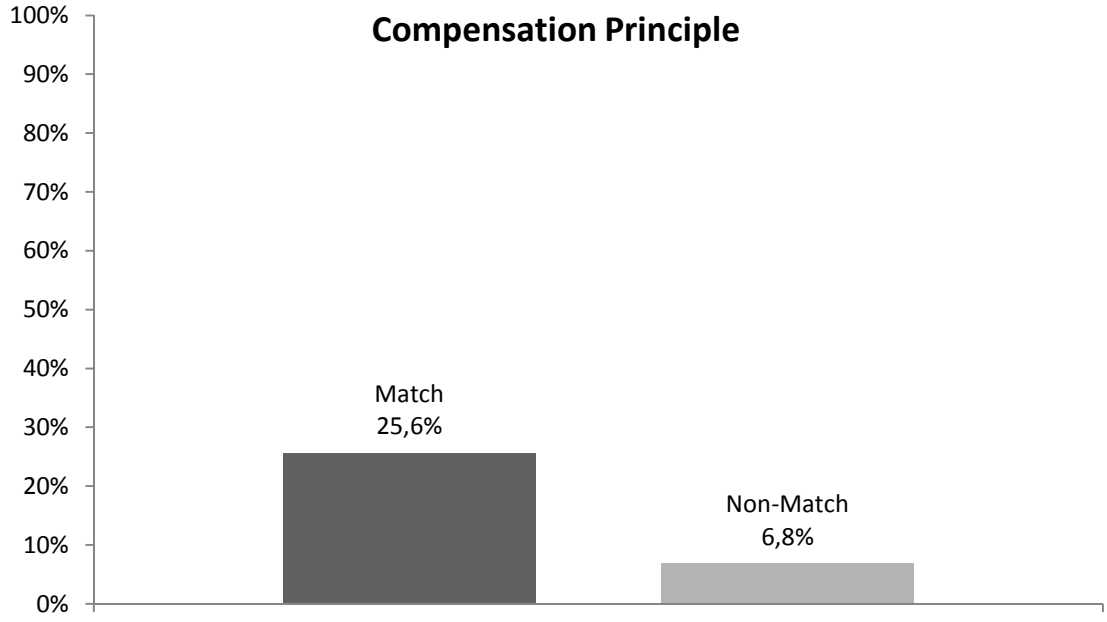


Figure 2.7. *Percentage of valid moderating effects of job resources that match job demands (match) and that do not match job demands (non-match) for the compensation principle*.

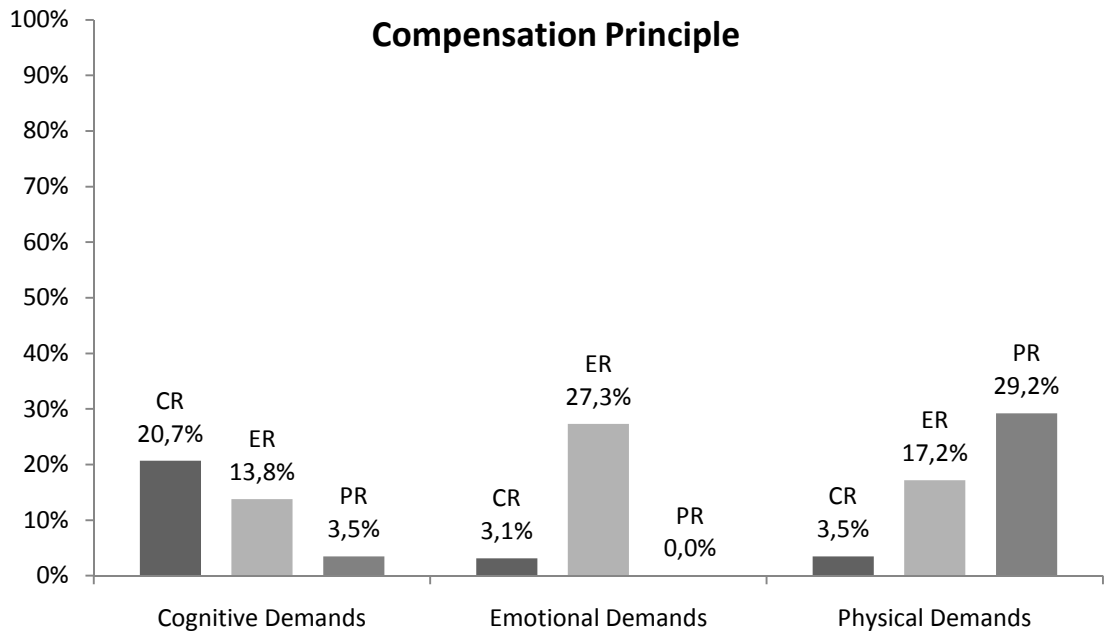


Figure 2.8. *Percentage of valid moderating effects of cognitive (CR), emotional (ER), and physical (PR) job resources on the relation between each of the different types of job demands and job strain for the compensation principle*.

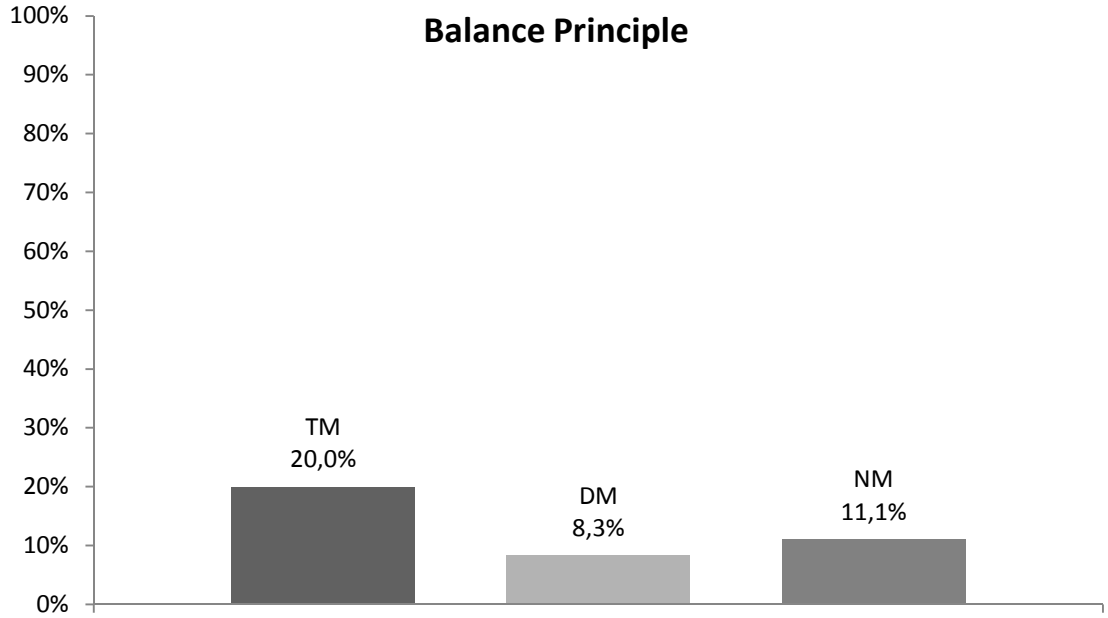


Figure 2.9. *Percentage of valid triple matches, double matches, and non-matches for the balance principle*.

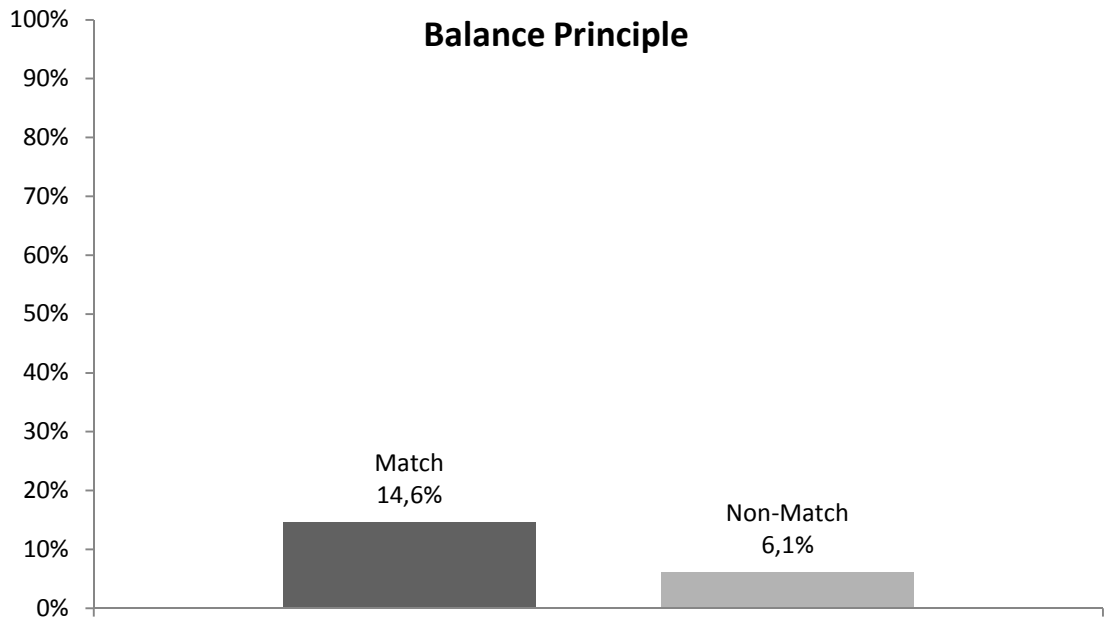


Figure 2.10. *Percentage of valid moderating effects of job resources that match job demands (match) and that do not match job demands (non-match) for the balance principle*.

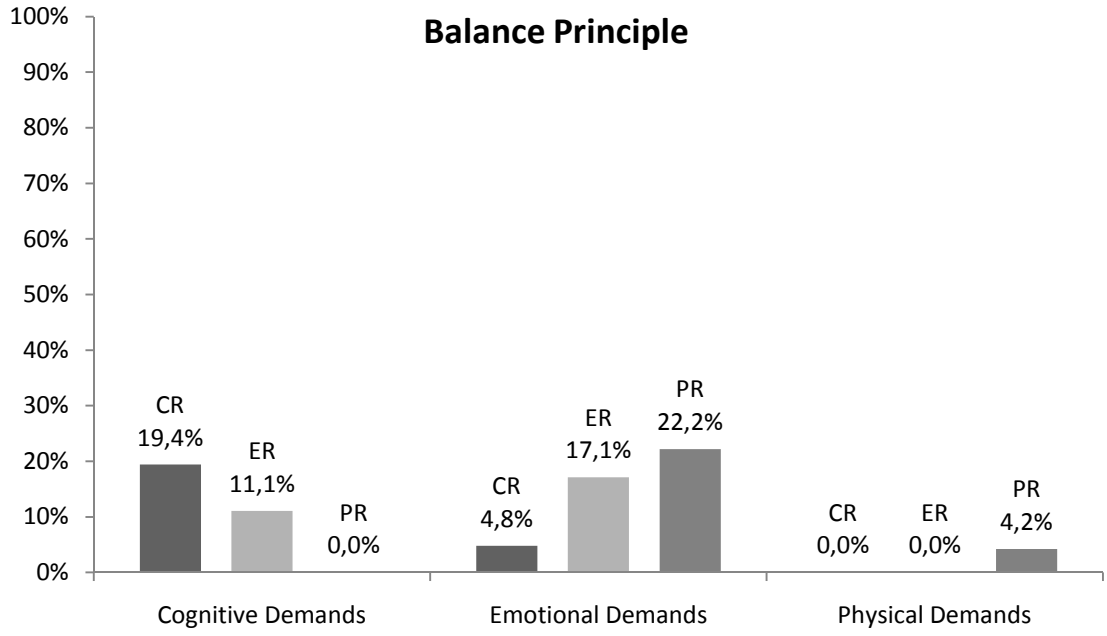


Figure 2.11. *Percentage of valid moderating effects of cognitive (CR), emotional (ER), and physical (PR) job resources on the relation between each of the different types of job demands and job strain for the balance principle*.

2.4 Discussion

The aim of this chapter was to provide a thorough overview of the background, key principles and theoretical underpinnings of the Demand-Induced Strain Compensation (DISC) Model, along with new and extended empirical evidence for the triple match principle and the matching hypothesis. Based on the triple match principle, it was hypothesized that valid moderating effects of job resources are most likely to occur in case of triple matches, less likely to occur in case of double matches, and least likely to occur in case of non-matches (Hypothesis 1). In addition, in line with the matching hypothesis, it was hypothesized that valid moderating effects of job resources are more likely to occur if there is a match between specific types of job demands and job resources than if there is a non-match between specific types of job demands and job resources (Hypothesis 2). Hypothesis 2 was tested on a global level and on a specific level. On the global level, no distinction was made between the cognitive, emotional, and physical domains. Our aim was to examine the extent to which the proposed functionality of matching job resources holds *in general*. By contrast, on the specific level, we examined the extent to which cognitive, emotional, and physical job resources moderate the relation between each of the different types of job demands (i.e. cognitive, emotional, and physical job demands) and job outcomes. Here, our aim was to examine the extent to which the proposed functionality of matching job resources holds for each type of demanding job. Hypotheses 1 and 2 were tested for the overall DISC Model, the compensation principle, and the balance principle. Data were analyzed by calculating the percentages of valid moderating effects of job resources that had been found in the 29 DISC studies (e.g. (total number of valid TM / total number of tested TM) x 100). Z-tests were conducted to determine whether the percentages were significantly different from each other.

For the overall DISC Model, results partly supported Hypotheses 1 and 2. That is, results were in line with Hypothesis 1, except for the finding that valid moderating effects of job resources were equally likely to occur in case of a double match as in case of a non-match. Further, results confirmed Hypothesis 2 on the global level and partly supported Hypothesis 2 on the specific level. That is, both in a cognitively and physically demanding job, valid moderating effects of non-matching emotional job resources were equally likely to occur as valid moderating effects of matching job resources. When Hypotheses 1 and 2 were tested for the compensation principle, we found results similar to those for the overall DISC Model, except for the finding that, in a cognitively demanding situation at work, valid moderating effects of non-matching physical job resources were equally likely to occur as moderating effects of matching cognitive job resources. For the balance principle, however, we found

divergent results. More specifically, it was shown that valid activation-enhancing effects of job resources were equally likely to occur in case of triple matches, double matches, and non-matches as well as in case of a match between demands and resources and in case of no such match (both on the global and on the specific level).

There are four ways in which the present study goes beyond previous overviews of empirical evidence for the DISC Model (Daniels & de Jonge, 2010; de Jonge & Dormann, 2003; de Jonge, Dormann, & van den Tooren, 2008). First, in the present overview, the search for unpublished DISC studies was extended, and exclusion criteria were applied to select a final database. Second, the quality of the DISC studies in the current overview was rated on the basis of four evaluation criteria, whereas previous overviews only distinguished cross-sectional and longitudinal studies. Third, whereas previous overviews reported results on the prevalence of triple matches only, the present study reports on all types of matches (i.e. triple matches, double matches, and non-matches). In addition, contrary to previous overviews, the current study paid special attention to the match (versus non-match) between job demands and job resources, both on a global level and on a specific level. Moreover, in the present study, results were reported for the overall DISC Model, the compensation principle, and the balance principle. The fourth way in which the present study goes beyond previous overviews of empirical evidence for the DISC Model, is that we used a statistical test (z-test) to determine whether the percentages of valid moderating effects were significantly different from each other. Due to these advancements in study selection, quality assessment, model testing, and data analysis, the empirical evidence in the current overview is not only more convincing than the empirical evidence in previous overviews, results also suggested that evidence for the overall DISC Model, both in terms of the triple match principle and the matching hypothesis, can be largely explained by findings for the compensation principle (i.e. the stress-buffering effect of job resources). This finding implies that one should be cautious drawing any firm conclusions regarding the overall DISC Model.

Quality of the DISC studies

If the current findings are interpreted in terms of the quality of the 29 DISC studies, one should again be careful drawing any firm conclusions, as 18 out of the 29 studies were categorized as low quality studies and only two studies could be labeled as high quality studies. In general, studies received the lowest ratings on the criteria design and measures. For instance, most studies used a cross-sectional design. Because cross-sectional data do not give a decisive answer about the causal relation between demands, resources, and strain, our

results could be biased. That is, we may have detected more valid moderating effects of job resources than there actually exist. Moreover, in 20 out of 29 DISC studies, *less* than eight out of nine scales (i.e. 88.9%) had three or more items and an alpha of .70 or higher. Because the quality of the measures was often insufficient, it is plausible that we would have obtained different results if the 29 DISC studies had been repeated.

Suggestions for future research

From the current findings, it appears that empirical evidence for the balance principle is not very promising. The fact that we did find support for the overall DISC Model can be largely explained by the great number of studies on the compensation principle compared to the relatively small number of studies on the balance principle. The question arises whether we would still have found support for the overall DISC Model if more studies had been conducted on the balance principle. Possibly, matching job resources are particularly functional as a stress buffer, but not as an activation enhancer. Therefore, more research on the balance principle is badly needed.

A noticeable finding of this review is that emotional job resources could be an important stress buffer if matching job resources are not accessible in a cognitively or physically demanding situation at work. However, as the majority of the 29 DISC studies has been conducted in the service sector, particularly health care, future research should reveal to what extent the dominant role of emotional job resources is specific to this particular sector and occupational group. Specifically, as emotional job demands are an integral part of human service jobs (Grandey, 2003; Zapf, Vogt, Seifert, Mertini & Isic, 1999), emotional job resources could play a central role in the job stress process because they are needed to regulate the emotional demands that often accompany other types of demanding work tasks. In addition, it is possible that, within a particular sector or occupational profession, certain types of job resources are more prevalent than other types of job resources. For instance, given the nature of the nursing profession (i.e. helping and caring), in this occupational group, emotional job resources may be more prevalent than cognitive job resources. Similarly, there may also be differences in the prevalence of certain types of job resources between particular sectors or occupational professions. For instance, emotional job resources may be more prevalent in the health care sector than in the metal industry. Given these differences in the prevalence of specific types of job demands and job resources within and between sectors and occupational professions, it is plausible that in other sectors or occupational professions than service work or nursing workers are more likely to benefit from cognitive job resources (e.g.

ICT professionals and academics) or physical job resources (e.g. blue collar workers and construction workers).

Finally, future research could improve the quality of studies on the DISC Model by using longitudinal designs and more reliable measures. Moreover, to be able to draw firm conclusions about the DISC Model, a complete test of the DISC Model is desirable. Currently, there are only six studies (20.7%) in which the DISC Model has been tested completely. Therefore, it is recommended that in future studies all types of demands, resources, and outcomes (i.e. cognitive, emotional, and physical) will be included, and all possible matches (i.e. triple matches, double matches of common kind, double matches of extended kind, and non-matches) will be examined. In addition, to enhance our understanding of the strengths and weaknesses of the DISC Model, research on the DISC Model could be extended by studies in which worker self-regulation processes involved in the activation of job resources will be examined (Chapters 3 and 4), along with studies in which the role of (matching) personal characteristics (Chapters 5 and 6), and the role of off-job recovery (de Jonge, Spoor, Sonnentag, Dormann, & van den Tooren, 2010) will be examined. Only if the quality of the DISC studies is good and researchers are aware of the strengths and weaknesses of the DISC Model, it will be possible to make better predictions about the functionality of particular job resources, and to apply our theoretical knowledge to practice (cf. Higgins, 2006).

Chapter 3

The Role of Matching Job Resources in Different Demanding Situations at Work: A Vignette Study

This chapter is largely based on:

Tooren, M. van den, & Jonge, J. de (2010). The role of matching job resources in different demanding situations at work: A vignette study. *Journal of Occupational and Organizational Psychology, 83*(1), 39-54.

3.1 Introduction

Under the headings of job demands and job resources, research on job stress has tried to identify job characteristics that may relate to worker health and well-being. Job demands are work-related tasks that require effort (e.g. solving complex problems or lifting heavy objects). Job resources are work-related assets that can be employed to deal with job demands (e.g. job autonomy or emotional support from colleagues). A central tenet of many job stress models is that job resources moderate the relation between job demands and worker health and well-being, such that workers who are confronted with high job demands and who have sufficient job resources to deal with these job demands, will experience less job strain than workers with the same level of job demands but insufficient job resources to deal with their demanding job (e.g. Karasek 1979; Johnson & Hall, 1988; Siegrist, 1996). This moderation effect is also known as the stress-buffering effect of job resources, and is particularly likely to occur if specific types of job resources are *matched* to specific types of job demands (see Chapter 2). That is, if job resources belong to the same domain of functioning as the type of job demands workers need to deal with. Generally speaking, three specific types of job demands and job resources can be distinguished: cognitive, emotional, and physical demands and resources (Hockey, 2000; de Jonge & Dormann, 2003). There is a match between job demands and job resources if demands and resources are both cognitive in nature, both emotional in nature, or both physical in nature.

In survey studies, workers are usually asked to indicate whether particular job resources are available. However, they are not asked in which demanding situation at work these resources are available, if these resources are relevant assets to deal with job demands and whether they would be used for this purpose. This is remarkable for two reasons. First, if workers believe that certain job resources are available in a particular demanding situation at work, this does not automatically imply that workers judge these job resources as the most relevant assets to deal with their demanding job, for instance, because these job resources do not correspond to the type of demands concerned. In fact, preliminary research has shown that workers' beliefs about the relevance of job resources are equally important in the prediction of job outcomes as their beliefs about the availability of job resources (de Jonge, Dormann & von Nordheim, 2006). Second, even if workers are aware of the availability of certain job resources and they perceive them as relevant assets to deal with a specific type of demanding job, this does not automatically imply that workers are always able or willing to actually use these job resources to deal with the demanding situation concerned. One explanation is that people have a limited capacity for self-regulatory behavior, akin to energy or strength, and

that the self's acts of volition are likely to deplete this limited capacity for self-regulation (Baumeister, Bratslavsky, Muraven & Tice, 1998; Muraven & Baumeister, 2000). It follows that, in case of high job demands, workers who have more self-regulation strength (i.e. capacity for self-regulation) are generally better able to use job resources than workers who are lower in self-regulation strength. Further, it has been argued that, in times of stress, people strive for minimal resource losses (Hobfoll, 1989; 2001). In work settings, this implies that workers who are faced with high job demands will try to protect or 'conserve' their job resources.

From the foregoing, it follows that workers who have access to matching job resources do not automatically take advantage of their functionality as a stress buffer. For matching job resources to operate as a stress buffer, workers should be aware of their availability, consider them as relevant, and decide to actually use them. Thus far, however, these self-regulation processes involved in the activation of job resources have been part of the black box of job stress. That is, research on job stress has typically focused on what causes job strain (i.e. job demands and job resources), without considering the self-regulation processes underlying the relation between demands, resources, and strain. Because a better understanding of these self-regulation processes could sharpen the boundary conditions of job stress models and, as a result, improve the explanatory power of these models, the aim of the current chapter is to open up the black box of job stress and to examine workers' beliefs about the *availability*, *relevance*, and *use* of specific types of job resources (i.e. cognitive, emotional, and physical resources) in different types of demanding situations at work (i.e. cognitively, emotionally, and physically demanding jobs).

Functional homeostatic regulation theory

As stated in Chapter 2, workers who are faced with high job demands will in the first place opt for job resources that match the type of job demands concerned. Because this preference for matching job resources is based on lifelong learning processes that bear most resemblance to operant conditioning (Skinner, 1969), it seems plausible that this preference is expressed in workers' beliefs about both the relevance and use of job resources. If workers are not able or willing to use matching job resources in corresponding types of demanding situations at work, they may opt for less functional non-matching job resources. For instance, given the assumed close relation between cognition and emotion (Nussbaum, 2001) – emotion affects cognition and cognition underlies emotion (Folkman, Lazarus, Gruen, & DeLongis, 1986; Frederickson, 2001; Gray, 2004; Lazarus, 1993; 2006) –, workers may opt for cognitive job resources in an

emotionally demanding job and emotional job resources in a cognitively demanding job. Workers seem particularly likely to opt for emotional job resources (rather than physical job resources) in a cognitively demanding situation at work, because cognitive efforts (e.g. making difficult decisions) might elicit emotions (cf. Lazarus, 1991) that disturb cognitive processing (cf. Zajonc, 1980). In a similar vein, workers seem particularly likely to opt for cognitive job resources (rather than physical job resources) in an emotionally demanding job, as job-inherent emotions might disturb cognitive processing, which, in turn, strengthens emotions or elicits new emotions that conflict organizational display rules (Zapf, 2002). So, if workers are faced with a cognitively demanding situation at work but are not able or willing to use matching (i.e. cognitive) job resources, they may opt for non-matching emotional job resources to counteract the emotions that disturb cognitive processing. Similarly, if workers are confronted with an emotionally demanding situation at work but are not able or willing to use matching (i.e. emotional) job resources, they may opt for non-matching cognitive job resources to preserve their capacity for cognitive processing and to prevent an increase of unwanted emotions. Like their preference for matching job resources, it seems plausible that workers' preference for non-matching cognitive and emotional job resources is also based on lifelong learning processes that bear most resemblance to operant conditioning (Skinner, 1969), and may therefore be expressed in their beliefs about both the relevance and use of job resources. Based on this line of reasoning, we at least expect to find that:

Hypothesis 1: Workers who are faced with a specific type of demanding situation at work will in the first place opt for matching job resources, both in terms of relevance and use.

Hypothesis 2: Workers who are faced with a cognitively demanding situation at work will in the second place opt for emotional job resources, both in terms of relevance and use.

Hypothesis 3: Workers who are faced with an emotionally demanding situation at work will in the second place opt for cognitive job resources, both in terms of relevance and use.

Finally, because the actual availability of job resources is likely to differ across organizations, workers may have different beliefs about the availability of job resources. Therefore, we have no particular hypotheses about how cognitive, emotional, and physical job resources will be ranked on the basis of their availability.

3.2 Method

Design

To investigate workers' beliefs about the availability, relevance, and use of specific types of job resources in different types of demanding situations at work, a quasi-experimental survey study with vignettes was developed. An advantage of a vignette study compared to traditional survey research is that, in case of vignettes, job demands and job resources are coupled by workers themselves rather than by a statistical computer program. In addition, because vignette studies allow the standardization of demanding situations at work, participants respond to the same stimuli leading to more uniform data (Gould, 1996; Hughes & Huby, 2002).

Workers who volunteered to participate in the current vignette study were presented three hypothetical demanding situations at work (i.e. vignettes), representing a cognitively, an emotionally, and a physically demanding job. Subsequently, participants had to project each of these vignettes on their personal situation at work, and imagine themselves in the hypothetical demanding job. After participants had projected a vignette on their personal situation at work (and imagined themselves in the hypothetical demanding job), they were asked to assess the relevance, the availability, and the use of three types of job resources (i.e. five items representing cognitive job resources, five items representing emotional job resources, and five items representing physical job resources) in the hypothetical demanding situation concerned (see Appendix A for an example).

Sample

Three separate studies were conducted in the Netherlands between June 2003 and February 2007. Data were collected in an institution for the blind, a nursing home, and in a passenger train (only passengers working in the service sector participated in the third study). The databases were merged to create a sample of 217 Dutch service workers. The study sample consisted of people working in health care (73.7%), education (5.1%), government (5.1%), retail trade (4.6%), banking/insurance (3.2%), transport (2.3%), and other service jobs such as consultancy (6.0%). The mean age was 40.1 years (SD = 10.9) and 76.9% of the participants were women.

Measures

Table 3.1 shows the reliabilities (i.e. Cronbach's alphas and KR-20's) and means of the vignette scales. In total, 27 scales could be distinguished. Availability and use of specific job resources were measured with a 3-point scale. The response categories were 1 (*yes*), 2 (*limited*), and 3 (*no*). Relevance of specific job resources was measured with a 2-point scale, accounting for the KR-20's. The possible responses were 1 (*yes*) and 2 (*no*). Data have been recoded, so the higher the score on a resource scale, the more a specific type of job resources was believed to be available, relevant, or likely to be used in the demanding situation concerned.

In general, the resource scales showed moderate to high reliability (i.e. $0.70 \leq \alpha \leq 0.89$). Seven scales had an alpha between 0.60 and 0.67, which is still acceptable given the number of scale items (Cortina, 1993). However, one scale (i.e. 'availability of cognitive job resources in a cognitively demanding situation at work') had an alpha of 0.44. This resource scale could not be improved psychometrically and was therefore replaced by one key item (i.e. 'Worker X will have the opportunity to vary complex tasks with simple tasks').

Data analysis

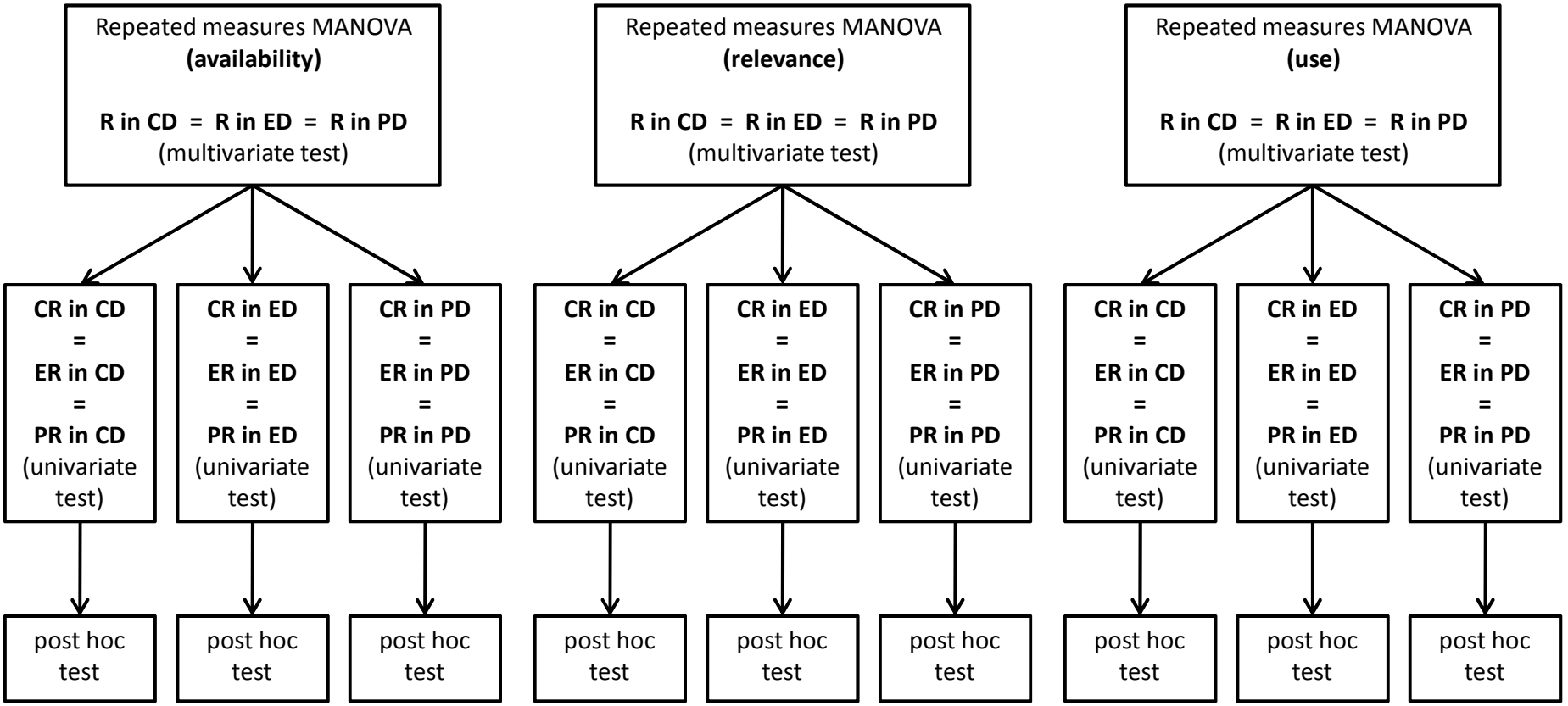
To test Hypotheses 1 to 3, and to explore workers' beliefs about the availability of cognitive, emotional, and physical job resources, we followed a conservative 'top-down approach' (see Figure 3.1). More specifically, because paired samples t-tests would probably have enhanced capitalization on chance, three repeated measure MANOVAs were conducted; that is, one for the availability of job resources, one for the relevance of job resources, and one for the use of job resources. For each repeated measures MANOVA, job resources were specified as a within-subject factor with three levels (i.e. cognitive, emotional, and physical). Further, cognitive job demands, emotional job demands, and physical job demands were specified as three separate measures. A significant main effect of job resources in the multivariate test (Wilks' Lambda) would imply that workers' beliefs about, for instance, the availability of specific types of job resources differed depending on the specific type of job demands concerned (i.e. cognitive, emotional, or physical job demands).

To investigate how workers' beliefs about, for instance the availability of specific types of job resources, related to each specific type of demanding job, the main effects of job resources in the univariate tests were considered. A significant main effect of job resources in the univariate test would imply that workers' beliefs about, for instance, the availability of

Table 3.1. *Number of items, reliabilities, means, and standard deviations of the resource scales (N = 217)*

			Cognitive job demands			Emotional job demands			Physical job demands		
		Items	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*
Availability[1]	Cognitive job resources	1		12.36	3.25	0.67	12.74	1.95	0.71	11.69	2.30
	Emotional job resources	5	0.71	12.26	1.99	0.76	12.68	2.03	0.82	11.87	2.50
	Physical job resources	5	0.70	12.03	2.17	0.79	12.55	2.22	0.77	11.97	2.29
Relevance [2]	Cognitive job resources	5	0.64	9.47	0.98	0.67	9.55	0.91	0.82	9.02	1.46
	Emotional job resources	5	0.65	9.35	1.09	0.60	9.55	0.87	0.89	8.83	1.71
	Physical job resources	5	0.79	9.00	1.51	0.87	9.11	1.58	0.86	9.39	1.31
Use[1]	Cognitive job resources	5	0.61	12.80	1.95	0.75	12.46	2.31	0.80	11.90	2.36
	Emotional job resources	5	0.76	12.34	2.31	0.78	12.56	2.27	0.87	11.69	2.84
	Physical job resources	5	0.66	11.96	2.69	0.84	12.03	2.78	0.86	12.15	2.74

Note. [1] reliability scores represent Cronbach's alphas [2] reliability scores represent KR-20's



Note. **R = resources (cognitive, emotional, and physical) CD = cognitive demands ED = emotional demands PD = physical demands CR = cognitive resources ER = emotional resources PR = physical resources**

Figure 3.1. *Different steps taken in the data analysis*

cognitive, emotional, and physical job resources differed in the specific demanding situation at work concerned.

Finally, for each significant main effect in the univariate tests, a post hoc test was conducted to examine which specific types of job resources differed from each other in the specific demanding situation at work concerned. The post hoc tests were corrected with a Bonferroni adjustment.

3.3 Results

Repeated measures MANOVAs

The multivariate tests of the three repeated measures MANOVAs showed a significant main effect of job resources across the three types of job demands. That is, it was shown that workers' beliefs about the availability ($F(6, 142) = 7.62$, $p < .01$, partial $\eta^2 = .24$), the relevance ($F(6, 168) = 7.12$, $p < .01$, partial $\eta^2 = .20$), and the use ($F(6, 109) = 4.00$, $p < .01$, partial $\eta^2 = .18$) of specific types of job resources differed depending on the specific type of job demands concerned.

In the subsequent univariate tests, we found a main effect for the availability of job resources in a cognitively demanding situation at work ($F(1.63, 239.06) = 10.62$, $p < .01$, partial $\eta^2 = .07$), an emotionally demanding situation at work ($F(1.83, 268.51) = 15.70$, $p < .01$, partial $\eta^2 = .10$), and a physically demanding situation at work ($F(2, 294) = 7.02$, $p < .01$, partial $\eta^2 = .05$). Further, a main effect was found for the relevance of job resources in a cognitively ($F(1.67, 288.39) = 12.50$, $p < .01$, partial $\eta^2 = .07$), an emotionally ($F(1.46, 253.23) = 23.16$, $p < .01$, partial $\eta^2 = .12$), and a physically ($F(1.68, 290.34) = 7.96$, $p < .01$, partial $\eta^2 = .04$) demanding situation at work. Findings showed also a main effect for the use of job resources in a cognitively ($F(2, 228) = 7.32$, $p < .01$, partial $\eta^2 = .06$) and an emotionally ($F(1.80, 204.92) = 11.66$, $p < .01$, partial $\eta^2 = .09$) demanding situation at work. However, we did not find a main effect for the use of job resources in a physically demanding situation at work ($F(1.69, 192.95) = 0.44$, $p = 0.61$, partial $\eta^2 = .00$), indicating that cognitive, emotional, and physical job resources would be used equally often in a physically demanding situation at work.

For the significant main effects in the univariate tests, post hoc tests were conducted to explore which specific types of job resources differed from each other in the specific demanding situations at work concerned. The results of the post hoc tests are discussed below.

Post hoc tests: availability of job resources

As shown in Table 3.2 and Figure 3.2, workers indicated that in a cognitively demanding situation at work, cognitive and emotional job resources were equally available (i.e. their availability did not differ significantly), and that both job resources were more available than physical job resources. In an emotionally demanding situation, emotional job resources were believed to be more available than cognitive job resources, which were, in turn, believed to be more available than physical job resources. Finally, in a physically demanding situation, physical and cognitive job resources were perceived as equally available, but both less available than emotional job resources. So, it seems that emotional job resources are most available across the different demanding situations at work. Cognitive job resources appear to be particularly available in a cognitively demanding situation, whereas physical job resources generally seem to be scarce.

Post hoc tests: relevance of job resources

Table 3.2 and Figure 3.3 show that in a cognitively demanding situation at work, workers did not distinguish between the relevance of cognitive and emotional job resources, and perceived both job resources to be more relevant than physical job resources. In an emotionally demanding job, emotional job resources were believed to be more relevant than cognitive job resources, which were, in turn, believed to be more relevant than physical job resources. Finally, in a physically demanding situation, physical job resources were perceived as more relevant than cognitive job resources, whereas both physical and emotional job resources as well as cognitive and emotional job resources were thought to be equally relevant. In other words, workers seem to perceive emotional job resources as relevant assets to deal with both emotional and cognitive job demands, whereas cognitive and physical job resources are believed to be particularly relevant in corresponding types of demanding situations at work.

Post hoc tests: use of job resources

From Table 3.2 and Figure 3.4 it can be inferred that in a cognitively demanding situation at work, cognitive and emotional job resources would be used equally often, and that both types of job resources would be used more often than physical job resources. In an emotionally demanding job, emotional job resources were more likely to be used than cognitive job resources, which were, in turn, more likely to be used than physical job resources. Finally, in line with the non-significant main effect for the use of job resources in a physically demanding situation, findings showed that workers would use physical, cognitive, and

Table 3.2. *Post hoc tests for the availability, the relevance, and the use of specific types of job resources in different demanding situations at work (N = 217)*

		Cognitive job demands			Emotional job demands			Physical job demands		
	Job resources	Mean difference	*t*	*p*	Mean difference	*t*	*p*	Mean difference	*t*	*p*
Availability *N* = 148	CR – ER	12.50 – 12.89	-1.46	0.44	12.36 – 12.84	-3.49	0.00	12.07 – 12.59	-3.54	0.00
	CR – PR	12.50 – 11.76	2.60	0.03	12.36 – 11.91	2.52	0.04	12.07 – 12.08	-0.09	1.00
	ER – PR	12.89 – 11.76	6.24	0.00	12.84 – 11.91	5.21	0.00	12.59 – 12.08	2.94	0.01
Relevance *N* = 174	CR – ER	9.50 – 9.52	-0.23	1.00	9.35 – 9.55	-3.21	0.01	8.97 – 9.09	-1.52	0.39
	CR – PR	9.50 – 9.08	3.70	0.00	9.35 – 8.89	4.18	0.00	8.97 – 9.37	-3.95	0.00
	ER – PR	9.52 – 9.08	4.17	0.00	9.55 – 8.89	5.65	0.00	9.09 – 9.37	-2.28	0.07
Use *N* = 115	CR – ER	12.79 – 12.53	1.24	0.66	12.25 – 12.69	-2.51	0.04	11.99 – 12.08	-0.44	1.00
	CR – PR	12.79 – 11.99	3.85	0.00	12.25 – 11.71	2.73	0.02	11.99 – 12.21	-1.06	0.89
	ER – PR	12.53 – 11.99	2.44	0.05	12.69 – 11.71	4.21	0.00	12.08 – 12.21	-0.47	1.00

Note. CR = cognitive resources ER = emotional resources PR = physical resources

Post hoc tests are corrected with a Bonferroni adjustment

emotional job resources equally often if they were confronted with a physically demanding job. To summarize, workers seem to have a distinct preference for using emotional job resources in an emotionally demanding situation at work and, to a lesser extent, cognitive job resources in a cognitively demanding situation. They do not seem to prefer using a particular type of job resources in a physically demanding situation.

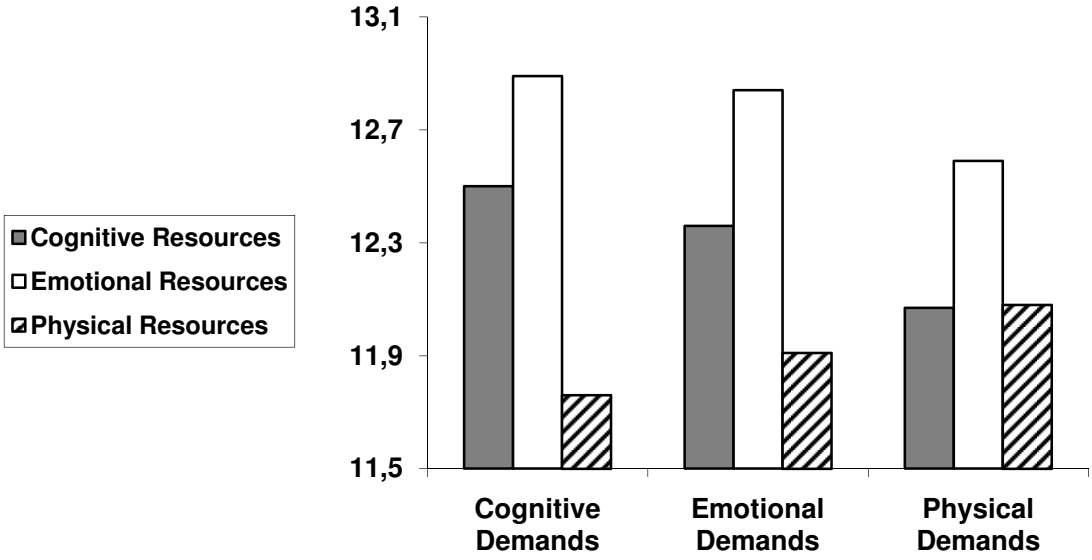


Figure 3.2. *Availability of specific types of job resources in different types of demanding situations at work (N = 148)*

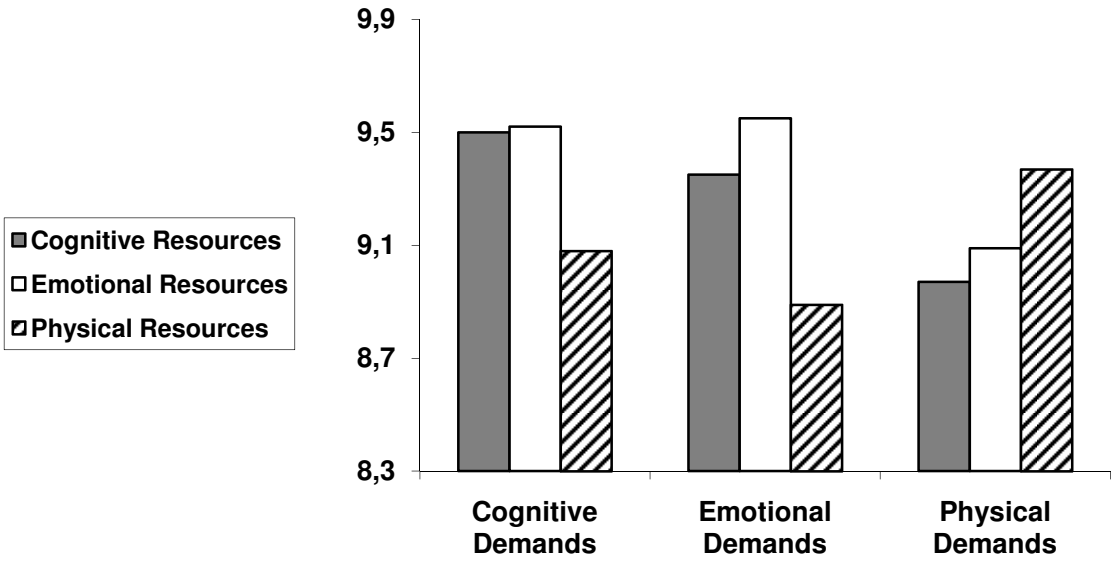


Figure 3.3. *Relevance of specific types of job resources in different types of demanding situations at work (N = 174)*

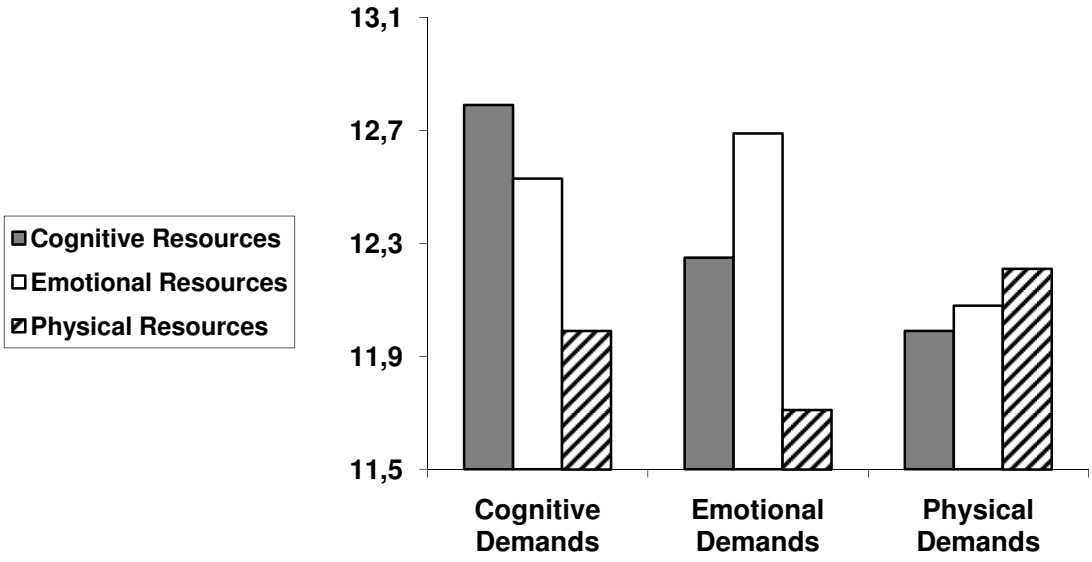


Figure 3.4. *Use of specific types of job resources in different types of demanding situations at work (N = 115)*

3.4 Discussion

The aim of this study was to gain more insight into the black box of job stress by investigating service workers' beliefs about the availability, relevance, and use of specific types of job resources (i.e. cognitive, emotional, and physical) in similar types of demanding situations at work. To gain a better understanding of these self-regulation processes involved in the activation of job resources, a quasi-experimental survey study with vignettes was developed. Data were analyzed by means of repeated measures MANOVAs. Post hoc analyses revealed that Hypothesis 1 could not be fully supported. Specifically, only if workers were faced with an emotionally demanding situation at work, they believed that matching (i.e. emotional) job resources were more relevant assets to deal with their demanding job than non-matching (i.e. cognitive and physical) job resources. In a similar vein, only if workers were faced with emotional job demands, they were more inclined to use matching job resources than non-matching job resources. Contrary to Hypothesis 2, workers did not perceive emotional job resources as the second most relevant assets to deal with a cognitively demanding job. Instead, cognitive and emotional job resources were believed to be equally relevant for this purpose. Similarly, in case of cognitive job demands, workers indicated that cognitive and emotional job resources would be used equally often. Finally, in line with Hypothesis 3, workers who were faced with an emotionally demanding situation at work opted in the second place for cognitive job resources, both in terms of relevance and use. In addition to the findings for Hypotheses 1 to 3, post hoc analyses revealed that workers perceived physical job

resources as the least relevant assets to deal with cognitive and emotional job demands, and that they were least likely to activate this type of non-matching job resources. In a physically demanding situation at work, physical job resources were perceived as more relevant than cognitive job resources, whereas physical and emotional job resources as well as cognitive and emotional job resources were thought to be equally relevant. Nonetheless, physical job resources were equally likely to be used as cognitive and emotional job resources.

With regard to the perceived availability of job resources in a cognitively demanding situation at work, service workers perceived cognitive and emotional job resources as equally available, while both types of job resources were believed to be more available than physical job resources. In an emotionally demanding situation at work, emotional job resources were believed to be more available than cognitive job resources. In turn, cognitive job resources were perceived as more available than physical job resources. Finally, in a physically demanding situation at work, workers indicated that physical and cognitive job resources were equally available, but both less available than emotional job resources.

Three salient points emerge from the findings. First, different patterns were observed regarding the availability, relevance, and use of matching and non-matching job resources in a physically demanding job. Specifically, in this type of demanding situation at work it was observed that, relative to non-matching job resources, physical job resources were believed to be hardly available, fairly relevant, and equally likely to be used. Further, relative to cognitive and physical job resources, emotional job resources were perceived as highly available, equally relevant, and equally likely to be used. Finally, compared to emotional and physical job resources, cognitive job resources appeared to be hardly available, least relevant, and equally likely to be used. No such differences were observed between the availability, relevance, and use of matching and non-matching job resources in a cognitively and emotionally demanding situation at work. That is, both with regard to the availability as well as the relevance and use of job resources in these types of demanding situations, the results suggested that cognitive, emotional, and physical job resources bear a constant relation to each other. So, to encompass the richness of the job stress process, it seems particularly important to disentangle the perceived availability, relevance, and use of the specific types of job resources in a physically demanding situation at work (cf. Le Blanc, de Jonge & Schaufeli, 2008). In a cognitively or emotionally demanding situation at work, specific types of job resources that were believed to be most available, were also perceived as the most

relevant assets to deal with these types of job demands, and most likely to be used for this purpose.

Second, Dollard, Dormann, Boyd, Winefield, and Winefield (2003) have noted that the stress literature on service work has so far added little to our knowledge of the specific job resources that are of importance to service jobs. From the results of the current study it can be inferred that there generally seems to be a dominant role for emotional job resources in the job stress process, whereas the role of physical job resources and, to a lesser extent, cognitive job resources appears much weaker and mainly restricted to corresponding types of demanding jobs. One possible explanation for the importance of emotional job resources in the job stress process is that emotional job demands are an integral part of service jobs (Grandey, 2003; Zapf, Vogt, Seifert, Mertini & Isic, 1999). In general, each type of job demands is accompanied by the necessity to deal with job-inherent and organizationally desired emotions. Nurses, for instance, may have to lift patients (physical job demands) on a daily basis and at the same time regulate their own sadness because they know the severely-ill patient is suffering and going to die very soon (emotional job demands). In other words, emotional job resources may play a central role in the job stress process because they are needed to deal with the emotional demands that often accompany other types of demanding work tasks.

Another explanation for the importance of emotional job resources in the job stress process is that service workers might perceive emotional job resources as a panacea against various types of job demands (cf. Cohen & Wills, 1985; Dormann & Zapf, 1999). Workers may be particularly likely to opt for emotional job resources in various types of demanding situations at work if this is the prevailing normative standard (i.e. organizational norm), and they consider their choice for emotional support (as compared to other types of job resources) to be most socially desirable in the demanding situation at work concerned (cf. Krahé, 1992). In addition, it has been argued that workers may have specific values, beliefs, and understandings that make them highly sensitive to detect and utilize particular 'affordances' in the work environment (Baron & Boudreau, 1987; Gibson, 1979). Affordances can be defined as properties of the work environment that can exert an influence on the worker only if he or she possesses the complementary characteristic to make use of or 'tune into' a certain affordance. For instance, if 'helping and caring' and 'giving and receiving' are valued activities among service workers, they could become especially alert to information in the work environment suggesting emotional support. Due to their focus on affordances for emotional support, these workers may be particularly likely to select emotional job resources

and preclude the detection of other, potentially more functional job resources to combat job demands.

Third, the results suggested that workers who are faced with a particular type of demanding job do not merely have a strong preference for corresponding types of job resources but also opt for non-corresponding types of job resources, both in terms of relevance and use. We already suggested that workers may opt for non-matching job resources if they are not able or willing to use matching job resources. If this occasion arises, non-matching job resources are used as an alternative for matching job resources. Another explanation why workers opt for non-corresponding types of job resources could be that they believe that the mere use of matching job resources is not sufficiently powerful to deal with the specific type of job demands concerned. In this situation, non-matching job resources are used in addition to matching job resources (cf. Hobfoll, 2001).

From a practical point of view, the current findings suggest that there is no use for organizations to enhance the availability of particular job resources in the work environment as long as workers do not perceive these job resources as relevant assets to deal with their demanding situation at work, and they are unlikely to use them for this purpose. For instance, in service jobs there seems to be a dominant role for emotional job resources in the job stress process. Consequently, if service workers are offered cognitive or physical job resources, these resources may be perceived as irrelevant assets to deal with job demands, and will probably not be used for this purpose. Although emotional job resources are not dysfunctional by definition in a cognitively or physically demanding situation at work, matching job resources seem more functional assets to deal with these types of job demands (Chapter 2). Therefore, it is not only a matter of offering particular job resources, but also a matter of directing and supporting workers in such a way, that they will activate these job resources at the desired moment (i.e. in corresponding types of demanding situations at work).

Study limitations and recommendations for future research

The results and implications of this study should be interpreted in terms of its limitations. First, the vignettes used might have caused a priming effect, so that workers were particularly likely to focus their attention on corresponding types of job resources. However, in the questionnaire job resources were presented in such a way that it was hard to detect matching job resources ‘at first sight’. Moreover, if there had been a strong priming effect, we would have found almost perfect matches in all types of demanding situations, but we have not.

Second, as workers were asked to report on the availability, relevance, and use of job resources in three *imaginary* demanding situations at work (i.e. vignettes), it is not impossible that, in reality, they might have responded differently than they thought (and indicated) they would do. However, although assessments obtained from hypothetical demanding situations at work may be less externally valid than assessments taken in the field, portraying a demanding job familiar to respondents has the potential to induce similar effects as those obtained in real life work settings (cf. Blodgett, Hill & Tax, 1997; Levesque & McDougall, 2000).

Third, for the analyses that were conducted using the one-item scale, results may have been specific to this particular cognitive job resource (i.e. the opportunity to vary complex tasks with simple tasks) instead of cognitive job resources in general. However, analyses including the initial resource scale (i.e. 'availability of cognitive job resources in a cognitively demanding situation at work') showed nearly identical results, implying that the one-item scale was a valid substitute for the multi-item scale.

Finally, this study included a relatively small and homogeneous sample (i.e. about 75% of the 217 service workers worked in health care) which poses questions about the study's generalizability to service jobs in general as well as other occupations. Especially the observed dominant role of emotional job resources may be specific to service workers, and health care workers in particular. Further research in larger, multi-occupation samples is therefore highly recommended.

In addition, it is recommended that in future studies, researchers do not only examine workers' beliefs about the availability, relevance, and use of matching and non-matching job resources in different types of demanding situations at work (like in the current study), but that they also study the importance of such measures in the prediction of job outcomes. Moreover, due to their possible effect on the activation of job resources, it might be interesting to include worker personal characteristics in the prediction of job outcomes (see Chapter 1). In all, this type of studies may further open the black box of job stress and improve the explanatory power of job stress models.

Chapter 4

Resource Substitution and Resource Supplementation: The Inclination to Use Matching and Non-Matching Job Resources in Different Demanding Situations at Work

This chapter is largely based on:

Tooren, M. van den, Jonge, J. de, & Dormann, C. (2010). Resource substitution and resource supplementation: The inclination to use matching and non-matching job resources in different demanding situations at work. *Manuscript submitted for publication*.

4.1 Introduction

In Chapter 3, results suggested that workers who are faced with high job demands generally have a strong preference for job resources that match the type of job demands concerned, both in terms of relevance and use. Job demands are work-related tasks that require effort (e.g. dealing with aggressive clients or moving heavy objects). Job resources are work-related assets that can be employed to deal with job demands (e.g. emotional support from colleagues, or a trolley). Generally speaking, three specific types of job demands and job resources can be distinguished: cognitive, emotional, and physical demands and resources (Hockey, 2000; de Jonge & Dormann, 2003). There is a match between job demands and job resources if job resources belong to the same domain of functioning as the type of job demands workers must deal with. More specifically, job resources match job demands if demands and resources are both either cognitive in nature, emotional in nature, or physical in nature (Hockey, 2000; de Jonge & Dormann, 2003).

Though workers seem generally inclined to show functional self-regulatory behavior (i.e. to activate matching job resources), the activation of non-matching job resources (i.e. job resources that do not belong to the same domain of functioning as job demands) also seems to be an important aspect of workers' self-regulatory behavior in highly demanding situations at work (see Chapter 3). However, as non-matching job resources are less functional resources than matching job resources to deal with specific types of demanding situations at work (see Chapter 2), the activation of non-matching job resources could have serious implications for both theory (e.g. weak support for the stress-buffering effect of job resources) and practice (e.g. unsuccessful job redesign). These effects are particularly likely to manifest themselves when workers decide to use non-matching job resources as a *substitute* for matching job resources, because then workers will not benefit from the functionality of matching job resources as stress buffers (cf. Hobfoll, 2001; Hobfoll & Lerman, 1989). In contrast, if workers decide to use non-matching job resources as a *supplement* to matching job resources, they may benefit from the stress-buffering effect of both matching *and* non-matching job resources (cf. Hobfoll, 2001; Westman, Hobfoll, Chen, Davidson, & Laski, 2005).

Although the activation of non-matching job resources may have a different impact on both theory and practice depending on whether it concerns resource substitution or resource supplementation, it is still unclear to what extent people strive for resource substitution and resource supplementation in each of the different types of demanding situations at work (i.e. cognitively, emotionally, and physically demanding jobs). Therefore, the aim of the current study is to examine people's inclination to active non-matching job resources as a substitute

for matching job resources and as a supplement to matching job resources in a cognitively, emotionally, and physically demanding situation at work.

Functional homeostatic regulation theory

One explanation for why workers are generally inclined to show functional self-regulatory behavior is that they strive for homeostasis (cf. Carver & Scheier, 1982, 1998; Edwards, 1998). Consider, for instance, a worker who is confronted with a physically strenuous task (e.g. moving heavy objects). As this task requires a lot of physical efforts, the worker may gradually become physically exhausted. At the moment the worker experiences an (imminent) discrepancy between his or her current physical condition and normal physical condition (i.e. reference value), s/he will come into action to reduce this discrepancy (Carver & Scheier, 2000). That is, the worker will mobilize job resources to deal with the demanding situation at work concerned. Through lifelong learning processes that bear most resemblance to operant conditioning (Skinner, 1969), workers have learned that homeostasis can best be strived for through the use of matching job resources. As a result, people are generally inclined to use cognitive job resources to deal with cognitive job demands, emotional job resources to deal with emotional job demands, and physical job resources to deal with physical job demands.

Although people seem to have a strong preference for matching job resources, results in Chapter 3 revealed that people also would use less functional non-matching job resources to deal with specific types of demanding situations at work. Non-matching job resources can be used either as a substitute for matching job resources (e.g. if people are not aware of the availability of matching job resources) (cf. Hobfoll, 2001; Hobfoll & Lerman, 1989), or as a supplement to matching job resources (e.g. if people believe that matching job resources are not sufficiently powerful to deal with the type of job demands concerned) (cf. Hobfoll, 2001; Westman et al., 2005). However, non-matching job resources may not be equally often used as a substitute for matching job resources as as a supplement to matching job resources. As stated above, people who are faced with stressful situations at work strive for homeostasis (cf. Carver & Scheier, 1982, 1998; Edwards, 1998). Because homeostasis in stressful situations at work can best be accomplished by activating matching job resources (de Jonge & Dormann, 2003; de Jonge et al., 2008), people may be more inclined to use non-matching job resources as a supplement to matching job resources than as a substitute for matching job resources.

In addition, given the close relation between cognition and emotion (Nussbaum, 2001) – emotion affects cognition and cognition underlies emotion (Folkman, Lazarus, Gruen, & DeLongis, 1986; Frederickson, 2001; Gray, 2004; Lazarus, 1993; 2006) –, it is reasonable to

assume that, once people have decided to activate non-matching job resources in a cognitively or emotionally demanding job, they are most inclined to use emotional job resources to deal with cognitive job demands, and cognitive job resources to deal with emotional job demands. Though both types of non-matching job resources are less functional resources than matching job resources, they may still be a good substitute for / supplement to matching job resources in the demanding situation at work concerned. For instance, in a cognitively demanding job, workers' cognitive efforts (e.g. finding solutions for complex problems) might elicit emotions (cf. Lazarus, 1991) that disturb cognitive processing (cf. Zajonc, 1980). In such a situation, where the regulation of cognitive job demands is impeded, emotional job resources might counteract the emotions that disturb cognitive processing, thereby better enabling workers to fulfill their cognitively demanding job. Similarly, in an emotionally demanding situation at work, job-related emotions (e.g. anger or fear) might disturb cognitive processing, which, in turn, strengthens emotions or elicits new emotions that conflict organizational display rules (Zapf, 2002). In that situation, cognitive job resources might preserve workers' capacity for cognitive processing and, as a result, prevent an increase of unwanted emotions. In contrast to the close relation between cognition and emotion, we have no indication of a *common* relation between physical conditions and cognition, or between physical conditions and emotion. Therefore, it seems reasonable to assume that, once people have decided to activate non-matching job resources in a physically demanding job, they will have no preference for either cognitive or emotional job resources, but will be inclined to use them equally often. Following this line of reasoning, it can be hypothesized that:

Hypothesis 1: To deal with cognitive job demands, people are most inclined to use single cognitive job resources, less inclined to use a combination of cognitive and emotional job resources, and even lesser inclined to use single emotional job resources. People are least inclined to use single physical job resources, other combinations of job resources, and no job resources at all.

Hypothesis 2: To deal with emotional job demands, people are most inclined to use single emotional job resources, less inclined to use a combination of emotional and cognitive job resources, and even lesser inclined to use single cognitive job resources. People are least inclined to use single physical job resources, other combinations of job resources, and no job resources at all.

Hypothesis 3: To deal with physical job demands, people are most inclined to use single physical job resources, less inclined to use combinations of physical and cognitive job resources and physical and emotional job resources, and even lesser inclined to use single cognitive job resources and emotional job resources. People are least inclined to use other combinations of job resources, and no job resources at all.

4.2 Method

Design

Data were collected by means of a vignette study. Compared to traditional survey research, an advantage of a vignette study is that vignettes allow standardization of demanding situations at work, leading to more uniform data (Hughes & Huby, 2002). As will be discussed below (see Procedure), we used a within-subjects experimental design in which all participants were exposed to the vignettes in random order.

Sample

The study sample consisted of 92 undergraduates from a Dutch university of technology (64 males and 28 females). The mean age was 20.3 years (SD = 1.8). Participants had experience with jobs on the side (M = 4 years, SD = 2.7) and holiday jobs (M = 4 years; SD = 2.3).

Procedure

In a laboratory environment, participants were presented 12 different hypothetical, demanding situations at work (i.e. vignettes) that had been created by the researchers. The different scenarios were presented randomly to the participants on a computer screen. Each scenario represented a highly demanding situation at work in a different profession. The vignettes were designed to represent a cognitively, an emotionally, or a physically demanding situation at work. When designing the vignettes, the researchers emphasized the type of job demands concerned and avoided mentioning possible accompanying demands (or suggesting that they could be active as well). The professions in the four scenarios representing cognitive job demands were accountant, air traffic controller, journalist, and criminal judge. The professions in the four scenarios representing emotional job demands were police officer, teacher, ambulance attendant, and family guardian, and the professions in the four scenarios representing physical job demands were garbage collector, shoe salesman, cashier, and construction worker. Appendix B presents three example vignettes.

Participants were asked to imagine themselves being the central figure (i.e. worker) in the vignettes who is experiencing the demanding situation concerned. After participants had read a vignette (and imagined themselves in the demanding situation), they were asked what specific type of job resources or combination of job resources they would use in that particular demanding situation at work. By mouse clicking the respective button on the screen, participants could choose one of the following options: (1) 'cognitive job resources', (2) 'emotional job resources', (3) 'physical job resources', (4) 'a combination of cognitive and emotional job resources', (5) 'a combination of cognitive and physical job resources', (6) 'a combination of emotional and physical job resources', (7) 'a combination of cognitive, emotional, and physical job resources', or (8) 'no job resources'. We included the option to choose no job resources at all, as we wanted to make sure that people would choose particular job resources from conviction rather than simply choosing resources randomly because they had to make a choice.

Before the vignettes were presented, participants were explained the concept of job resources and were given examples of cognitive, emotional, and physical job resources (e.g. the opportunity to take a mental break, a listening ear from colleagues, and ergonomic aids). We did not clarify the nature of the vignettes (i.e. whether a particular vignette represented a cognitive, emotional, or physical job demand). However, after the study, participants were asked to judge each of the vignettes as a cognitively, emotionally, or physically demanding job. On average, more than 90% of the participants classified the vignettes as intended by the researchers (e.g. if a vignette was designed to represent a cognitively demanding situation at work, 90% of the participants classified the vignette as such).

Data analysis

Because the teacher scenario seemed ambiguous (about 1/3 of the participants classified this scenario as a cognitively demanding situation at work), it was decided to leave this vignette out of the analyses. For each of the 11 remaining vignettes, eight resource variables were created that represented the different resources participants could choose from (i.e. single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources). Subsequently, these resource variables were dummy-coded. For instance, if a participant indicated that s/he would use single cognitive job resources in a particular vignette, the accompanying eight resource variables were, in line with the order described above, dummy-coded as 1 0 0 0 0 0 0 0, respectively. Similarly, if a participant would use a combination of cognitive and emotional job resources, the eight resource

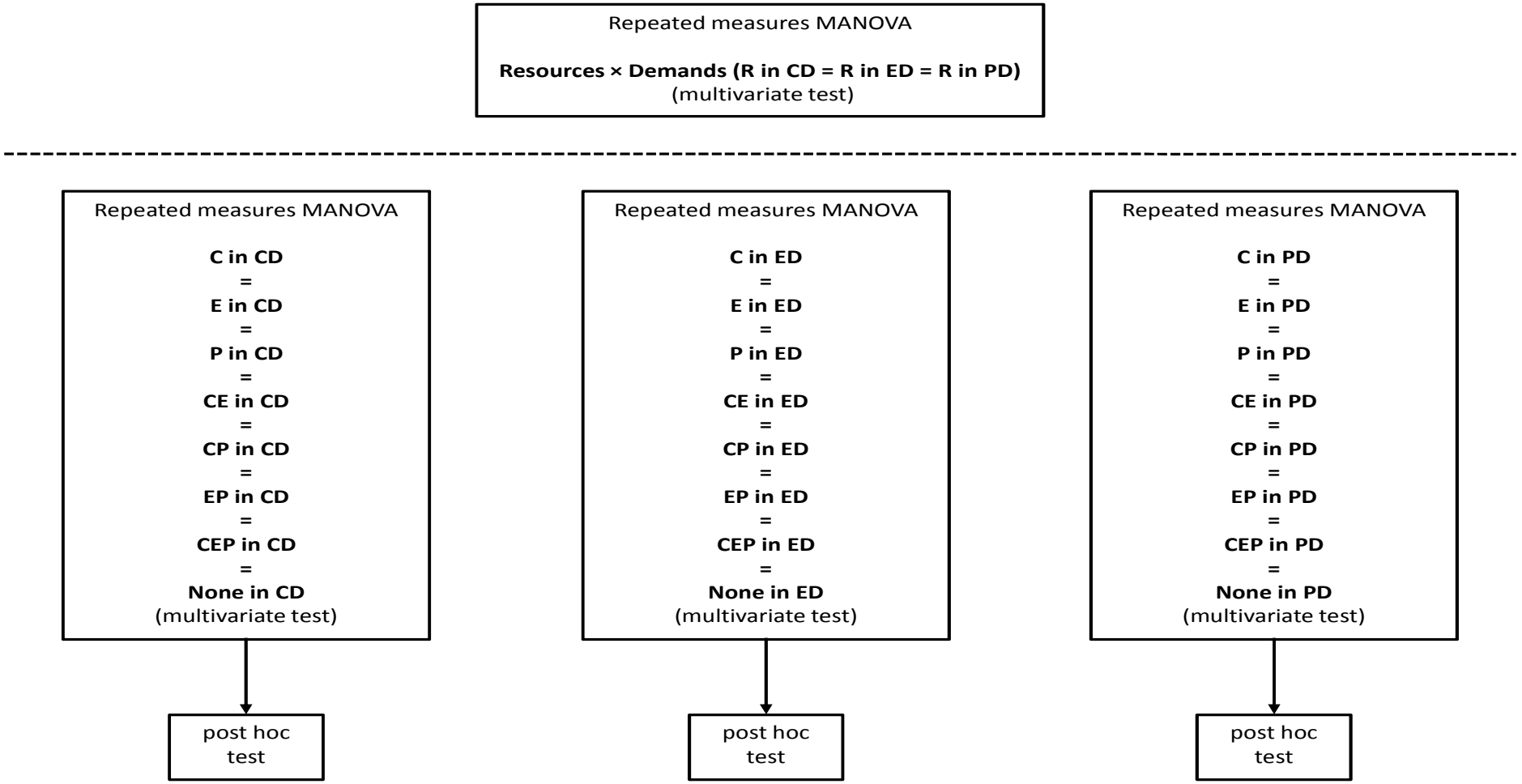
variables were dummy-coded as 0 0 0 1 0 0 0 0, respectively. A mean score was calculated for each resource variable over the four vignettes representing cognitive job demands (i.e. accountant, air traffic controller, journalist, and criminal judge), the three vignettes representing emotional job demands (i.e. police officer, ambulance attendant, and family guardian), and the four vignettes representing physical job demands (i.e. garbage collector, shoe salesman. cashier, and construction worker). Table 4.1 shows the means of the eight resource variables in each specific type of demanding situation at work.

To test Hypotheses 1 to 3, we followed a conservative 'top-down approach' (Figure 4.1). Specifically, because paired samples t-tests would probably have enhanced capitalization on chance, a repeated measures MANOVA was conducted for each type of job demands (i.e. cognitive, emotional, and physical job demands). However, to justify these three separate repeated measures MANOVAs, it was first investigated whether the inclination to use single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources differed *between* the specific types of job demands (see Figure 1, above the dotted line). For this purpose, a repeated measures MANOVA was conducted in which job resources and job demands were both specified as within-subject factors. Job resources consisted of eight levels (i.e. cognitive, emotional, physical, cognitive-emotional, cognitive-physical, emotional-physical, cognitive-emotional-physical, and no job resources) and job demands consisted of three levels (cognitive, emotional, and physical). A significant interaction effect between job resources and job demands in the multivariate test would imply that the inclination to use single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources differed *between* the specific types of job demands (i.e. cognitive, emotional, and physical job demands).

Next, a repeated measures MANOVA was conducted for each type of job demands (see Figure 4.1, below the dotted line) in which job resources were specified as a within-subject factor with eight levels (i.e. cognitive, emotional, physical, cognitive-emotional, cognitive-physical, emotional-physical, cognitive-emotional-physical, and no job resources). For each repeated measures MANOVA, a significant main effect of job resources would imply that the inclination to use single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources differed *within* the specific type of demanding job concerned (i.e. cognitive, emotional, or physical job demands). Finally, for each significant main effect of job resources, a post hoc test was conducted to examine what resources variables differed from each other in the specific

Table 4.1. *Means and standard deviations of the resource variables (N = 92)*

	Cognitive job demands		Emotional job demands		Physical job demands	
	M	*SD*	*M*	*SD*	*M*	*SD*
Cognitive job resources	.52	.30	.07	.15	.04	.13
Emotional job resources	.03	.08	.47	.31	.03	.11
Physical job resources	.07	.16	.00	.00	.49	.29
Cognitive and Emotional job resources	.16	.18	.36	.28	.03	.08
Cognitive and Physical job resources	.08	.16	.00	.04	.23	.25
Emotional and Physical job resources	.02	.06	.02	.09	.09	.18
Cognitive, Emotional, and Physical job resources	.02	.08	.02	.08	.03	.08
None (no job resources)	.12	.19	.06	.15	.08	.16



Note. **R = resources (cognitive, emotional, and physical) CD = cognitive demands ED = emotional demands PD = physical demands C = cognitive resources E = emotional resources P = physical resources CE = cognitive-emotional resources CP = cognitive-physical resources EP = emotional-physical resources CEP = cognitive-emotional-physical resources None = no resources**

Figure 4.1. *Different steps taken in the data analysis*

demanding situation at work concerned. The post hoc tests were corrected with a Bonferroni adjustment.

4.3 Results

Repeated measures MANOVAs

The multivariate test of the repeated measures MANOVA showed a significant interaction effect between job resources and job demands. That is, it was shown that the inclination to use single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources differed *between* the specific types of job demands ($F(14, 78) = 109.06$, $p < .01$, partial $\eta^2 = .95$). In the subsequent repeated measures MANOVAs (one for each type of job demands), we found a main effect for the inclination to use job resources in a cognitively demanding situation at work ($F(7, 85) = 96.72$, $p < .01$, partial $\eta^2 = .89$), an emotionally demanding situation at work ($F(6, 86) = 204.63$, $p < .01$, partial $\eta^2 = .94$), and a physically demanding situation at work ($F(7, 85) = 70.65$, $p < .01$, partial $\eta^2 = .85$). In other words, the inclination to use single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources differed *within* each specific type of demanding situation at work. Results of the post hoc tests are discussed below.

Post hoc tests: cognitive job demands

As shown in Table 4.2 and Figure 4.2, people who were confronted with high cognitive job demands had a stronger inclination to use single cognitive job resources than single emotional and physical job resources, combinations of specific job resources, and no job resources at all. In addition, people were more inclined to use a combination of cognitive and emotional job resources than single emotional job resources, a combination of emotional and physical job resources, and a combination of cognitive, emotional, and physical job resources. However, a combination of cognitive and emotional job resources would be used equally often as single physical job resources, a combination of cognitive and physical job resources, and no job resources at all (i.e. their use did not differ significantly). Finally, results revealed that people were more inclined to use no job resources than single emotional job resources, and that single emotional job resources would be used equally often as single physical job resources and combinations of cognitive and physical job resources, emotional and physical job resources, and cognitive, emotional, and physical job resources.

Table 4.2. *T-statistics of the post hoc tests for cognitive job demands (N = 92)*

	CR_a	ER_a	PR_a	CR_ER_a	CR_PR_a	ER_PR_a	$CR\_ER\_PR_a$	$None_a$
CR_b	-	-	-	-	-	-	-	-
ER_b	$14.56^{**}{}_a$	-	-	-	-	-	-	-
PR_b	$10.67^{**}{}_a$	n.s.	-	-	-	-	-	-
CR_ER_b	$9.10^{**}{}_a$	$6.19^{**}{}_b$	n.s.	-	-	-	-	-
CR_PR_b	$11.00^{**}{}_a$	n.s.	n.s.	n.s.	-	-	-	-
ER_PR_b	$14.79^{**}{}_a$	n.s.	$1.54^{*}{}_a$	$7.32^{**}{}_a$	$3.50^{*}{}_a$	-	-	-
$CR\_ER\_PR_b$	$14.79^{**}{}_a$	n.s.	n.s.	$7.32^{**}{}_a$	$3.32^{*}{}_a$	n.s.	-	-
$None_b$	$9.50^{**}{}_a$	$4.75^{**}{}_b$	n.s.	n.s.	n.s.	$4.91^{**}{}_b$	$4.68^{**}{}_b$	-

Note. CR = cognitive resources ER = emotional resources PR = physical resources CR_ER = combination of cognitive and emotional resources CR_PR = combination of cognitive and physical resources ER_PR = combination of emotional and physical resources CR_ER_PR = combination of cognitive, emotional, and physical resources None = no resources were used.

Subscripts $_a$ and $_b$ indicate which resource variable is significantly more often used ($_a$: column > row $_b$: row > column)

* $p < .05$ ** $p < .01$ n.s. = no significant difference between job resources in row and column

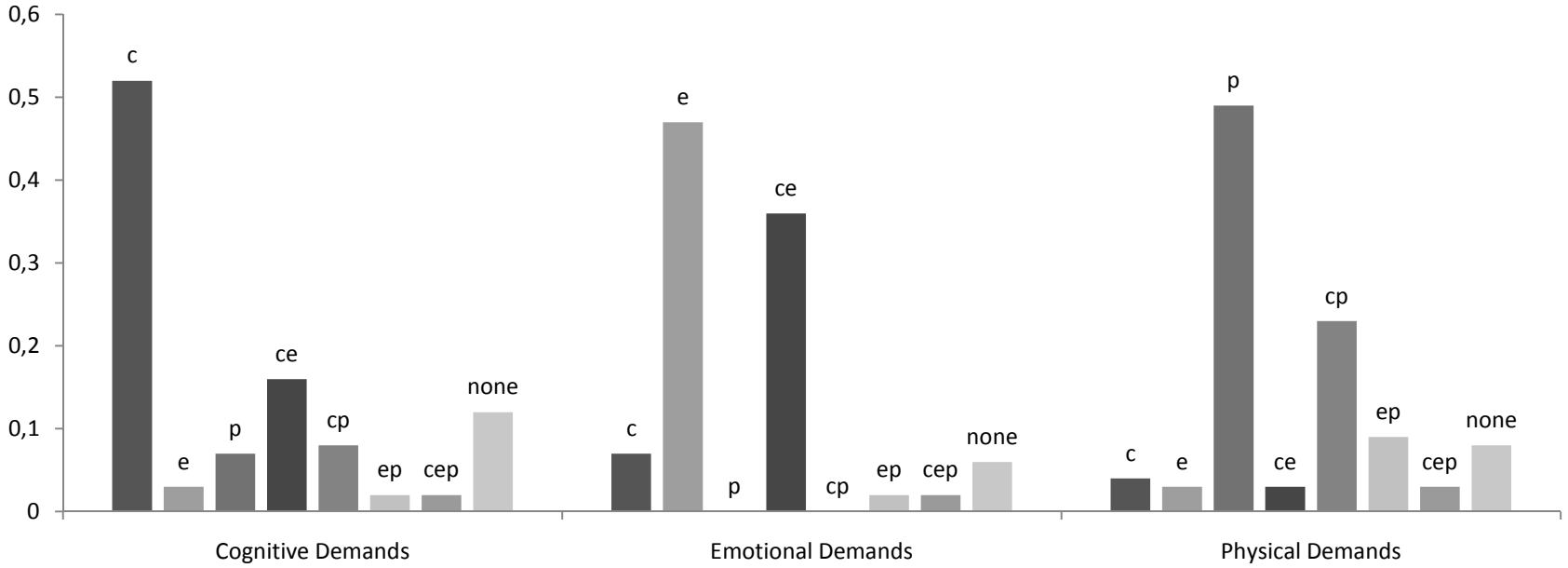


Figure 4.2. *Specific types of job resources (in the order cognitive, emotional, physical, cognitive-emotional, cognitive-physical, emotional-physical, cognitive-emotional-physical, and no job resources) respondents would use in different types of demanding situations at work (N = 92)*

Post hoc tests: emotional job demands

Table 4.3 and Figure 4.2 show that if people were faced with an emotionally demanding job, they were most inclined to use emotional job resources, either as a single job resource, or in combination with cognitive job resources. Further, both single emotional job resources and a combination of cognitive and emotional job resources would be used more often than single cognitive and physical job resources, other combinations of specific job resources, and no job resources at all. Finally, results revealed that single cognitive job resources would be used more often than single physical job resources and a combination of cognitive and physical job resources, but equally often as a combination of emotional and physical job resources, a combination of cognitive, emotional, and physical job resources, and no job resources at all.

Post hoc tests: physical job demands

Finally, in Table 4.4 and Figure 4.2 it is shown that people who were confronted with high physical job demands had a stronger inclination to use single physical job resources than single cognitive and emotional job resources, combinations of specific job resources, and no job resources at all. In addition, results revealed that a combination of cognitive and physical job resources would be used more often than single cognitive and emotional job resources, other combinations of specific job resources, and no job resources at all. In contrast, a combination of emotional and physical job resources would be used equally often as single cognitive and emotional job resources, a combination of cognitive and emotional job resources, a combination of cognitive, emotional, and physical job resources, and no job resources at all. Finally, it was shown that people were inclined to use single cognitive job resources equally often as single emotional job resources, and that both types of job resources would be used equally often as a combination of cognitive and emotional job resources, a combination of cognitive, emotional, and physical job resources, and no job resources at all.

4.4 Discussion

The aim of the current study was to examine the extent to which people are inclined to use non-matching job resources as a substitute for matching job resources, and as a supplement to matching job resources in different demanding situations at work. To uncover the choices people make regarding the investment of matching and non-matching job resources, several vignettes were developed to experimentally examine people's inclination to use single cognitive, emotional, and physical job resources, combinations of these specific types of job resources, and no job resources at all in different hypothetical demanding situations at work

Table 4.3. *T-statistics of the post hoc tests for emotional job demands (N = 92)*

	CR_a	ER_a	PR_a	CR_ER_a	CR_PR_a	ER_PR_a	$CR\_ER\_PR_a$	$None_a$
CR_b	-	-	-	-	-	-	-	-
ER_b	$10.41^{**}{}_b$	-	-	-	-	-	-	-
PR_b	$4.06^{**}{}_a$	$14.72^{**}{}_a$	-	-	-	-	-	-
CR_ER_b	$8.37^{**}{}_b$	n.s.	$12.38^{**}{}_b$	-	-	-	-	-
CR_PR_b	$3.88^{**}{}_a$	$14.59^{**}{}_a$	n.s.	$11.83^{**}{}_a$	-	-	-	-
ER_PR_b	n.s.	$13.32^{**}{}_a$	n.s.	$10.66^{**}{}_a$	n.s.	-	-	-
$CR\_ER\_PR_b$	n.s.	$12.83^{**}{}_a$	n.s.	$11.23^{**}{}_a$	n.s.	n.s.	-	-
$None_b$	n.s.	$10.76^{**}{}_a$	$4.13^{**}{}_b$	$8.49^{**}{}_a$	$3.63^{*}{}_b$	n.s.	n.s.	-

Note. CR = cognitive resources ER = emotional resources PR = physical resources CR_ER = combination of cognitive and emotional resources CR_PR = combination of cognitive and physical resources ER_PR = combination of emotional and physical resources CR_ER_PR = combination of cognitive, emotional, and physical resources None = no resources were used.

Subscripts $_a$ and $_b$ indicate which resource variable is significantly more often used ($_a$: column > row $_b$: row > column)

* $p < .05$ ** $p < .01$ n.s. = no significant difference between job resources in row and column

Table 4.4. *T-statistics of the post hoc tests for physical job demands (N = 92)*

	CR_a	ER_a	PR_a	CR_ER_a	CR_PR_a	ER_PR_a	$CR\_ER\_PR_a$	$None_a$
CR_b	-	-	-	-	-	-	-	-
ER_b	n.s.	-	-	-	-	-	-	-
PR_b	$12.39^{**}{}_b$	$13.68^{**}{}_b$	-	-	-	-	-	-
CR_ER_b	n.s.	n.s.	$14.53^{**}{}_a$	-	-	-	-	-
CR_PR_b	$6.27^{**}{}_b$	$7.14^{**}{}_b$	$5.38^{**}{}_a$	$7.39^{**}{}_b$	-	-	-	-
ER_PR_b	n.s.	n.s.	$10.05^{**}{}_a$	n.s.	$4.11^{**}{}_a$	-	-	-
$CR\_ER\_PR_b$	n.s.	n.s.	$14.09^{**}{}_a$	n.s.	$7.96^{**}{}_a$	n.s.	-	-
$None_b$	n.s.	n.s.	$11.47^{**}{}_a$	n.s.	$4.43^{**}{}_a$	n.s.	n.s.	-

Note. CR = cognitive resources ER = emotional resources PR = physical resources CR_ER = combination of cognitive and emotional resources CR_PR = combination of cognitive and physical resources ER_PR = combination of emotional and physical resources; CR_ER_PR = combination of cognitive, emotional, and physical resources None = no resources were used.

Subscripts $_a$ and $_b$ indicate which resource variable is significantly more often used ($_a$: column > row $_b$: row > column)

** $p < .01$ n.s. = no significant difference between job resources in row and column

(i.e. cognitively, emotionally, and physically demanding jobs). Data were analyzed by repeated measures MANOVAs, which partly supported Hypotheses 1 to 3. Specifically, in line with Hypothesis 1, people who were faced with high cognitive job demands were inclined to use single cognitive job resources more often than a combination of cognitive and emotional job resources, whereas a combination of cognitive and emotional job resources would be used more often than single emotional job resources. However, contrary to our expectations, together these three options were not always preferred over single physical job resources, other resource combinations, and the use of no job resources at all.

As far as Hypothesis 2 is concerned, results contradicted our predictions as it was shown that people who were confronted with high emotional job demands were inclined to use single emotional job resources equally often as a combination of cognitive and emotional job resources. As expected, both single emotional job resources and a combination of cognitive and emotional job resources would be used more often than single cognitive job resources. Contrary to our expectations, however, together these three options were not always preferred over single physical job resources, other resource combinations, and the use of no job resources at all.

Finally, in line with Hypothesis 3, results revealed that if people were confronted with high physical job demands, they would use single physical job resources more often than combinations of cognitive and physical job resources and emotional and physical job resources. However, in contrast to our predictions, a combination of cognitive and physical job resources would be used more often than a combination of emotional and physical job resources. In addition, though people were inclined to use a combination of cognitive and physical job resources more often than single cognitive job resources and emotional job resources, a combination of emotional and physical job resources would be used equally often as single cognitive and emotional job resources. Finally, as predicted, single cognitive and emotional job resources would be used equally often. Nonetheless, contrary to our expectations, together these five options were not always preferred over other resource combinations and the use of no job resources at all.

The current findings suggest that functional homeostatic regulation processes are probabilistic in nature. That is, though the choice for matching job resources clearly prevailed, people were also inclined to use less functional non-matching job resources. Non-matching job resources often seemed to be used as a supplement to matching job resources rather than as a substitute for matching job resources. One remarkable finding was that there particularly seemed to be a

dominant role for non-matching cognitive job resources, whereas non-matching emotional job resources would be used less often than expected. One explanation for this finding may be that people usually operate (i.e. make decisions, take action, etc.) from a set of cognitive schemas or 'frames of reference' (Vonk, 1999). The specific values, beliefs, needs, and understandings that stem from these frames of reference may make people highly sensitive to detect and utilize particular 'affordances' in the work environment (Baron & Boudreau, 1987; Gibson, 1979). Affordances are properties of the work environment that can exert an influence on the person only if s/he possesses the complementary characteristic to make use of or 'tune into' a certain affordance. For instance, as 'helping and caring' and 'giving and receiving' are valued activities among health care workers, these workers could become alert to information in the work environment suggesting emotional support. Due to their focus on affordances for emotional support, health care workers may be strongly inclined to use emotional job resources to deal with different types of high job demands. In fact, in a field study among service workers who were mainly employed in health care, there appeared to be a dominant role for emotional job resources (see Chapter 3). Similarly, in the current study, respondents' academic education at a university of technology may have led them to believe that the mobilization of cognitive job resources such as knowledge and expertise is an important solution to any problem they are faced with. It seems, hence, reasonable to assume that some respondents have operated from a frame of reference that led them to approach each of the vignettes in a rational manner (i.e. showing an inclination to use cognitive job resources). In addition, some respondents may once have learned that it is socially undesirable to show their emotions. As a result, these respondents may have been less inclined to approach the vignettes in an emotional manner (i.e. showing an inclination to use emotional job resources).

From a practical point of view, we may conclude that people are generally inclined to use matching job resources, and that it is, hence, worth the effort to make matching job resources available to workers. However, people also seem to attach value to less functional non-matching job resources, which they are often inclined to use in combination with matching job resources. The type of non-matching job resources that are most likely to be used might be strongly related to people's frame of reference, which will, in turn, often be related to the occupational profession in which they work. For instance, whereas health care workers may be especially alert to non-matching emotional job resources, information technology workers may be more inclined to use non-matching cognitive job resources. Of

course, sensitivity to these particular types of non-matching job resources may differ from person to person, but in general this might be the pattern observed.

Study limitations and recommendations for future research

The results and implications of this study should be interpreted in terms of its limitations. First, the vignettes that were presented to participants might have caused a priming effect, so that respondents were particularly likely to focus their attention on corresponding types of job resources. However, if there had been a strong priming effect, we would have found almost perfect matches in all types of demanding situations, but we have not.

Second, as participants were asked to report on the use of job resources in *hypothetical* demanding situations at work (i.e. vignettes), it is not impossible that, in reality, they might have responded differently than they thought (and indicated) they would do. However, though assessments obtained from hypothetical situations at work may be less externally valid than assessments taken in the field, portraying a demanding job familiar to respondents has the potential to induce similar effects as those obtained in real life work settings (cf. Blodgett, Hill & Tax, 1997; Levesque & McDougall, 2000). Of course, most respondents were not familiar to the kind of demanding situations portrayed to them in terms of 'hands-on' experience, but the professions presented to them are generally so well-known and understandable that they should have been able to imagine themselves being the central figure (i.e. worker) in the vignettes.

Finally, this study is based on a relatively small sample of undergraduates, which poses questions about the study's generalizability to working populations. However, because comparable patterns have been reported for a larger sample of service workers (Chapter 3), and, contrary to the study in Chapter 3, we asked participants to imagine themselves being the central figure in hypothetical, demanding situations at work that did *not* relate to their personal situation at work, our student sample seems warranted. Moreover, it seems reasonable to assume that, like undergraduates, workers would neither have had any experience with the imaginary demanding situations at work. And if they had, it would probably have been one particular scenario. Nonetheless, further research in larger, multi-occupation samples is highly recommended.

In addition, it is recommended that in future studies homeostatic regulation theory will be further examined, both in terms of its validity (like the current study) and its boundary conditions. With respect to the latter, it may be interesting to empirically investigate the role of workers' frame of reference, for instance, by means of a number of experiments in which

participants' frame of reference is manipulated. Eventually, this type of studies may further enhance our understanding of the activation of matching and non-matching job resources in different demanding situations at work. Through these new insights, we might become better able to improve the explanatory power of job stress theories and to tailor job redesign interventions in an optimal way.

Chapter 5

Job Resources and Matching Active Coping Styles as Moderators of the Longitudinal Relation between Job Demands and Job Strain

This chapter is largely based on:

Tooren, M. van den, Jonge, J. de, Vlerick, P., Daniels, K., & Van de Ven, B. (2010). Job resources and matching active coping styles as moderators of the longitudinal relation between job demands and job strain. *Manuscript submitted for publication*.

5.1 Introduction

Research in job stress has concentrated on identifying characteristics of the work environment that may relate to worker health and well-being. One approach proposes that health and well-being can be explained by two distinct classes of job characteristics: *job demands* and *job resources* (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Job demands are work-related tasks that require effort, and vary from solving complex problems to dealing with aggressive clients or lifting heavy objects. Job resources, on the other hand, are work-related assets that can be employed to deal with job demands. Examples of job resources are job autonomy, emotional support from colleagues, and technical equipment.

Several researchers have pointed out the stress-buffering effect of job resources on the relation between job demands and job strain (e.g. Bakker & Demerouti, 2007; Karasek & Theorell, 1990; Siegrist, 1996). Specifically, it has been proposed that high job demands will have a deleterious impact on worker health and well-being unless workers have sufficient job resources to deal with their demanding job. Job resources may be particularly likely to operate as a stress-buffer if they are *matched* to job demands. That is, if workers use job resources that belong to the same domain of functioning as the type of job demands they need to deal with (e.g. Cohen & Wills, 1985; Cutrona & Russell, 1990). This idea of match is often referred to as the 'matching hypothesis' (Cohen & McKay, 1984) and is accompanied by a sound body of empirical evidence (see Chapter 2). However, Chapter 2 also revealed that, to this very moment, the matching hypothesis has mainly been tested in cross-sectional studies. Because cross-sectional designs are not well-suited to make causal inferences about the relation between demands, resources, and strain (Taris & Kompier, 2003), it seems of great interest to extend the number of longitudinal studies on the matching hypothesis. Therefore, the first aim of the current study is to examine the matching hypothesis with respect to the longitudinal relation between job demands, job resources, and job strain. In this study, we will use a time lag of one year to control for time-variant effects (e.g. seasonal fluctuations) that might be present when using time lags shorter than one year (cf. de Jonge, Dormann, Janssen, Dollard, Landeweerd, & Nijhuis, 2001; de Lange, Taris, Kompier, Houtman, & Bongers, 2003). Moreover, compared to time lags of more than one year (i.e. two or three years), a one-year time lag has proven to be most appropriate for demonstrating longitudinal stressor-strain relations (de Lange, Taris, Kompier, Houtman, & Bongers, 2004).

In addition to the match between job demands and job resources, stress-buffering effects of job resources may also depend on workers' personal characteristics. Specifically, it has been argued that personal characteristics are likely to moderate the linkage between job

conditions and job strain (Cooper, Dewe, & O'Driscoll, 2001). An individual characteristic that could particularly moderate the stress-buffering effect of job resources, is worker active coping style. Active coping style can be defined as a persistent tendency to actively manage critical events that pose a challenge, threat, harm, loss, or benefit to a person (cf. Aspinwall & Taylor, 1997; Lazarus, 1991). If we translate this definition to work settings, it follows that workers with a high active coping style are more inclined to actively cope with job demands than workers with a low active coping style (cf. Latack, 1986; Pienaar, 2008; de Rijk, Le Blanc, Schaufeli, & de Jonge, 1998). Because active coping behavior in demanding situations at work implies the investment of job resources, it seems reasonable to assume that differences in active coping style will have a different impact on the activation of job resources in stressful situations at work. That is, in case of high job demands, workers with a high active coping style may be more likely to activate job resources than workers with a low active coping style (cf. Daniels & de Jonge, 2010). Because workers who activate job resources are generally more likely to benefit from the stress-buffering effect of job resources than workers who do not use job resources, individual differences in active coping style should be expressed in the number of stress-buffering effects of job resources that are found for the individuals involved. In a cross-sectional study by de Rijk et al. (1998), it was indeed shown that high (versus low) active coping style has a synergistic effect on the stress-buffering effect of job resources. The second aim of the current study was to examine the moderating effect of worker active coping style on the *lagged* stress-buffering effect of job resources.

Several researchers have suggested that the moderating effect of active coping style will be stronger if the nature of coping is specific to job resources (cf. Daniels, Harris, & Briner, 2004; Frese, 1999). In other words, to show stronger moderating effects of active coping style on the stress-buffering effect of job resources, active coping style should belong to the same domain of functioning as job resources. To the best of our knowledge, the moderating effect of specific, corresponding types of active coping styles has not been tested yet. Therefore, the third aim of the current study is to examine the moderating effect of *matching* active coping styles with respect to the longitudinal relation between job demands, job resources, and job strain.

Matching hypothesis

According to the matching hypothesis, specific types of job resources should be matched to specific types of job demands to show stress-buffering effects of job resources (e.g. Cohen &

Wills, 1985; Sargent & Terry, 1998). Generally speaking, three specific types of job demands and job resources can be distinguished: cognitive, emotional, and physical demands and resources (Hockey, 2000; de Jonge & Dormann, 2003). When the matching hypothesis is applied to the longitudinal relation between job demands and job strain, it follows that workers who are faced with high cognitive job demands (e.g. solving complex problems) at a certain moment in time, are least likely to experience job strain (e.g. mental fatigue) one year later if they have sufficient cognitive job resources (e.g. information from handbooks) to deal with their cognitively demanding job. Similarly, workers who are confronted with high emotional job demands (e.g. feeling threatened by aggressive patients) at a certain moment in time, are least likely to experience job strain (e.g. emotional exhaustion) one year later if they have sufficient emotional job resources (e.g. a listening ear from colleagues) to deal with their emotionally demanding job. Finally, if workers are faced with high physical job demands (e.g. moving heavy objects) at a certain moment in time, they are least likely to experience job strain (e.g. back pain) one year later if they have sufficient physical job resources (e.g. a trolley) to deal with their physically demanding job (de Jonge & Dormann, 2003; 2006). This brings us to the following hypothesis:

Hypothesis 1: stress-buffering effects of job resources on the longitudinal relation between job demands and job strain are more likely to occur if there is a match between specific types of job demands and job resources than if there is a non-match between specific types of job demands and job resources.

Matching active coping styles

As explained before, workers with a high active coping style are more likely to activate job resources in demanding situations at work and may, hence, experience less job strain one year later than workers with a low active coping style (cf. de Rijk, et al., 1998; Schaufeli, 2001). However, sometimes, stress-buffering effects of job resources might occur less often than what could have been expected on the basis of resource accessibility and workers' active coping style (i.e. high versus low). More specifically, according to Warr's (1987) concept of fit, workers with certain personal characteristics seek out and respond to jobs that offer more of these characteristics. If we apply this concept of person-job (P-J) fit (see Chapter 1) to the current setting (i.e. workers who activate job resources to actively cope with job demands), it is plausible that workers will only activate available job resources if they have a personal characteristic (i.e. a high active coping style) that corresponds to the type of job resources

concerned. In other words, the nature of coping may need to be specific to job resources to optimize the synergistic effect of high active coping style (cf. Daniels et al., 2004; Frese, 1999).

In line with the distinction made by Greenglass, Schwarzer, Jakubiec, Fiksenbaum, and Taubert (1999), we defined three types of active coping styles: cognitive, emotional, and physical active coping styles. Each specific type of active coping style reflects the extent to which workers are likely to activate specific, corresponding types of job resources to actively cope with job demands (cf. Warr, 1987). For instance, workers with a high cognitive active coping style are more likely to use cognitive job resources than workers with a low cognitive active coping style. In a similar vein, workers with a high emotional active coping style are more likely to use emotional job resources than workers with a low emotional active coping style, whereas workers with a high physical active coping style are more likely to use physical job resources than workers with a low physical active coping style. Though some workers may score high on all three types of active coping styles, others may only score high on one or two specific types of active coping styles and may therefore only use job resources from one or two specific domains (e.g. cognitive or physical job resources) to actively cope with job demands. For this latter group of workers, stress-buffering effects of job resources from the third domain (i.e. emotional job resources) are less likely to occur. This brings us to the following hypotheses:

Hypothesis 2: stress-buffering effects of job resources on the longitudinal relation between job demands and job strain are more likely to occur if workers have a high specific active coping style than if workers have a low specific active coping style.

Hypothesis 3: the synergistic effect of high specific active coping styles are more likely to occur if there is a match between specific types of job resources and specific types of active coping styles than if there is a non-match between specific types of job resources and specific types of active coping styles.

5.2 Method

Design

Data were collected among graduates from eight Belgian teacher training colleges, and were obtained by a questionnaire survey that was conducted at the end of 2004 (Time 1), the end of

2005 (Time 2), and the end of 2006 (Time 3). Questionnaires were sent to the workers' home addresses. Respondents participated on a voluntary basis and signed an informed consent at each measurement. Because the strain measures at Time 3 differed from the strain measures at Time 1 and Time 2, it was decided to test our hypotheses by means of the first and second wave of the study. Active coping style, however, was only measured during the third and final wave of the study (the idea to examine the synergistic effect of matching active coping styles originated after the second wave of data collection), so that the final study sample consisted of teachers who participated in all three waves. Because active coping style was not measured at Time 1, this person variable could not be examined as a continuous moderator and had to be examined as a dichotomous moderator instead (see Data analysis).

Sample

The study sample consisted of 317 teacher training graduates who worked as a teacher between 2004 and 2006. Of all graduates who were invited to participate in the study at Time 1 (N = 7092), 2527 returned the questionnaire (response rate 35.6%). From this sample of respondents, we selected the graduates who were currently working as a teacher (N = 1116). At Time 2, 443 out of 1116 graduates returned the questionnaire *and* were still working as a teacher. The final sample consisted of 317 out of 443 graduates who were still working as a teacher when they filled out the active coping style scales at Time 3.

The mean age in the study sample was 26.4 years (SD = 5.6) and 78.5% was female. On average, participants had 4.1 years (SD = 1.8) teaching experience, and 88.6% worked full-time (i.e. 20 to 30 teaching units (1 unit = 50 minutes direct contact with pupils) per week). Of all participants, 33.8% worked in primary education (28.4% regular education and 5.4% special education), 56.6% worked in secondary education (52.4% regular education and 4.2 % special education), and 9.6% worked in other types of education.

A comparison of drop-outs (i.e. no participation at Time 2 ('group A'), or at Time 3 ('group B')) with continuous participants (i.e. participation at Time 1 and Time 2 ('group C'), or at Time 1, Time 2, and Time 3 ('group D')) showed that the data did not appear to suffer from serious selection problems. Specifically, using multiple logistic regression in which a dichotomous variable distinguishing participants who remained in the study from those who dropped out was included as the dependent variable (cf. Goodman & Blum, 1996), attrition effects were found for cognitive job demands at Time 1 ('group A' vs. 'group C', and 'group A' vs. 'group D'), and for physical job resources at Time 1 and physical complaints at Time 2 ('group B' vs. 'group D'). However, inspection of the respective mean scores revealed no

healthy worker effect (Zapf, Dormann, & Frese, 1996). That is, it was shown that 'group A' (M = 3.88) experienced less cognitive demands at Time 1 than 'group C' (M = 3.98) and 'group D' (M = 3.99). Further, 'group B' indicated that they had more physical job resources at T1 (M = 3.44) and less physical complaints at T2 (M = 1.66) than 'group D' (M = 3.24 and M = 1.73, respectively).

Measures

Independent variables included in this study were cognitive, emotional, and physical job demands (Time 1), corresponding job resources (Time 1), and corresponding active coping styles (Time 3). Dependent variables were chosen from the same domain as demands, resources, and active coping styles, resulting in cognitive, emotional, and physical strain measured at Time 1 and Time 2. Table 5.1 shows the psychometric properties of the measures included as well as their zero-order correlations.

Job demands and job resources. Cognitive, emotional, and physical job demands and job resources were assessed with the DISC Questionnaire (DISQ 1.1, de Jonge, Dormann, van Vegchel, von Nordheim, Dollard, & Cotton, 2004). Items were scored on a 5-point frequency scale, ranging from 1 (*never or very rarely*) to 5 (*very often or always*).

The cognitive, emotional, and physical demands scales were measured with four, six, and five items, respectively. Example items of the respective demands scales are successively 'Worker X will need to display high levels of concentration and precision at work', 'Worker X will have to display emotions (e.g. towards clients, colleagues, or supervisors) that are inconsistent with his/her current feelings', and 'Worker X will have to lift or move heavy persons or objects (more than 10 kg)'.

The cognitive, emotional, and physical resources scales were measured with five items each. Example items of the respective resources scales are successively 'Worker X would have the opportunity to take a break when tasks require a lot of concentration', 'Other people (e.g. clients, colleagues, or supervisors) would be a listening ear for worker X when s/he has faced a threatening situation', and 'Worker X would receive help from others (e.g. clients, colleagues, or supervisors) in lifting or moving heavy persons or objects'.

Active coping styles. Items assessing the three specific types of active coping styles were scored on a 4-point agreement scale, ranging from 1 (*totally disagree*) to 4 (*totally agree*). Cognitive active coping style was measured with eleven items derived from the Reflective Coping Scale (Greenglass et al., 1999). An example item is 'I tackle a problem by thinking about realistic alternatives'. Emotional active coping style was measured with five

Table 5.1. *Number of items, Cronbach's alphas, test-retest reliabilities, and Pearson correlations (N = 317)*

Measure	Items	α_1	α_2	r_t	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Cognitive demands	4	.75	.73	.52**	-														
2. Emotional demands	6	.80	.84	.44**	.26**	-													
3. Physical demands	5	.84	.90	.71**	.03	.29**	-												
4. Cognitive resources	5	.57	.60	.40**	.03	-.16**	-.07	-											
5. Emotional resources	5	.78	.78	.47**	-.06	-.25**	-.05	.51**	-										
6. Physical resources	5	.74	.81	.37**	-.08	-.19**	-.16**	.46**	.33**	-									
7. Cognitive active coping style	11	.83			.21**	.11	-.06	-.04	-.07	.01	-								
8. Emotional active coping style	5	.84			.00	-.12*	.07	.18**	.30**	.11	-.06	-							
9. Physical active coping style	4	.76			-.05	-.13*	-.14*	.21**	.21**	.27**	.04	.44**	-						
10. Cognitive strain T1	3	.84		.56**	-.02	.13*	.04	-.28**	-.35**	-.19**	-.01	-.14*	-.09	-					
11. Emotional exhaustion T1	8	.84		.61**	.33**	.31**	.13*	-.26**	-.35**	-.16**	.12*	-.19**	-.17**	.16**	-				
12. Physical complaints T1	4	.61		.64**	.06	.15**	.26**	-.09	-.15**	-.24**	-.01	-.10	-.07	.06	.23**	-			
13. Cognitive strain T2	3	.80			-.02	.07	-.00	-.16**	-.25**	-.18**	-.08	-.19**	-.18**	.56**	.07	.03	-		
14. Emotional exhaustion T2	8	.87			.25**	.22**	.11	-.19**	-.27**	-.17**	.16**	-.25**	-.19**	.16**	.61**	.23**	.21**	-	
15. Physical complaints T2	4	.64			.06	.10	.17**	-.10	-.16**	-.16**	.05	-.13*	-.06	.06	.26**	.64**	.02	.34**	-

Note. $^*p < .05$ $^{**}p < .01$

items derived from the Emotional Support Seeking Scale (Greenglass et al., 1999). An example item is 'If I am depressed at work, I make an appeal to others (e.g. colleagues, supervisors, or clients) to help me feel better'. Physical active coping style was measured with four items based on the Instrumental Support Seeking Scale (Greenglass et al., 1999). An example item is 'If my job requires many or sustained physical efforts, I ask help from others (e.g. colleagues or supervisor)'.

Strain. Cognitive strain was defined as the lack of active learning, that is, the degree workers are enabled and stimulated to acquire new knowledge and skills. This cognitive construct was measured with three items that were derived from a scale developed by Taris, Kompier, de Lange, Schaufeli, and Schreurs (2003). An example item is 'In my job I can develop myself'. Items were scored on a 4-point frequency scale, ranging from 1 (*(almost) never*) to 4 (*(nearly) always*). To assist in the interpretation of the results, the signs of the respective parameter estimates have been reversed, such that high levels of active learning reflect cognitive strain. Emotional strain was assessed by an index of emotional exhaustion, which can be defined as a feeling of being emotionally worn out. This construct was measured with eight items derived from the Utrecht Burnout Scale that has been particularly designed for teachers (UBOS-L) (Schaufeli & van Dierendonck, 2000). An example item is 'I feel emotionally drained from my work'. Items were scored on a 7-point frequency scale, ranging from 0 (*never*) to 6 (*always*). Physical strain was assessed by an index of physical complaints. Physical complaints refer to neck, shoulder, back, and limbs problems in the last six months and were measured with four items derived from a scale developed by Hildebrandt and Douwes (1991). An example item is 'During the past six months, did you have trouble with your low back?'. The possible responses were 1 (*no*), 2 (*sometimes*), and 3 (*yes*).

Data analysis

We applied structural equation modeling (SEM) using LISREL 8.50 (Jöreskog & Sörbom, 1996) to test for stress-buffering effects of job resources on the longitudinal relation between job demands and job strain. In addition, because active coping style was measured at Time 3, multiple group analyses were used to test whether (1) any differences could be observed between workers with a low specific active coping style and workers with a high specific active coping style, and (2) the nature of coping must be specific to job resources to optimize the synergistic effect of high specific active coping styles. Specifically, three pairs of sub-samples were created by dividing scores on each type of active coping style, using median split. Workers were categorized based on their score as either having a low specific active

coping style (low score) or a high specific active coping style (high score) (cf. van Dick & Wagner, 2001). This resulted in different sub-samples (i.e. two per coping style) of workers having a low cognitive active coping style (N = 164) and workers having a high cognitive active coping style (N = 143), workers having a low emotional active coping style (N = 147) and workers having a high emotional active coping style (N = 169), and workers having a low physical active coping style (N = 172) and workers having a high physical active coping style (N = 140).

Stress-buffering effects of job resources on the longitudinal relation between job demands and job strain were tested by examining multiplicative interaction terms between job demands and job resources (i.e. demands × resources) at Time 1 in the prediction of job strain at Time 2. Because of the large number of interaction terms (nine in total), stress-buffering effects of job resources were tested by means of two separate analyses including either interaction terms between *matching* demands and resources, or interaction terms between *non-matching* demands and resources (see de Jonge & Dormann, 2006). These two separate analyses were conducted in each sub-sample, resulting in twelve SEM analyses in which we also controlled for age and gender, as well as for cognitive strain, emotional exhaustion, and physical complaints at Time 1.

According to Jaccard and Wan (1996), multiple group analyses can be conducted for each pair of sub-samples (i.e. low versus high cognitive active coping style, low versus high emotional active coping style, and low versus high physical active coping style) by first estimating the parameters of the main terms and moderating terms in the different groups with no across-group constraints imposed (i.e. the main terms and interaction terms of both groups are assumed to be *un*equal). If the pooled chi-square of a particular pair of sub-samples is non-significant, the parameters can be re-estimated with across-group constraints imposed on all main terms and moderating terms (i.e. the main terms and interaction terms of both groups are assumed to be equal). A moderating effect of a particular type of active coping style is present if the pooled chi-square of the constrained model is significantly higher than the pooled chi-square of the unconstrained model. Because the residuals among our outcome variables at Time 2 were allowed to correlate, the unconstrained models were fully saturated resulting in three pooled chi-squares of zero (which is non-significant). Next, we re-estimated the parameters with across-group constraints imposed on all main terms and moderating terms, and calculated whether the pooled chi-squares of the constrained models significantly differed from zero (i.e. the pooled chi-square of the unconstrained models).

5.3 Results

Testing Hypothesis 1, results in Table 5.2 showed two significant two-way interactions between matching job demands and job resources in the prediction of job strain one year later. One two-way interaction showed a stress-buffering effect. Specifically, it was shown that a combination of high physical demands and high physical resources resulted in less emotional exhaustion one year later than a combination of high physical demands and low physical resources (t = -3.15, p < .01). The other two-way interaction was not in the predicted direction. That is, a reversed interaction effect was found in which a combination of high cognitive demands and high cognitive resources led to *more* cognitive strain one year later than a combination of high cognitive demands and low cognitive resources (t = 2.25, p < .05).

In addition to the significant two-way interactions between matching demands and resources, one significant two-way interaction was found between non-matching demands and resources. More specifically, as shown in Table 5.3, a combination of high emotional demands and high physical resources resulted in less emotional exhaustion one year later than a combination of high emotional demands and low physical resources (t = -2.25, p < .05).

To summarize, one out of nine (11.1%) tested two-way interactions between matching demands and resources, and one out of eighteen (5.6%) tested two-way interactions between non-matching demands and resources showed a lagged stress-buffering effect of job resources. To determine whether the percentages were significantly different from each other, a z-test was conducted (Moore & McCabe, 1999). Contrary to Hypothesis 1, results of the z-test revealed that stress-buffering effects of job resources on the longitudinal relation between job demands and job strain were equally likely to occur in case of a match between specific types of job demands and job resources as in case of a non-match between specific types of job demands and job resources (z = 0.26; p = .80).

Testing Hypothesis 2, results of the multiple group analyses showed that for each type of active coping style (i.e. cognitive, emotional, and physical active coping style), lagged moderating effects of job resources were equally likely to be found for teachers with a low active coping style as for teachers with a high active coping style. Specifically, testing moderating terms of matching demands and resources, no differences were found between workers with a low or high cognitive active coping style (Δ pooled χ^2 = 15.77, df = 27, p = .96), workers with a low or high emotional active coping style (Δ pooled χ^2 = 0.95, df = 27, p = 1.00), and workers with a low or high physical active coping style (Δ pooled χ^2 = 4.10, df = 27, p = 1.00). Similarly, testing moderating terms of non-matching demands and resources, no

Table 5.2. *Lagged structural equation models of cognitive strain, emotional exhaustion, and physical complaints with moderating terms of matching job demands and job resources for the total sample (N = 317)*

	Cognitive strain T2			Emotional exhaustion T2			Physical complaints T2		
	B	*SE*	*t*	*B*	*SE*	*t*	*B*	*SE*	*t*
Control variables									
Gender	-0.19	0.08	-2.27*	0.04	0.12	0.34	0.11	0.08	1.28
Age	-0.00	0.01	-0.18	0.00	0.01	0.35	0.00	0.01	0.33
T1 outcome variables									
Cognitive strain T1	0.50	0.05	10.07**	0.04	0.07	0.63	-0.03	0.05	-0.54
Emotional exhaustion T1	-0.02	0.04	-0.58	0.49	0.05	9.09**	0.13	0.04	3.33**
Physical complaints T1	-0.05	0.05	-0.99	0.12	0.07	1.71	0.43	0.05	8.40**
Demands and resources									
Cognitive demands	-0.00	0.04	-0.11	0.12	0.05	2.37*	-0.01	0.04	-0.24
Emotional demands	0.03	0.04	0.85	0.06	0.05	1.15	0.00	0.04	0.00
Physical demands	-0.02	0.03	-0.74	-0.01	0.05	-0.24	0.02	0.03	0.54
Cognitive resources	0.04	0.04	1.11	-0.01	0.06	-0.19	0.03	0.04	0.88
Emotional resources	-0.05	0.04	-1.21	-0.02	0.06	-0.38	-0.04	0.04	-1.14
Physical resources	-0.09	0.04	-2.37*	-0.09	0.05	-1.67	-0.04	0.04	-1.07
Moderating terms									
Cognitive demands × Cognitive resources	0.08	0.03	2.25*	0.03	0.05	0.71	0.06	0.03	1.89
Emotional demands × Emotional resources	-0.00	0.03	-0.11	0.02	0.04	0.48	0.03	0.03	0.88
Physical demands × Physical resources	-0.02	0.03	-0.76	-0.13	0.04	-3.15**	-0.01	0.03	-0.34

Note. *B* = unstandardized coefficient *SE* = standard error *t* = t-statistic

*$p < .05$ **$p < .01$

Table 5.3. *Lagged structural equation models of cognitive strain, emotional exhaustion, and physical complaints with moderating terms of non-matching job demands and job resources for the total sample (N = 317)*

	Cognitive strain T2			Emotional exhaustion T2			Physical complaints T2		
	B	*SE*	*t*	*B*	*SE*	*t*	*B*	*SE*	*t*
Control variables									
Gender	-0.19	0.08	-2.30*	0.09	0.12	0.74	0.09	0.08	1.09
Age	-0.00	0.01	-0.68	0.00	0.01	0.12	0.00	0.01	0.23
T1 outcome variables									
Cognitive strain T1	0.48	0.05	9.67**	0.03	0.07	0.45	-0.05	0.05	-1.05
Emotional exhaustion T1	-0.02	0.04	-0.58	0.49	0.05	9.00**	0.12	0.04	3.19**
Physical complaints T1	-0.04	0.05	-0.82	0.11	0.07	1.49	0.44	0.05	8.61**
Demands and resources									
Cognitive demands	-0.02	0.04	-0.65	0.11	0.05	2.07*	-0.01	0.04	-0.28
Emotional demands	0.04	0.04	1.12	0.06	0.05	1.22	0.00	0.04	-0.12
Physical demands	-0.03	0.03	-0.89	0.00	0.05	-0.06	0.01	0.03	0.45
Cognitive resources	0.04	0.04	1.10	-0.01	0.06	-0.25	0.03	0.04	0.71
Emotional resources	-0.05	0.04	-1.36	-0.04	0.06	-0.69	-0.05	0.04	-1.32
Physical resources	-0.11	0.04	-2.88**	-0.08	0.05	-1.41	-0.05	0.04	-1.39
Moderating terms									
Cognitive demands × Emotional resources	0.01	0.03	0.42	0.04	0.05	0.85	-0.02	0.03	-0.48
Cognitive demands × Physical resources	0.05	0.04	1.23	0.02	0.06	0.43	0.07	0.04	1.90
Emotional demands × Cognitive resources	0.02	0.03	0.54	0.02	0.05	0.45	0.06	0.03	1.74
Emotional demands × Physical resources	-0.05	0.03	-1.32	-0.11	0.05	-2.25*	-0.02	0.03	-0.49
Physical demands × Cognitive resources	0.04	0.04	1.11	-0.04	0.05	-0.83	-0.03	0.04	-0.75
Physical demands × Emotional resources	0.06	0.03	1.66	0.04	0.05	0.83	0.03	0.03	0.97

Note. *B* = unstandardized coefficient *SE* = standard error *t* = t-statistic

*$p < .05$ **$p < .01$

differences were found between workers with a low or high cognitive active coping style (Δ pooled χ^2 = 23.49, *df* = 36, *p* = .95), workers with a low or high emotional active coping style (Δ pooled χ^2 = 1.81, *df* = 36, *p* = 1.00), and workers with a low or high physical active coping style (Δ pooled χ^2 = 4.79, *df* = 36, *p* = 1.00). As we did not find any evidence for Hypothesis 2, there was no statistical rationale for testing Hypothesis 3.

5.4 Discussion

The current study aimed to expand earlier research on job stress by examining whether stress-buffering effects of job resources on the longitudinal relation between job demands and job strain (i.e. stressor-strain relations that developed within one year) are more likely to occur if (1) there is a match (rather than a non-match) between specific types of job demands and job resources (Hypothesis 1), and (2) workers have a high specific active coping style rather than a low specific active coping style (Hypothesis 2). In addition, it was hypothesized that the synergistic effect of high specific active coping styles occurs more often if there is a match (rather than a non-match) between specific types of job resources and specific types of active coping styles (Hypothesis 3).

Matching hypothesis

Contrary to the matching hypothesis (Hypothesis 1), results showed that stress-buffering effects of job resources on the longitudinal relation between job demands and job strain were equally likely to occur in case of a match between specific types of demands and resources than in case of a non-match between specific types of demands and resources. In addition, lagged stress-buffering effects of job resources were only found if physical resources were involved, whereas no effects were found containing a cognitive component (i.e. cognitive demands, cognitive resources, or cognitive strain). This study is therefore somewhat inconsistent with other longitudinal studies on the relation between demands, resources, and strain, which showed much stronger evidence for the matching hypothesis (Chrisopoulos, Dollard, Winefield, & Dormann, 2010; de Jonge & Dormann, 2006). One explanation for the current findings may be that our sample consisted of beginning teachers who still needed to develop adequate coping strategies to deal with high job demands (cf. Le Maistre & Paré, 2010). That is, the beginning teachers in our sample may still have needed to learn what kind of job resources they had to employ to realize an optimal match between job demands and job resources. In any case, to put the current findings in the right perspective, more longitudinal studies on the matching hypothesis are badly needed.

Matching active coping styles

Contrary to Hypothesis 2, results revealed that neither type of active coping style interacted with job resources to moderate the longitudinal relation between job demands and job strain. Because lagged moderating effects of job resources were equally likely to be found for teachers with a low specific active coping style as for teachers with a high specific active coping style, there was no statistical rationale for testing Hypothesis 3.

One explanation why lagged moderating effects of job resources were equally likely to be found for workers with a low specific active coping style as for workers with a high specific active coping style, could be that job characteristics (i.e. demands and resources) are of more importance to the job stress process than personal characteristics (i.e. specific active coping styles). Though it has been argued that personal characteristics are particularly likely to moderate the linkages between job conditions and strain (Cooper et al., 2001), moderating effects of coping style have not always been demonstrated (e.g. Edwards, Baglioni, & Cooper, 1990). An alternative explanation may be that the mere perception that one has sufficient job resources to cope with job stressors (e.g. colleagues who can provide support) may already offset the impact of job demands (cf. Cohen & Wills, 1985). Perhaps workers with a low specific active coping style did not necessarily need to activate available job resources in order to mitigate (or prevent) the adverse impact of high job demands on their health and well-being one year later. Finally, because active coping style was examined as a dichotomous moderator, power problems might explain why specific active coping styles did not make a significant contribution to the prediction of job strain.

Study limitations and implications

A key limitation of the current study is that it included a homogeneous sample (i.e. beginning teachers). Because this sample poses questions about the study's generalizability to the teaching profession in general as well as other service jobs, future research could focus on more heterogeneous samples. A second limitation of this study is that some findings may not be fully reliable due to the somewhat lower alpha (.57) of the cognitive resource scale.

From a theoretical point of view, the current findings suggest that, in order to show stress-buffering effects of job resources on the longitudinal relation between job demands and job strain, it makes no difference whether or not specific types of job resources are matched to specific types of job demands. In addition, the findings emphasize the importance of job rather than personal characteristics (Cox, 1978). Specifically, results showed that for each type of active coping style, two-way interactions between specific types of job demands and

job resources had similar lagged effects on job strain for workers with a low specific active coping style as for workers with a high specific active coping style. Hence, to show stress-buffering effects of job resources on the longitudinal relation between job demands and job strain, it seems to make no difference whether or not individual differences in specific active coping styles are taken into account.

The current findings could be of importance to educational practice as well, as there is a high attrition rate, especially among beginning teachers (Macdonald, 1999). Those who leave the teaching profession usually do so within the first five years (Kersaint, Lewis, Potter, & Meisels, 2007). Further, school teaching is generally regarded as a highly stressful profession (Howard & Johnson, 2004). Burnout, for instance, is a major problem among teachers, and may seriously affect the achievement of educational goals even before attrition is at stake (Guglielmi & Tatrow, 1998; Stoeber & Rennert, 2008). In this study it was shown that the adverse lagged effects of physical and emotional job demands on emotional exhaustion can both be diminished by physical job resources. However, based on the findings in Chapter 2, it is recommended that employers do not only give priority to physical job resources to arm teachers against these job demands, but also try to make matching emotional job resources easily accessible to all teachers. For instance, when teachers need to deal with job-inherent emotions (e.g. being angry with rude pupils) and/or organizationally desired emotions (e.g. staying calm in front of a class), employers could provide emotional support, or stimulate emotional support among colleagues (e.g. a listening ear during breaks or work meetings). In addition to job redesign interventions, in personnel selection teachers could be selected based on personal characteristics that strengthen their immunity to job strain. The current findings suggest, however, that there is no need to address teachers' specific active coping styles, as these personal characteristics do not seem to affect the investment of available job resources during stressful situations at work.

To conclude, results in this longitudinal survey study did support neither the matching hypothesis, nor the moderating effect of specific (matching) active coping styles on the stress-buffering effect of job resources. However, since the results were somewhat inconsistent with previous findings on the matching hypothesis (see Chrisopoulos et al., 2010; de Jonge & Dormann, 2006), and previous research has shown mixed results with respect to the moderating effect of coping (see e.g. Edwards et al., 1990; de Rijk et al, 1998), one should be cautious drawing any firm, generalizable conclusions with respect to the matching hypothesis and the moderating effect of specific (matching) active coping styles. Therefore, further

longitudinal research among both beginning and experienced teachers as well as in multi-occupation samples is highly recommended.

Chapter 6

Job Resources and Regulatory Focus as Moderators of Short-Term Stressor-Strain Relations: A Daily Diary Study

This chapter is largely based on:

Tooren, M. van den, & Jonge, J. de (2010). Job resources and regulatory focus as moderators of short-term stressor-strain relations: A daily diary study. *Manuscript submitted for publication*.

6.1 Introduction

There is not much doubt that job demands are a major predictor of stress experiences at work (e.g. Bakker & Demerouti, 2007; de Lange, Taris, Kompier, Houtman, & Bongers, 2003). Job demands can be defined as work-related tasks that require effort, and vary from solving complex problems to dealing with aggressive clients or lifting heavy objects. If job demands persevere over a longer period of time (e.g. months or years), initial stress experiences are likely to convert to chronic physical and psychological dysfunctioning, such as musculo-skeletal problems, cardiovascular disease, and burnout (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Kivimäki et al., 2002; Larsson, Søgaard, & Rosendal, 2007).

Because job demands can often not be reduced, research in job stress has concentrated on identifying job characteristics that can diminish the deleterious effects of job demands on worker health and well-being. Against this background, several researchers have pointed out the stress-buffering effect of job resources. Job resources are work-related assets that can be employed to deal with job demands. Examples of job resources are job autonomy, emotional support from colleagues, or technical equipment. In case of a stress-buffering effect of job resources, job resources moderate the relation between job demands on job strain, such that workers who are faced with high job demands and who have sufficient job resources to deal with these demands, will experience less job strain than workers with the same level of job demands but insufficient job resources to deal with their demanding job. Job resources may be particularly likely to operate as a stress buffer if workers use job resources that belong to the same domain of functioning as the type of job demands they need to deal with (e.g. Cohen & Wills, 1985; Cutrona & Russell, 1990). The idea that job resources should be *matched* to job demands in order to operate as a stress buffer is often referred to as the 'matching hypothesis' (Cohen & McKay, 1984).

To this very moment, the matching hypothesis has only been tested in studies with a cross-sectional or longitudinal design (see Chapter 2; Chapter 5; Daniels & de Jonge, 2010). One important feature of these studies is that the matching hypothesis is tested with respect to the *long-term* relation between job demands, job resources, and job strain, that is, with respect to demand-resource-strain relations that develop over longer periods of time (e.g. months or years). What these studies do not allow for, however, is that job demands can also have an *immediate* effect on job strain (e.g. see Ilies, Johnson, Judge, & Keeney, 2010). That is, whereas it may sometimes take years before job demands result in job strain (e.g. cardiovascular disease), stressor-strain relations may also develop within one day (e.g. concentrations problems). So far, however, no studies have been conducted to test the

matching hypothesis at day level. It is therefore unclear whether specific types of job resources also operate as a stress buffer over a short period of time (i.e. within one day), and to what extent matching job resources are more functional resources than non-matching job resources to deal with job demands in the context of day-to-day working life. Another important feature of studies on the matching hypothesis is that they have a *between-person* design. In other words, it is investigated whether workers who are faced with high job demands and who have insufficient job resources to deal with these job demands experience more job strain than workers who are confronted with the same amount of job demands but who have sufficient job resources at their disposal. What is not reflected by this between-person approach, however, is that the development of job strain is a process that occurs *within* the individual. Moreover, if studies have a between-person design, individual differences between workers can not be ruled out as an explanation for the relation between demands, resources, and strain.

Because immediate stress-reactions at work may have a great impact on workers' quality of life (cf. Almeida, 2005; Diener & Diener, 1996), it seems of great interest to study the *daily* job stress process as it occurs *within* the individual. Therefore, the first aim of the current study is to examine the matching hypothesis with respect to the short-term (i.e. day level) relation between demands, resources, and strain as it occurs within the individual. More specifically, by means of a within-person design it will be examined whether within-person stress-buffering effects of job resources in the context of day-to-day working life (i.e. workers experience less job strain on days they encounter high job demands and high job resources than on days they are faced with high job demands and low job resources) are stronger in case of a match between job demands and job resources than in case of no such match.

As has already been stated in Chapter 5, workers' personal characteristics are likely to moderate the relation between job conditions and job strain (Cooper, Dewe, & O'Driscoll, 2001). Since a within-person design rules out any unintended between-person variance as an explanation for the relation between demands, resources, and strain, the current study enables us to test the moderating effect of one particular personal characteristic on the stress-buffering effect of job resources, and to draw more firm conclusions from the findings. Because results in Chapter 5 did not support the moderating effect of specific (matching) active coping styles, for the current study it was decided to examine the moderating effect of worker regulatory focus. This particular personal characteristic was chosen for two different reasons, which will be elaborated upon below.

The first reason is that the activation of job resources during stressful situations at work requires self-regulatory behavior, and regulatory focus could play a decisive role in this behavior. Specifically, according to Regulatory Focus theory (Brockner & Higgins, 2001; Higgins, 1997), an individual's behavior is regulated by two distinct motivational orientations or 'regulatory foci'; a prevention focus and a promotion focus. If people are predominantly prevention focused, their self-regulatory behavior is characterized by avoidance strategies and a 'conservative bias'. Prevention focused individuals are sensitive to punishments that may result from poor performance, and therefore try to insure against losses and insure non-losses. In contrast, if people are predominantly promotion focused, their self-regulatory behavior is characterized by approach strategies and a 'risky bias'. Promotion focused individuals are sensitive to rewards that may be obtained from superior performance, and therefore try to insure gains and insure against non-gains. Because differences in regulatory focus (i.e. prevention focus versus promotion focus) have a different impact on self-regulatory behavior, differences in regulatory focus will also have a different impact on the activation of job resources in stressful situations at work. More specifically, as will be explained later, we propose that prevention focused workers are less inclined to activate job resources than promotion focused workers.

The second reason why it was decided to examine regulatory focus as a moderator of the stress-buffering effect of job resources is that differences in resource activation between prevention focused workers and promotion focused workers may be even more pronounced at day level. Specifically, in the context of day-to-day working life, a quick, almost impulsive course of action is expected to prevent strain from getting worse. Such quick decisions are less likely to be shown by workers with a conservative bias (i.e. prevention focused workers) than workers with a risky bias (i.e. promotion focused workers) (cf. Crowe & Higgins, 1997; Förster, Higgins, & Taylor Bianco, 2003).

To the best of our knowledge, the moderating effect of regulatory focus has not been tested before, neither at day level, nor with respect to the long-term relation between demands, resources, and strain. Given its potential impact on the stress-buffering effect of job resources in the context of day-to-day working life, the second aim of the present study is to examine the moderating effect of worker regulatory focus with respect to the short-term (i.e. day level) relation between demands, resources, and strain as it occurs within the individual.

Matching hypothesis

According to the matching hypothesis, stress-buffering effects of job resources are most likely to occur if specific types of job resources are matched to specific types of job demands (e.g. Cohen & Wills, 1985; Sargent & Terry, 1998). Generally speaking, three specific types of job demands and job resources can be distinguished: cognitive, emotional, and physical demands and resources (Hockey, 2000; de Jonge & Dormann, 2003). When the matching hypothesis is applied to the daily job stress process as it occurs within workers, it follows that workers who are faced with high cognitive job demands (e.g. solving complex problems) at a particular day, are least likely to experience job strain (e.g. concentration problems) during that day if they have sufficient cognitive job resources (e.g. information from handbooks) to deal with their cognitively demanding job. Similarly, workers who are confronted with high emotional job demands (e.g. feeling threatened by aggressive patients) at a particular day, are least likely to experience job strain (e.g. emotional exhaustion) during that day if they have sufficient emotional job resources (e.g. a listening ear from colleagues) to deal with their emotionally demanding job. Finally, if workers are faced with high physical job demands (e.g. moving heavy objects) at a particular day, they are least likely to experience job strain (e.g. back pain) during that day if they have sufficient physical job resources (e.g. a trolley) to deal with their physically demanding job (de Jonge & Dormann, 2003; 2006). This brings us to the following hypothesis:

Hypothesis 1: within-person stress-buffering effects of job resources on the short-term relation between job demands and job strain are more likely to occur if there is a match between specific types of job demands and job resources than if there is a non-match between specific types of job demands and job resources.

Regulatory focus

The match between demands and resources may not be the only mechanism underlying the within-person stress-buffering effect of job resources on the short-term relation between job demands and job strain. Another possible mechanism underlying the within-person stress-buffering effect of job resources in the context of day-to-day working life is that some workers are more hesitant about using job resources than others. More specifically, according to the Conservation of Resources (COR) theory (Hobfoll, 1989; 2001), in times of stress people strive to minimize net loss of resources. Any failure to 'conserve' resources will lead to psychological stress (Hobfoll, 2001). In work settings, this implies that workers who are

faced with high job demands will try to protect their job resources (e.g. workers who are faced with a physically strenuous task may not ask for physical help so that the physical power of their colleagues will not be depleted). However, due to differences in regulatory focus (i.e. prevention focus versus promotion focus) (Higgins, 1997), not all workers may be equally motivated to minimize resource losses. Prevention focused workers, for instance, are sensitive to punishments (e.g. psychological stress after resource loss) and will therefore be highly motivated to minimize resource losses. People in a promotion focus, however, are sensitive to rewards and particularly concerned with realizing gains and precluding non-gains. The failure to conserve job resources and the psychological stress that follows resource loss is therefore less likely to be an issue for them. Following this line of reasoning, we believe that in times of stress, those who are predominantly prevention focused are more likely to minimize resource losses – and thus less likely to use job resources – than those who are predominantly promotion focused. In other words, COR theory (Hobfoll, 1989; 2001) may especially apply to individuals with a prevention focus and to a lesser extent to individuals with a promotion focus.

Regulatory focus may be particularly likely to moderate the within-person stress-buffering effect of job resources at day level, because in case of short-term stressor-strain relations, a worker experiences job strain immediately after the stressor occurs, and hence needs to respond quickly in terms of resource investment to prevent strain from getting worse. As stated before, such ad hoc decisions are less likely to be shown by prevention focused workers (conservative bias) than by promotion focused workers (risky bias) (cf. Crowe & Higgins, 1997; Förster et al., 2003), implying that, in the context of day-to-day working life, those who are predominantly prevention focused are even more likely to minimize resource losses – and thus less likely to use job resources – than those who are predominantly promotion focused. Following this line of reasoning, it is hypothesized that:

Hypothesis 2: within-person stress-buffering effects of job resources on the short-term relation between job demands and job strain are more likely to occur if workers are predominantly promotion focused than if workers are predominantly prevention focused.

6.2 Method

Procedure

Mid 2009, two daily diary studies were conducted among nurses from two Dutch nursing homes. Participants were given an electronic diary in the form of a pocket computer (i.e. a palmtop type Tungsten E2 or a palmtop type T|X), which they had to fill out for eight consecutive days. Because regulatory focus was considered to be a stable personal characteristic (cf. Kark & van Dijk, 2007), promotion focus and prevention focus were not measured at day level but taken from a baseline questionnaire survey that had been conducted in February 2009. Nurses could only participate in the diary study if they had also participated in the questionnaire survey. At the time of the questionnaire survey, nurses were not informed about the diary study, so they could not anticipate on their participation in the diary study later that year, for instance through (non-)compliance. Based on their scores on the promotion focus scale and the prevention focus scale, 100 nurses (i.e. 50 nurses per nursing home) were selected who could either be categorized as (1) high promotion – low prevention focused, or (2) high prevention – low promotion focused. Nurses qualified for a particular category if they scored in the highest tertile of the promotion focus scale and the lowest tertile of the prevention focus scale, or vice versa. Nurses were selected on the basis of these two tertiles, as we were interested in nurses who were *predominantly* promotion focused or *predominantly* prevention focused, and we wanted to ensure that the findings in this study were not biased by respondents who were socialized with both types of regulatory focus or lacked both (cf. Knollmann & Wild, 2007). In each nursing home, we aimed for about 20 participants per category (i.e. 40 participants per nursing home and 80 participants in total). Participants volunteered for the study and signed an informed consent after the instruction session. After they had finished the diary study, participants received a monetary reward of 15 euros each.

In this study, we were interested in the short-term relation between job demands, job resources and job strains, so only data from working days were included. Data from non-working days were recoded as missing values. On working days, participants completed the diary after getting up (Measurement 1, abbreviated M1), after they had finished their shift (Measurement 2, abbreviated M2), and before bedtime (Measurement 3, abbreviated M3). Physical and psychological strains were measured at each measurement. Job demands and job resources were only measured at M2.

Participants

Of all nurses who received a pocket computer (N = 77), five nurses did not start or complete the diary study (response rate 93.5%). Reasons varied from non-compliance to technical problems with the pocket computer that could not be solved during the study. Data from seven other nurses were excluded from the study because these nurses did not qualify for either regulatory focus category (these nurses were not selected for the diary study, but had changed places with nurses who were selected, without informing the researchers). Finally, data from one nurse were excluded as this person only completed the diary study on non-working days. Therefore, the final study sample consisted of 64 nurses. Their mean age was 41.1 years (SD = 10.8), and 89.1% was female. Nurses worked 28.6 hours a week on average (SD = 6.3), and 85.9% worked in shifts (35.9% also did night shifts). Of all respondents, 33 nurses qualified as high promotion – low prevention focused, and 31 nurses qualified as high prevention – low promotion focused.

Measures

Independent variables included in this study were cognitive, emotional, and physical job demands, corresponding types of job resources, and regulatory focus. Dependent variables were chosen from the same domain as job demands and job resources, resulting in cognitive, emotional, and physical job strain. It was decided to focus on strains measured at M2 (i.e. directly after participants had finished their shift), because strains measured before bedtime at M3 might have been affected by off-job recovery (i.e. leisure time activities). Job strain measured at M1 (i.e. after getting up) was included as control variable. To keep the number of items in the diary survey as short as possible, all scales in the diary survey consisted of three items each. Table 6.1 shows the number of items, means, standard deviations, and zero-order correlations of the measures included.

Job demands and job resources. Cognitive, emotional, and physical job demands and job resources were assessed with a Dutch version of the shortened DISC Questionnaire (DISQ-S 2.0, de Jonge et al., 2007). Items were scored on a 5-point agreement scale, ranging from 1 (*totally disagree*) to 5 (*totally agree*).

An example item of the cognitive demands scale is 'Today, I had to display high levels of concentration and precision at work'. The mean Cronbach's alpha was .82, and was calculated by adding the alphas of the eight consecutive days and dividing the sum score by eight. Due to a lower mean Cronbach's alpha (.51) that could not be further improved by deleting one item, we decided to use the best single item to measure emotional job demands,

Table 6.1. *Number of items, means, standard deviations, and Pearson correlations (N = 64)*

		Items	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1.	Cognitive demands	3	3.87	.61	-											
2.	Emotional demands	1	3.81	.60	.60**	-										
3.	Physical demands	3	3.58	.65	.16	.54**	-									
4.	Cognitive resources	1	3.14	.77	-.39**	-.19	-.02	-								
5.	Emotional resources	3	3.13	.56	.16	.19	.29*	.15	-							
6.	Physical resources	1	2.44	.77	-.25	-.22	-.03	.49**	.27*	-						
7.	Cognitive strain M1	3	1.98	.48	.06	.15	.39**	-.02	.34**	.06	-					
8.	Emotional strain M1	3	1.95	.67	.03	.28*	.55**	-.03	.14	.01	.69**	-				
9.	Physical strain M1	3	1.35	.46	-.05	.20	.37**	.04	.27*	.10	.21	.45**	-			
10.	Cognitive strain M2	3	2.05	.48	.23	.22	.35**	-.14	.22	-.06	.84**	.63**	.10	-		
11.	Emotional strain M2	3	2.13	.78	.13	.37**	.49**	-.16	.09	-.12	.62**	.89**	.37**	.60**	-	
12.	Physical strain M2	3	1.40	.47	.02	.25*	.45**	-.04	.27*	-.01	.26*	.43**	.93**	.15	.37**	-

Note. M1 = measurement 1 M2 = measurement 2

*$p < .05$ **$p < .01$

namely ‘Today, I had to do a lot of emotionally draining work’. Finally, an example item of the physical demands scale is ‘Today, I had to lift or move heavy persons or objects (more than 10 kg)’. The mean Cronbach’s alpha was .78.

Due to a lower mean Cronbach’s alpha (.55) that could not be further improved by deleting one item, we decided to use the best single item to measure cognitive job resources, namely ‘Today, I varied complex tasks with simple tasks’. An example item of the emotional resources scale is ‘Today, I got emotional support from others when a threatening situation at work occurred’. The mean Cronbach’s alpha was .68. Finally, because Cronbach’s alphas could not be interpreted for three-item scales and two-item scales due to negative alphas, we decided to use the best single item of the physical resources scale, namely ‘Today, I took a physical break when things got physically strenuous’.

Strain. Cognitive strain refers to the extent workers experience deficits in attention, information processing, and (working) memory. The items were derived from a scale developed by Chalder et al. (1993). The mean Cronbach’s alpha was .65 at M1 and .65 at M2. An example item is ‘I have difficulty concentrating’. Items were scored on a 5-point agreement scale, ranging from 1 (*totally disagree*) to 5 (*totally agree*). Emotional strain was assessed by an index of emotional exhaustion, which can be defined as a feeling of being emotionally worn out. The items were derived from the Utrecht Burnout Scale (UBOS) (Schaufeli & van Dierendonck, 2000). An example item is ‘I feel emotionally drained from my work’. Items were scored on a 7-point frequency scale, ranging from 0 (*never*) to 6 (*always*). The mean Cronbach’s alpha was .82 at M1 and .79 at M2. Finally, physical strain was assessed by an index of physical complaints (i.e. neck, shoulder, and back problems). The items were derived from a scale developed by Hildebrandt and Douwes (1991). An example item is ‘I have trouble with my lower back’. The possible responses were 1 (*to a great extent*), 2 (*to a moderate extent*), and 3 (*to a small extent*). Data were recoded, so the higher the score on this scale, the more physical complaints were experienced. The mean Cronbach’s alpha was .76 at M1 and .78 at M2.

Regulatory Focus. Prevention focus and promotion focus were measured with six items each in a baseline questionnaire survey. The items were derived from two scales developed by Lockwood, Jordan, and Kunda (2002). An example item of the prevention focus scale (Cronbach’s alpha .79) is ‘In my work, I am more oriented toward preventing losses than I am toward achieving gains’. An example item of promotion focus scale (Cronbach’s alpha .68) is ‘In my work, I am more oriented toward achieving success than preventing

failure'. Items were scored on a 5-point agreement scale, ranging from 1 (*totally disagree*) to 5 (*totally agree*).

Data analysis

Data were analyzed with multilevel analyses using MLwiN 2.1 (Rasbash, Steele, Browne, & Goldstein, 2009). The predictor variables at day level (level 1) were job demands, job resources, and outcome measures at M1. The predictor variable at the person level (level 2) was regulatory focus. As we wanted to compare nurses who were *predominantly* promotion focused versus nurses who were *predominantly* prevention focused, this variable was dummy coded with high prevention – low promotion focus (versus high promotion – low prevention focus) as reference category.

To test the hypotheses, we tested and compared two models for each type of outcome measure (i.e. cognitive, emotional, and physical strain). Specifically, to test Hypothesis 1, we examined a null-model (Model 0), including the intercept, the outcome measure at M1, main terms of job demand and job resources (cognitive, emotional, and physical demands and resources), and interaction terms between job demands and job resources. Because of the large number of interaction terms (nine in total), stress-buffering effects of job resources were tested by means of two separate analyses including either interaction terms between *matching* demands and resources, or interaction terms between *non-matching* demands and resources (see de Jonge & Dormann, 2006). This resulted in six models, two for each type of outcome measure. To test Hypothesis 2, regulatory focus was added to Model 0 as main term, and in combination with job demands (two-way interaction), job resources (two-way interaction), and job demands and job resources (three-way interaction). The six resulting models will all be referred to as Model 1. Results supported the moderating effect of regulatory focus if Model 1 showed a significantly better fit than Model 0, and within-person stress-buffering effects of job resources occurred more often if nurses were predominantly promotion focused than if nurses were predominantly prevention focused. The improvement of Model 1 above Model 0 was examined by computing the difference between the respective likelihood ratios. This difference follows a chi-square distribution, with the number of new parameters added to the model as degrees of freedom.

In each model, only the intercept was allowed to vary at level 2 (i.e. to differ across individuals). The slopes of the other level-1 predictor variables were assumed to be the same for all individuals. This latter decision was based on the idea that, in principle, workers who have an identical type of job (i.e. similar demands and resources) and who have similar scores

on regulatory focus, will also be similar in their experience of job strain. If workers differ in their experience of job strain, this can be explained by individual differences in levels of job demands, job resources, and/or regulatory focus.

In addition, in multilevel modeling, predictor variables without meaningful zero-point need to be centered (Luke, 2004). Accordingly, in line with Enders and Tofighi (2007), the level-1 predictor variables outcome measure at M1, job demands, and job resources were group mean centered (i.e. centered around the person mean). The dummy variable regulatory focus was preserved in its natural metric.

6.3 Results

Testing Hypothesis 1, results in Table 6.2 showed one significant two-way interaction between matching demands and resources. Specifically, it was shown that nurses experienced less emotional strain on days they encountered high emotional demands and high emotional resources than on days they were faced with high emotional demands and low emotional resources (t = -2.40, p < .05).

In addition, three significant two-way interactions were found between non-matching demands and resources (Table 6.3). Two two-way interactions showed a stress-buffering effect. More specifically, nurses experienced less emotional strain on days they were faced with high cognitive demands and high emotional resources than on days they were confronted with high cognitive demands and low emotional resources (t = -2.21; p < .05). Further, it was shown that nurses experienced less emotional strain on days they encountered high emotional demands and high physical resources than on days they were confronted with high emotional demands and low physical resources (t = -2.39; p < .05). Finally, results showed one two-way interaction that was not in the predicted direction. That is, a reversed interaction effect was found, showing that nurses experienced *more* emotional strain on days they were confronted with high emotional demands and high cognitive resources than on days they were faced with high emotional demands and low cognitive resources (t = 3.71; p < .01).

In sum, in the context of day-to-day working life, one out of nine (11.1%) tested two-way interactions between matching demands and resources, and two out of eighteen (11.1%) tested two-way interactions between non-matching demands and resources showed a within-person stress-buffering effect of job resources. So, contrary to Hypothesis 1, within-person stress-buffering effects of job resources on short-term stressor-strain relations were equally likely to occur in case of a match between specific types of job demands and job resources as in case of a non-match between specific types of job demands and job resources.

Table 6.2. *Multilevel models of cognitive strain, emotional strain, and physical strain with moderating terms of matching job demands and job resources (N = 64)*

	Cognitive Strain M2				Emotional Strain M2				Physical Strain M2			
	Model 0		Model 1		Model 0		Model 1		Model 0		Model 1	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	2.09**	0.06	2.03**	0.09	2.15**	0.10	2.26**	0.14	1.40**	0.06	1.40**	0.08
Outcome M1	0.46**	0.09	0.48**	0.09	0.30**	0.11	0.30**	0.11	0.47**	0.10	0.45**	0.10
Cognitive demands	-0.03	0.09	0.06	0.12	0.06	0.09	0.08	0.13	0.02	0.03	0.01	0.04
Emotional demands	0.09	0.06	0.02	0.10	0.12*	0.06	0.12	0.09	0.02	0.02	0.04	0.03
Physical demands	0.15	0.08	0.12	0.14	0.02	0.07	0.04	0.14	0.04	0.03	0.07	0.05
Cognitive resources	-0.05	0.05	-0.13	0.08	-0.13*	0.05	-0.17	0.09	-0.02	0.02	-0.01	0.03
Emotional resources	0.11	0.08	0.16	0.11	-0.07	0.08	-0.15	0.11	0.02	0.03	-0.01	0.04
Physical resources	-0.08	0.07	0.03	0.11	-0.02	0.06	-0.00	0.10	0.01	0.02	0.00	0.04
CD × CR	0.02	0.11	-0.05	0.12	-0.12	0.12	-0.25	0.13	-0.04	0.04	-0.05	0.05
ED × ER	-0.04	0.10	0.10	0.23	-0.28*	0.12	0.19	0.24	0.01	0.03	0.01	0.08
PD × PR	-0.11	0.13	-0.64*	0.29	-0.01	0.14	-0.02	0.30	-0.01	0.05	-0.03	0.11
Regulatory focus			0.09	0.12			-0.22	0.19			-0.01	0.12
CD × focus			-0.30	0.18			-0.04	0.18			0.00	0.06
ED × focus			0.08	0.12			-0.05	0.12			-0.03	0.04
PD × focus			0.06	0.17			-0.01	0.16			-0.03	0.06
CR × focus			0.15	0.11			0.08	0.11			-0.01	0.04
ER × focus			-0.12	0.15			0.11	0.15			0.05	0.05
PR × focus			-0.06	0.14			0.00	0.14			0.02	0.05
CD × CR × focus			0.17	0.32			0.47	0.32			0.07	0.11
ED × ER × focus			-0.19	0.25			-0.64*	0.27			-0.00	0.09
PD × PR × focus			0.72*	0.33			0.08	0.34			0.04	0.12
-2*LL	380.59		368.28		426.59		413.49		35.48		32.10	
Δ -2*LL (*df*)			12.31 (10)				13.10 (10)				3.38 (10)	
# daily measurements	215		215		214		214		213		213	

Note. CD = cognitive demands ED = emotional demands PD = physical demands CR = cognitive resources ER = emotional resources PR = physical resources

B = unstandardized coefficient *SE* = standard error -2*LL = log likelihood *df* = degrees of freedom

*$p < .05$ **$p < .01$

Table 6.3. *Multilevel models of cognitive strain, emotional strain, and physical strain with moderating terms of non-matching job demands and job resources (N = 64)*

	Cognitive Strain M2				Emotional Strain M2				Physical Strain M2			
	Model 0		Model 1		Model 0		Model 1		Model 0		Model 1	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	2.09**	0.06	2.01**	0.09	2.15**	0.10	2.28**	0.14	1.40**	0.06	1.41**	0.08
Outcome M1	0.47**	0.09	0.47**	0.09	0.28**	0.10	0.29**	0.11	0.45**	0.10	0.41**	0.10
Cognitive demands	-0.02	0.09	0.18	0.13	0.08	0.09	0.06	0.13	0.01	0.03	-0.02	0.05
Emotional demands	0.07	0.06	-0.03	0.10	0.06	0.06	0.11	0.09	0.03	0.02	0.05	0.03
Physical demands	0.17*	0.08	0.02	0.15	0.09	0.08	0.06	0.15	0.02	0.03	0.07	0.05
Cognitive resources	-0.05	0.05	-0.16*	0.08	-0.15**	0.05	-0.18*	0.08	-0.02	0.02	-0.01	0.03
Emotional resources	0.11	0.08	0.20	0.11	-0.02	0.08	-0.15	0.11	0.02	0.03	-0.01	0.04
Physical resources	-0.08	0.07	0.05	0.11	0.03	0.07	-0.00	0.10	0.00	0.02	-0.03	0.04
CD × ER	-0.07	0.21	-0.54	0.27	-0.46*	0.21	-0.23	0.28	-0.01	0.07	0.07	0.10
CD × PR	-0.04	0.19	-0.49	0.27	-0.17	0.19	0.11	0.29	-0.01	0.07	0.06	0.10
ED × CR	0.00	0.07	0.04	0.15	0.28**	0.08	0.02	0.15	-0.01	0.03	-0.02	0.05
ED × PR	-0.15	0.10	-0.02	0.18	-0.23*	0.10	-0.32	0.18	0.03	0.04	-0.03	0.07
PD × CR	-0.00	0.07	-0.39*	0.19	-0.06	0.08	0.01	0.20	-0.05	0.03	-0.04	0.07
PD × ER	0.02	0.17	-0.02	0.34	0.33	0.21	0.53	0.35	-0.02	0.06	-0.09	0.12
Regulatory focus			0.10	0.12			-0.25	0.19			-0.02	0.12
CD × focus			-0.43*	0.19			-0.00	0.19			0.03	0.07
ED × focus			0.12	0.13			-0.12	0.12			-0.03	0.04
PD × focus			0.16	0.18			0.08	0.18			-0.06	0.06
CR × focus			0.17	0.11			0.02	0.11			-0.02	0.04
ER × focus			-0.16	0.15			0.21	0.15			0.04	0.05
PR × focus			-0.11	0.14			0.07	0.14			0.06	0.05
CD × ER × focus			0.30	0.47			-0.44	0.49			-0.13	0.17
CD × PR × focus			0.96*	0.39			-0.47	0.40			-0.03	0.14
ED × CR × focus			-0.01	0.17			0.40*	0.18			0.03	0.06
ED × PR × focus			-0.13	0.21			0.16	0.22			0.10	0.08
PD × CR × focus			0.45*	0.21			-0.05	0.22			-0.01	0.08
PD × ER × focus			0.01	0.40			-0.16	0.45			0.11	0.15
-2*LL	378.09		358.17		417.01		402.97		30.22		22.47	
Δ -2*LL (*df*)			19.92 (13)				14.04 (13)				7.75 (13)	
# daily measurements	215		215		214		214		213		213	

Note. CD = cognitive demands ED = emotional demands PD = physical demands CR = cognitive resources ER = emotional resources PR = physical resources

B = unstandardized coefficient *SE* = standard error -2*LL = log likelihood *df* = degrees of freedom

*$p < .05$ **$p < .01$

Finally, results in Tables 6.2 and 6.3 revealed that in neither analysis, Model 1 showed a significantly better fit than Model 0. Because worker regulatory focus did not make a significant contribution to the prediction of job strain, there was no support for Hypothesis 2[2].

6.4 Discussion

The aim of the current study was to investigate whether within-person stress-buffering effects of job resources on short-term stressor-strain relations (i.e. at day level) are more likely to occur if (1) there is a match rather than a non-match between job demands and job resources (Hypothesis 1), and (2) workers are predominantly promotion focused rather than prevention focused (Hypothesis 2). To examine our hypotheses, a daily diary study was conducted in which job demands, job resources, and job strain were measured on eight consecutive days. Regulatory focus (i.e. promotion focus and prevention focus) was considered to be a stable personal characteristic, and was hence not measured at day level but taken from a baseline survey study. Multilevel analyses revealed that within-person stress-buffering effects of job resources on short-term stressor-strain relations were equally likely to occur in case of a match between specific types of job demands and job resources as in case of a non-match between specific types of job demands and job resources. In addition, it was shown that worker regulatory focus did not make a significant contribution to the prediction of job strain. Based on these findings, it was concluded that there was neither support for the matching hypothesis (Hypothesis 1), nor for the moderating effect of regulatory focus (Hypothesis 2) when studying within-person processes in the context of day-to-day working life.

Matching hypothesis

Although there is a sound body of empirical evidence for the matching hypothesis as regards the long-term relation between job demands, job resources, and job strain (see Chapter 2; Chapter 5), the current findings suggest that the matching hypothesis does not apply to the short-term relation between demands, resources, and strain as it occurs within workers. That is, though job resources did operate as a stress-buffer, matching job resources do not seem to

[2] Re-analyzing the data with the original three-item scales for emotional job demands, cognitive job resources, and physical job resources showed nearly identical results, implying that the one-item scales that had been used in favor of the study's internal consistency were a valid substitute for the multi-item scales. In addition, data were re-analyzed including age, gender, contract hours a week, and shift work as control variables. This additional step in the analyses did not make a significant contribution to the prediction of job strain. Moreover, analyses including control variables showed nearly identical results as analyses without control variables. For the sake of parsimony, we decided to omit the control variables from the multilevel analyses.

be more functional stress buffers than non-matching job resources when studying within-person processes in the context of day-to-day working life. One explanation for why the matching hypothesis was not supported may be that coping with stressful situations at work takes time (cf. Kleber & van der Velden, 2003), and the time-span of this diary study may have been too short for adaptation to take place. Specifically, if job demands originated at the time of the diary study, nurses may not have been capable of coping adequately with the type of job demands concerned. That is, they may still have needed to learn what kind of job resources they had to employ to realize an optimal match between job demands and job resources. Comparable adaptation processes are shown in the area of immune functioning. Specifically, when a new virus enters the human body, the adaptive immune system will initially not be able to respond in an adequate way and the person becomes ill. However, the next time the virus enters the human body, the virus will be recognized and the adaptive immune system will mount faster and stronger attacks each time the virus is encountered. Similarly, each time a worker encounters a certain job demand, adaptation takes place. In the longer term, when adaptation is completed, workers know, either explicitly or implicitly (cf. Smith, 2001), what kind of job resources they need to employ to realize an optimal match between job demands and job resources. However, if adaptation is not yet completed, as might have been the case in the current study, workers are less capable of selecting job resources that match job demands. At the same time, both current findings and previous findings (see e.g. Chapter 2; Chapter 5) suggest that non-corresponding types of job resources that may be used instead are not dysfunctional per se and can still operate as stress-buffers, which could explain the lack of support for the matching hypothesis in the current study.

Regulatory focus

In the current study, results revealed that the short-term relation between job demands, job resources, and job strain as it occurs within individuals was not affected by worker regulatory focus. Specifically, in the context of day-to-day working life, within-person stress-buffering effects of job resources were equally likely to occur for nurses who were predominantly promotion focused as nurses who were predominantly prevention focused. One explanation for this finding could be that job characteristics (i.e. job demands and job resources) are of more importance to the daily job stress process as it occurs within the individual than workers' personal characteristics (i.e. regulatory focus) (cf. Cox, 1978).

An alternative explanation may be that, at day level, job demands might have served as situational cues that evoked a temporary regulatory focus in nurses (cf. Neubert, Kacmar,

Carlson, Chonko, & Roberts, 2008). As this temporary state may differ from nurses' stable regulatory focus, temporary regulatory focus might have weakened the moderating effect of stable regulatory focus. In addition, as the mere perception that one has sufficient job resources to deal with job stressors (e.g. colleagues who can provide support) may already offset the impact of job demands (cf. Cohen & Wills, 1985), nurses who were predominantly prevention focused might not necessarily have had to activate available job resources to mitigate (or prevent) the adverse impact of job demands on their health and well-being. Finally, because regulatory focus was a dichotomous variable, power problems might explain why regulatory focus did not make a significant contribution to the prediction of job strain.

Study limitations and implications

A key limitation of this study is that, due to a relatively small number of daily measurements, the large number of main terms and interaction terms, scales with somewhat lower alphas (i.e. $\alpha < .70$), and the inclusion of a dichotomous moderator, it is difficult to determine whether the null findings can be explained by a lack of relationship, or by a lack of statistical power. In addition, this study included a homogeneous sample (i.e. nursing home nurses), which poses questions about the study's generalizability to health care professions in general as well as to other service jobs.

As far as the theoretical implications are concerned, the current findings suggest that job resources operate as a stress-buffer of short-term stressor-strain relations as they occur within individuals, but that in order to show within-person stress-buffering effects of job resources in the context of day-to-day working life, it makes no difference whether or not specific types of job resources are matched to specific types of job demands. In addition, the current findings emphasize the importance of job rather than personal characteristics in the daily job stress process as it occurs within the individual (cf. Cox, 1978). Specifically, our findings suggest that, when studying within-person processes in the context of day-to-day working life, interactions between specific types of job demands and job resources have similar effects on health and well-being of workers who are predominantly promotion focused as workers who are predominantly prevention focused. Hence, to show within-person stress-buffering effects of job resources on the short-term relation between job demands and job strain, it seems to make no difference whether or not individual differences in regulatory focus are taken into account.

From a practical point of view, it can be tentatively concluded that, on a daily basis, job resources are important assets to buffer the relation between job demands and job strain.

However, to prevent job strain in the context of day-to-day working life, there seems no need for employers to provide workers exclusively with job resources that match job demands. Further, as far as personnel selection is based on immunity to daily job strain (i.e. job strain that develops within one day), there seems no need to address worker regulatory focus, as this personal characteristic does not seem to affect the investment of available job resources during stressful situations at work, at least not on a daily basis.

Nonetheless, to be able to draw firm, generalizable conclusions when examining the matching hypothesis and the moderating effect of worker regulatory focus with respect to the short-term relation between job demands, job resources, and job strain as it occurs within individuals, further daily (diary) research among nursing homes nurses and other service professions, as well as in multi-occupation samples is highly recommended.

Chapter 7

General Discussion

This thesis presents a series of studies that have been conducted to examine the key principles and theoretical underpinnings of the Demand-Induced Strain Compensation (DISC) Model (de Jonge & Dormann, 2003). The aim of these studies was to test two key assumptions underlying the DISC Model. The first key assumption is that specific types of job demands (i.e. cognitive, emotional, and physical job demands) can best be dealt with through the activation of job resources that *match* the type of job demands concerned (i.e. matching job resources) rather than job resources that do not match the type of job demands concerned (i.e. non-matching job resources). This idea of match is also known as the matching hypothesis (Cohen & McKay, 1984). The second key assumption is that workers who are confronted with a specific type of demanding situation at work are generally inclined to use matching job resources to deal with these job demands (i.e. workers are generally inclined to show functional self-regulatory behavior). To test these two key assumptions underlying the DISC Model, five studies were designed that together make up a triptych. In the first part of the triptych, the first assumption was tested (Chapter 2). In the second and third part of the triptych, the second assumption was tested. This second assumption was tested from two different perspectives. More specifically, in the second part of the triptych (Chapters 3 and 4), two studies were designed to open up the black box of job stress, that is, to enhance our understanding of the self-regulation processes involved in the activation of job resources (i.e. alertness to available job resources, evaluation of the relevance of job resources, and decision making regarding the actual use of job resources). In the third part of the triptych (Chapters 5 and 6), the moderating effect of workers' personal characteristics (i.e. specific active coping styles and regulatory focus) on the stress-buffering effect of job resources was examined, on the assumption that these two person variables facilitate/inhibit the actual use of job resources in demanding situations at work.

In this chapter, a general discussion of Chapters 2 to 6 is given. First, section 7.1 presents an overview of the main research findings, which is followed by a discussion of the methodological considerations that should be taken into account when interpreting the results of the studies (section 7.2). In sections 7.3 and 7.4, the theoretical and practical implications of the research findings are discussed, respectively. Finally, this chapter concludes with recommendations for future research in section 7.5 and some final remarks in section 7.6.

7.1 Main findings

This section presents an overview of the most important findings in this thesis. Results are presented concerning (1) the functionality of matching (versus non-matching) job resources in specific types of demanding situations at work, (2) the self-regulation processes involved in the activation of job resources, and (3) the moderating effect of workers' personal characteristics on the stress-buffering effect of job resources. In addition, findings will be presented that are not directly related to the aims of this thesis, yet that are worthwhile to be mentioned.

The functionality of matching job resources

In Chapter 2, the matching hypothesis was tested by means of a review of 29 studies on the DISC Model. For the overall DISC Model, the matching hypothesis was supported on the global level (when no distinction was made between cognitive, emotional, and physical job demands and job resources) and partly supported on the specific level (when the functionality of matching job resources was tested for each specific type of job demands). More specifically, results were in line with the matching hypothesis, except for the finding that, both in a cognitively and physically demanding job, moderating effects of non-matching emotional job resources were equally likely to occur as moderating effects of matching job resources. When the matching hypothesis was tested for the compensation principle (i.e. the stress-buffering effect of job resources), we found results that were almost similar as those for the overall DISC Model, except that in a cognitively demanding situation at work, moderating effects of non-matching physical job resources were equally likely to occur as moderating effects of matching cognitive job resources. For the balance principle (i.e. the activation-enhancing effect of job resources), however, it was shown that activation-enhancing effects of job resources were equally likely to occur in case of a match between demands and resources as in case of no such match (both on the global and on the specific level). In sum, results in Chapter 2 suggested that there is support for the matching hypothesis, but that this hypothesis particularly holds for the stress-buffering effect of job resources. If matching cognitive or physical job resources are unavailable in, respectively, a cognitively or physically demanding job, non-matching emotional job resources seem to be a good alternative as stress buffer.

In addition to the matching hypothesis, the triple match principle was also tested in Chapter 2. According to the triple match principle, the likelihood of finding moderating effects of job resources increases as the level of match between demands, resources, and outcomes increases. Results in Chapter 2 partly supported the triple match principle for the

overall DISC Model and the compensation principle. That is, both for the overall DISC Model and the compensation principle, results were in line with the triple match principle, except for the finding that valid moderating effects of job resources were equally likely to occur in case of double matches as in case of non-matches. For the balance principle, however, no results were found that supported the triple match principle. More specifically, results revealed that activation-enhancing effects of job resources were equally likely to occur in case of triple matches, double matches, and non-matches. So, like the matching hypothesis, there is support for the triple match principle, but this principle particularly seems to hold for the stress-buffering effect of job resources.

Functional self-regulatory behavior: opening up the black box of job stress

In Chapters 3 and 4, two vignette studies were conducted to gain a better understanding of the self-regulation processes involved in the activation of job resources (i.e. to open up the black box of job stress). The first vignette study (Chapter 3) was conducted among 217 Dutch service workers, and examined the perceived accessibility and relevance of matching and non-matching job resources, along with the inclination to use matching and non-matching job resources in different, hypothetical, demanding situations at work. It was hypothesized that people generally opt for matching job resources, both in terms of relevance and use. Results showed that different patterns could be observed regarding the availability, relevance, and use of matching and non-matching job resources in a physically demanding situation at work, whereas no such differences were observed in a cognitively and emotionally demanding job. That is, in case of cognitive or emotional job demands, specific types of job resources that were believed to be most available were also perceived as the most relevant assets to deal with these types of job demands, and most likely to be used for this purpose. In addition, contrary to our predictions, there generally seemed to be a dominant role for emotional job resources in the job stress process. That is, in general, emotional job resources were believed to be highly available, relevant, and likely to be used across the different types of demanding jobs, whereas the role of physical job resources and, to a lesser extent, cognitive job resources appeared weaker and, as expected, mainly restricted to corresponding types of job demands. Because workers did not merely show functional self-regulatory behavior but were also inclined to use less functional non-matching job resources, a second vignette study was conducted among 92 undergraduates from a Dutch university of technology (Chapter 4). The aim of this study was to examine the extent to which people are inclined to use non-matching job resources as a substitute for matching job resources, and as a supplement to matching job

resources. In line with our predictions, results revealed that people were generally inclined to use matching job resources, and that non-matching job resources often tended to be used as a supplement to matching job resources rather than as a substitute for matching job resources. However, results also revealed that there particularly seemed to be a dominant role for non-matching cognitive job resources, whereas non-matching emotional job resources tended to be used less often than expected. In sum, results in Chapters 3 and 4 suggested that, in case of high job demands, people generally have a strong preference for matching job resources, both in terms of relevance and use. Although the activation of non-matching job resources also appears to be an important aspect of people's self-regulatory behavior in demanding situations at work, non-matching job resources seem particularly likely to be used as a supplement to matching job resources rather than as a substitute for matching job resources.

Functional self-regulatory behavior: the role of personal characteristics

In Chapters 5 and 6, a longitudinal survey study (Chapter 5) and a daily diary study (Chapter 6) were conducted to examine the moderating effect of, respectively, specific active coping styles and regulatory focus on the stress-buffering effect of job resources. The longitudinal survey study was conducted among 317 Belgian teachers. It was hypothesized that stress-buffering effects of job resources on the longitudinal relation between job demands and job strain are more likely to occur for workers who have a matching active coping style (i.e. an active coping style that corresponds to the type of job resources) than workers who have a non-matching active coping style (i.e. an active coping style that does not correspond to the type of job resources). However, contrary to our predictions, results revealed that neither type of active coping style (i.e. cognitive, emotional, or physical active coping style) interacted with job resources to moderate the longitudinal relation between job demands and job strain. As a result, there was no statistical rationale for testing the synergistic effect of matching (versus non-matching) active coping styles. In Chapter 6, a daily diary study was conducted among 64 Dutch nursing home nurses in which we investigated the moderating effect of worker regulatory focus on the within-person stress-buffering effect of job resources. It was hypothesized that stress-buffering effects of job resources on the short-term relation between job demands and job strain (i.e. at day level) are more likely to occur for workers who are predominantly promotion focused than workers who are predominantly prevention focused. However, contrary to our expectations, worker regulatory focus did not make a significant contribution to the prediction of job strain. More precisely, in the context of day-to-day working life, within-person stress-buffering effects of job resources were equally likely to

occur for workers who were predominantly promotion focused as for workers who were predominantly prevention focused. In sum, results in Chapters 5 and 6 showed that workers' personal characteristics (i.e. specific active coping styles and regulatory focus) did not moderate the stress-buffering effect of job resources, suggesting that the activation of matching and non-matching job resources during stressful situations at work does not relate to these particular person variables.

In addition to the moderating effect of workers' personal characteristics, the matching hypothesis was tested with respect to the long-term relation between demands, resources, and strain (Chapter 5) and the short-term relation between demands, resources, and strain as it occurs within individuals (Chapter 6). However, contrary to our predictions, in both studies stress-buffering effects of job resources were equally likely to occur in case of a match between specific types of job demands and job resources as in case of a non-match between specific types of job demands and job resources. In other words, both for long-term stressor-strain relations and within-person short-term stressor-strain relations, the functionality of matching job resources (as compared to non-matching job resources) seems less pronounced than could have been expected on the basis of the findings in Chapter 2.

7.2 Methodological considerations

Though this thesis has many strong points, such as a range of sophisticated designs (i.e. a quasi-experiment, an experiment, and two field studies), methods (i.e. two vignette studies, a two-wave panel survey, and a daily diary study) and statistical techniques (i.e. repeated measures MANOVA, structural equation modeling, and multilevel modeling), there are some methodological limitations that should be considered when interpreting the results. These limitations relate to the design, sample, measures, and statistical analyses of the studies in Chapters 2 to 6.

Study design

In Chapter 2, we studied the functionality of matching job resources. Conclusions were drawn on the basis of a review of 29 DISC studies. An assessment of the quality of the DISC studies revealed, however, that 18 of the 29 studies could be categorized as low quality studies and only two studies could be labeled as high quality studies. In general, studies received the lowest ratings on the methodological criteria design and measures, suggesting that our results may be biased. That is, as most studies had a cross-sectional design, data did not give a decisive answer about the causal relation between demands, resources, and strain. As a result,

we may have detected more valid moderating effects of job resources than there actually exist. In addition, because the quality of the measures was not always sufficient, it is plausible that we would have obtained different results if the 29 DISC studies had been repeated.

In the vignette studies in Chapters 3 and 4, participants were presented different hypothetical, demanding situations at work (i.e. vignettes representing cognitive, emotional, or physical job demands) to examine the self-regulation processes involved in the activation of job resources. One limitation of both studies is that the vignettes used might have caused a priming effect, so that people were particularly likely to focus their attention on matching job resources. In addition, in reality, people might have responded differently than they thought (and indicated) they would do. However, if there really had been a strong priming effect, we would have found almost perfect matches in all types of demanding situations at work, but we have not. Moreover, although vignettes are hypothetical in nature, they have the potential to induce similar effects as those obtained in real life situations (cf. Blodgett, Hill & Tax, 1997; Levesque & McDougall, 2000).

Finally, in Chapter 5, the moderating effect of specific active coping styles on the stress-buffering effect of job resources was examined with respect to the longitudinal relation between job demands and job strain. Because active coping style was only measured during the third and final wave of the study, we had no other choice than to include the active coping style scales that had been filled out at Time 3. The fact that active coping style was measured at a different point in time than demands, resources, and strain does not necessarily need to be problematic as active coping style reflects a stable personal characteristic (cf. Latack & Havlovic, 1992). However, because active coping style was measured at Time 3, the final study sample consisted of 317 teachers rather than the 443 teachers who had still been participating in the study at Time 2. This smaller sample may have reduced the power of the study, which could be an explanation for why we did not find support for the moderating effect of specific active coping styles.

Study sample

A recurring fact in Chapters 2 to 6 is the homogeneity of the samples under study. For instance, in Chapter 2, the majority of the DISC studies was conducted in the service sector, particularly in health care. In the vignette study in Chapter 3 and the diary study in Chapter 6, health care workers predominated as well, whereas the teachers in the longitudinal study in Chapter 5 were also employed in the service sector. One limitation of homogeneous samples is that homogeneity could cause power problems due to a lack of variance in job demands and

job resources (Kristensen, 1995). However, since samples from health care have much natural variance (Fox, Dwyer, & Ganster, 1993; Ganster & Fusilier, 1989), power problems may not be at issue here (at least not in the health care samples under study). Nonetheless, the fact that most respondents were employed in the service sector, and in health care in particular, does pose questions about the generalizability of the results to other sectors and occupational professions. Moreover, within occupational professions, ecological validity may also be at issue. For instance, in Chapter 5, the sample under study consisted of 317 beginning teachers. As beginning teachers still lack experience, they may not have known yet how to cope adequately with the demands imposed on them. Our findings concerning the matching hypothesis and the moderating effect of specific active coping styles in the longitudinal study in Chapter 5 may therefore not be representative for the teaching profession in general. Further, the study sample in Chapter 6 may not be completely representative of the nursing population in the nursing homes concerned (and hence nursing homes in general), as participants in the daily diary study were selected on the basis of their scores on two regulatory focus scales (i.e. a prevention focus scale and a promotion focus scale) that had been included in a baseline questionnaire survey. That is, nurses were only selected if they had scored in the highest tertile of the promotion focus scale and the lowest tertile of the prevention focus scale, or vice versa. Nurses who had scored differently on these scales were excluded from the study. Finally, in the vignette study in Chapter 4, data were collected among a sample of undergraduates. Although we have reason to believe that, in this particular study, a student sample is warranted, one should be careful when generalizing the results of this study to the working population.

Measurement instruments

Since several scales had somewhat lower alphas, the findings in Chapters 3, 5, and 6 may not be fully reliable. In addition, as some scales in Chapters 3 and 6 have been replaced by one-item scales, results of these studies may be specific to the particular item(s) concerned. It should be noted, however, that the one-item scales have been included in favor of the studies' internal consistency, and turned out to be valid substitutes for the multi-item scales (i.e. re-analyzing the data with the multi-item scales showed nearly identical results). Finally, in Chapter 3, data were analyzed by means of a conservative 'top-down approach' (see Figure 3.1 in Chapter 3). Though we tested whether it was justified to examine the availability, relevance, and use of job resources for each type of job demands (see multivariate tests), ideally, we should have done the same for the availability, relevance, and use of job

resources. That is, ideally, we should have tested whether it was justified to examine the availability, the relevance, and the use of job resources separately. However, this was statistically not possible, as the relevance of job resources was measured with a two-point scale (yes / no) and the availability and use of job resources were measured with a three-point scale (yes / limited / no).

Statistical analyses

In Chapters 5 and 6, it was investigated whether the stress-buffering effect of job resources is moderated by specific active coping styles and regulatory focus, respectively. However, as specific active coping styles were measured at Time 3 rather than at Time 1 (i.e. simultaneously with job demands and job resources), and we wanted to compare nurses who were *predominantly* promotion focused with nurses who were *predominantly* prevention focused, both specific active coping styles and regulatory focus were included as dichotomous variables in the analyses. That is, we created two sub-samples for each specific active coping style to conduct multiple group analyses, while regulatory focus was included as a dummy variable in the multilevel analyses. Because specific active coping styles and regulatory focus were dichotomous variables, part of the variance was removed from these variables, which may have caused power problems (Stone-Romero & Anderson, 1994). This might explain why we did not find support for the moderating effect of specific active coping styles and regulatory focus on the stress-buffering effect of job resources.

7.3 Theoretical implications

The aim of this section is to discuss the theoretical implications of the main findings of this thesis. Specifically, this section addresses the following questions: (1) what conclusions can be drawn regarding the two key assumptions underlying the DISC Model?, (2) what do the findings of this thesis imply for the DISC Model?, and (3) how do the findings relate to job stress research in general?

Key assumptions underlying the DISC Model

The studies in this thesis examined two key assumptions underlying the DISC Model. The first assumption is that matching job resources are more functional resources than non-matching job resources to deal with specific types of demanding situations at work. The second assumption underlying the DISC Model is that people who are faced with a specific type of demanding situation at work are generally inclined to show functional self-regulatory

behavior (i.e. to use matching job resources to deal with these job demands). Next, these two assumptions will be discussed based on the main findings from Chapters 2 to 6.

First assumption: the functionality of matching job resources

In general, results in Chapter 2 showed that moderating effects of job resources are more likely to occur if there is a complementary fit between specific types of job demands and job resources (i.e. J-J fit) than if there is no such fit, suggesting that matching job resources are more functional resources than non-matching job resources to deal with specific types of demanding situations at work. However, a closer look at the results revealed that matching job resources seem particularly functional if they are used in demanding situations at work that have an adverse impact on worker health and well-being. That is, if matching job resources are employed as stress buffers. If matching job resources are employed to strengthen the relation between job demands and worker activation, moderating effects of job resources are less likely to occur. In other words, matching job resources (as compared to non-matching job resources) may be particularly functional as stress buffers, but not as activation enhancers.

Since matching job resources seem particularly functional as stress buffers, it is remarkable that we found no support for the matching hypothesis in Chapters 5 and 6. That is, results did support neither the matching hypothesis when testing stress-buffering effects of job resources on the longitudinal relation between job demands and job strain (Chapter 5), nor when testing within-person stress-buffering effects of job resources on the short-term relation between job demands and job strain (i.e. at day level). Though we have reason to believe that adaptation is at issue here (see Chapters 5 and 6), the findings in Chapters 5 and 6 make one think. More specifically, because evidence for the matching hypothesis in Chapter 2 could not be replicated in the studies in Chapter 5 (longitudinal design) and Chapter 6 (within-person design), there is reason to believe that, due to the large number of cross-sectional studies in Chapter 2, results in this chapter may be biased. That is, because cross-sectional data do not give a decisive answer about the causal relation between demands, resources, and strain, the *actual* percentage of theoretically valid moderating effects of job resources might be lower, while the relative functionality of matching job resources (versus non-matching job resources) might be less pronounced than has been suggested in Chapter 2. However, in anticipation of future reviews that will include more studies with a longitudinal and/or within-person design, from the findings in Chapter 2 one may tentatively conclude that, as far as the stress-buffering effect of job resources is concerned, the matching hypothesis seems valid.

In addition to matching job resources, this thesis revealed that non-matching job resources may also operate as stress buffers. In other words, if workers are faced with high job demands that have an adverse impact on their health and well-being, Job-Job (J-J) misfit does not seem to be dysfunctional per se. A noticeable finding in this matter is the functionality of non-matching emotional job resources, which seem to serve as a panacea against various types of job demands (see Chapter 2). However, it should be noted that these results relate to a group of respondents that mainly consisted of workers in the service sector, and in health care in particular. Therefore, one explanation for the functionality of non-matching emotional job resources could be that emotional job resources are needed to deal with the emotional demands that are an integral part of service jobs (Grandey, 2003; Zapf, Vogt, Seifert, Mertini, & Isic, 1999). Moreover, given the nature of health care professions (i.e. helping and caring), emotional job resources may be more prevalent (and hence better accessible) in health care than other types of job resources. Future research could reveal to what extent the functionality of non-matching job resources as a stress buffer is specific to the sector and occupational group under study.

Second assumption: functional self-regulatory behavior

Based on the findings in Chapters 3 and 4, it can be concluded that people who are faced with high job demands generally opt for matching job resources, both in terms of relevance and use. In other words, there seems to be a complementary fit between matching job resources and workers' self-regulation processes involved in the activation of job resources (i.e. Person-Job (P-J) fit). However, the conclusion that people generally strive for J-J fit is not only based on the finding that people had a strong preference for matching job resources as compared to non-matching job resources. This conclusion is also based on the finding that, once people had decided to activate non-matching job resources, they were particularly inclined to use non-matching job resources as a supplement to matching job resources rather than as a substitute for matching job resources. The specific type of non-matching job resources that people tended to use seems strongly related to their frame of reference (cf. Vonk, 1999). For instance, results in Chapters 3 and 4 revealed that service workers who were mainly working in health care had a strong preference for non-matching emotional job resources, whereas undergraduates from a university of technology were more inclined to activate non-matching cognitive job resources. Future research could reveal to what extent the choice for specific types of non-matching job resources depends on people's frame of reference (as compared to the prevalence of specific types of job demands and job resources, as suggested above).

In Chapters 5 and 6, it was hypothesized that, due to individual differences in personal characteristics (i.e. specific active coping styles and regulatory focus), some workers are more inclined to activate (matching) job resources than other workers, which, in turn, will be expressed in the number and types of stress-buffering effects of job resources that are found for the individuals involved. In other words, for (matching) job resources to operate as stress-buffers, workers should have personal characteristics that facilitate them to activate (matching) job resources. In case of active coping style, this type of complementary fit between (matching) job resources and workers' personal characteristics (i.e. P-J fit) was even further specified to the specific resource domains, assuming that active coping style should belong to the same domain as job resources (i.e. job resources and active coping style should both be cognitive, emotional, or physical in nature) to moderate the stress-buffering effect of job resources. However, specific active coping styles and regulatory focus did not moderate the stress-buffering effect of job resources, suggesting that a complementary fit between (matching) job resources and workers' personal characteristics is of no importance for stress-buffering effects to occur, neither with respect to the long-term relation between job demands and job strain (active coping style), nor with respect to the short-term relation between job demands and job strain as it occurs within individuals (regulatory focus).

In all, we may conclude that people generally have a strong preference for matching job resources, both in terms of relevance and use, but that the activation of non-matching job resources is also an important aspect of people's self-regulatory behavior in demanding situations at work. People particularly seem to activate non-matching job resources as a supplement to matching job resources. The specific type of non-matching job resources that people are inclined to activate could be strongly related to the sector and/or occupational profession in which they work. As yet, the choice for matching and non-matching job resources does not seem to relate to workers' personal characteristics (i.e. specific active coping styles and regulatory focus).

The DISC Model

Based on the findings of this thesis, we may conclude that the DISC Model as it stands now seems warranted, regarding both the two key assumptions on which the DISC Model's predictions have been based and the predictor variables included in the model (i.e. job characteristics). However, it should be noted that the overall evidence for the matching hypothesis as well as its extended version, the triple match principle, can be largely explained by findings for the compensation principle (i.e. the stress-buffering effect of job resources).

As far as the activation-enhancing effect of job resources is concerned, results did neither support the matching hypothesis, nor the triple match principle. In anticipation of future reviews investigating the functionality of matching job resources as stress buffers and activation enhancers, one should therefore be careful drawing any firm conclusions regarding the DISC Model.

Job stress research

The results of this thesis suggest that, in order to show moderating effects of job resources, it is important to match job resources to job demands, particularly if one examines the stress-buffering effect of job resources. More specifically, the findings indicated that if job resources are matched to job demands, the likelihood of finding stress-buffering effects of job resources increases. In addition, results revealed that if people are faced with high job demands, they are generally inclined to use functional matching job resources. It is therefore recommended that job stress researchers include more specific, corresponding types of job demands and job resources in their studies than is currently the case (cf. Viswesvaran, Sanchez, & Fisher, 1999). For instance, one can think of the construct 'social support', which has often been examined as a moderator of the relation between job demands and job strain (see e.g. Bakker & Demerouti, 2007; Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010). Social support can be considered a global construct, as it either refers to emotional support (an emotional job resource), informational support (a cognitive job resource), or instrumental support (a physical job resource) (Cohen & Wills, 1985). By increasing both the specificity with which social support is measured and the extent to which this construct is matched to the type of job demands concerned, social support will show a better complementary fit with job demands, and will therefore be more likely to operate as a stress buffer (cf. de Jonge, van Vegchel, Shimazu, Schaufeli, & Dormann, 2010; Sargent & Terry, 1998).

As regards the moderating effect of personal characteristics on the stress-buffering effect of job resources, previous research has shown mixed results. For instance, a study by De Rijk, Le Blanc, Schaufeli, and de Jonge (1998) revealed that worker active coping style operates as a moderator of the stress-buffering effect of job resources. In contrast, Edwards, Baglioni, and Cooper (1990) did not find support for the moderating effect of coping style. To the best of our knowledge, the studies in Chapters 5 and 6 are the first studies that have ever examined the moderating effect of specific active coping styles and regulatory focus on the stress-buffering effect of job resources. Results revealed that, to show stress-buffering effects of job resources on the long-term relation between job demands and job strain, it makes no

difference whether or not individual differences in specific active coping styles are taken into account. In a similar vein, results revealed that, to show within-person stress-buffering effects of job resources on the short-term relation between job demands and job strain, it makes no difference whether or not individual differences in regulatory focus are taken into account. In other words, the studies in this thesis emphasize the importance of job rather than personal characteristics, implying that there is no need to extend job stress models with specific active coping styles and regulatory focus (cf. Cox, 1978). However, given the mixed results for the moderating effect of workers' personal characteristics, more research is needed to reveal whether the current findings are the rule rather than the exception.

7.4 Practical implications

Because job demands can often not be reduced, the idea of increasing job resources instead is appealing to current working life. In Chapter 2, results revealed that it is important that employers provide workers with job resources that *match* the type of job demands concerned, particularly if workers are faced with job demands that have an adverse impact on their health and well-being. Though results in Chapters 5 and 6 did not support the matching hypothesis, neither the findings of the longitudinal study in Chapter 5, nor the findings of the daily diary study in Chapter 6 suggested that non-matching job resources are more functional stress buffers than matching job resources. Therefore, it is recommended that employers provide workers with job resources that match the type of job demands concerned. For instance, if work is characterized by job demands that impinge on mental processes (e.g. finding solutions for complex problems), employers could provide workers with sources of informational support, or job autonomy. In a similar vein, if workers need to deal with job-inherent emotions (e.g. feeling threatened by an aggressive patient) and/or organizationally desired emotions (e.g. staying friendly to a rude customer) during interpersonal transactions, employers could provide emotional support, or stimulate emotional support among colleagues (e.g. a listening ear during work meetings). Finally, if work is characterized by physical job demands (e.g. moving heavy objects), employers could facilitate instrumental support from colleagues, or provide workers with technical equipment (e.g. a chain saw) or ergonomic aids (e.g. an adjustable chair). If employers provide workers with job resources that match the type of job demands concerned, they may prevent the development of job strain, both in the long-term and in the short-term. As far as positive outcomes such as learning, growth, creativity, and performance are concerned, matching job resources seem less functional. However, there has not been much research on the balance principle yet. In anticipation of future studies on

the activation-enhancing effect of matching job resources, it is therefore recommended that employers who aim to stimulate positive outcomes offer workers a total package of job resources in which both matching and non-matching job resources are largely available.

Results in Chapters 3 and 4 further revealed that people are generally inclined to use matching job resources. This implies that if employers make matching job resources available to workers, they will generally be used. However, it is not only a matter of offering workers matching job resources. Because people are also inclined to use non-matching job resources, workers need to become aware of the availability of matching job resources, the relevance of matching job resources, and the importance of the actual use of matching job resources. This particularly seems to apply to physically demanding jobs, in which different patterns have been observed between the availability, relevance, and use of matching and non-matching job resources (see Chapter 3). More specifically, in case of physical job demands, the perceived availability of job resources does not guarantee that workers consider these job resources as relevant assets to deal with job demands, while neither the perceived availability nor the perceived relevance of job resources guarantees that workers will actually use job resources. Workers' frame of reference could play a key role in making workers aware of the importance of matching job resources in the job stress process. That is, by reframing workers' cognitive schemas, workers could become more alert to matching job resources in the work environment, and more inclined to actually use these job resources to deal with their demanding jobs (cf. Baron & Boudreau, 1987; Gibson, 1979). In any case, though the role of workers' frame of reference on the self-regulation processes involved in the activation of job resources is still speculative, what we do know from the findings in Chapters 5 and 6 is that workers' personal characteristics (i.e. specific active coping styles and regulatory focus) did not moderate the stress-buffering effect of job resources. In other words, specific active coping styles and regulatory focus do not seem to affect the activation of available job resources during stressful situations at work. As far as personal selection is based on immunity to job stress, there seems, hence, no need to address these personal characteristics in the selection procedure.

7.5 Recommendations for future research

Since the review in Chapter 2 was mainly based on cross-sectional studies and many studies included measures with somewhat lower reliabilities, the empirical findings for the matching hypothesis and its extended version, the triple match principle, could be biased. As a result, we were unable to draw firm conclusions on the functionality of matching job resources in

specific demanding situations at work as well as on the proposition that the likelihood of finding moderating effects of job resources increases as the match between demands, resources, and outcomes increases. To be able to draw more firm conclusions on the matching hypothesis and the triple match principle, it is recommended that in future research the quality of studies on the DISC Model will be improved by the use of longitudinal designs and more reliable measures. Though, in practice, the choice for a particular time lag often depends on practical circumstances (i.e. time, money), it is recommended that future longitudinal studies will use time lags of various lengths (either within or across studies). In this way, it can be verified whether the findings in Chapter 5 reflect the actual functionality of matching job resources, or whether the findings are determined by the specific time lag that might either have been too short or too long for demonstrating lagged stress-buffering effects of matching job resources. In addition, it is desirable that in studies on the DISC Model all types of job demands, job resources, and job outcomes (i.e. cognitive, emotional, and physical demands, resources, and outcomes) will be included, and all possible matches (i.e. triple matches, double matches of common kind, double matches of extended kind, and non-matches) will be examined, with regard to both the compensation principle and the balance principle. In other words, to test the DISC Model, it is recommended that in future studies a complete test of the DISC Model will be conducted that includes both negative and positive outcomes.

One subject that has been mentioned briefly in Chapter 3 is the way in which job resources are measured in survey studies. Specifically, in survey studies, workers are usually asked to indicate whether job resources are available in the work environment, on the assumption that available job resources are also automatically activated to deal with job demands. However, as shown in Chapters 3 and 4, this can be generally assumed for matching job resources, but the assumption is less plausible for non-matching job resources. More precisely, results in Chapters 3 and 4 showed that people who are faced with high job demands are generally inclined to use matching job resources. It is therefore recommended that in future studies on job stress and the DISC Model in particular, each specific type of job resources (i.e. cognitive, emotional, and physical job resources) will be measured in relation to each specific type of job demands (i.e. cognitive, emotional, and physical job demands), and workers will be asked to indicate to what extent they *use* the specific type of job resources to deal with the specific type of job demands concerned. Because the availability of job resources in the work environment does not automatically imply that these job resources are also actually used, measuring the use of specific types of job resources in relation to

specific types of demanding situations at work could increase the likelihood of finding moderating effects of job resources on the relation between job demands and job outcomes.

Results in Chapters 3 and 4 suggested that people's frame of reference could influence the activation of matching and non-matching job resources in demanding situations at work. Future research could empirically investigate the role of workers' frame of reference in the investment of job resources, for instance, through a number of experiments in which participants' frame of reference is manipulated. If it turns out that workers' frame of reference affects the investment of matching and non-matching job resources, it will be desirable to find an optimal way in which workers, through their frame of reference, can be incited to activate matching job resources. Combined with job redesign interventions (i.e. offering matching job resources), reframing workers' frame of reference could be an important step in the reduction of job strain and, possibly, the enhancement of positive outcomes such as learning, growth, creativity, and job performance.

Results of the studies in Chapters 5 and 6 did neither support the matching hypothesis with respect to the long-term relation between demands, resources, and strain, nor with respect to the short-term relation between demands, resources, and strain as it occurs within individuals. In addition, it was shown that neither specific active coping styles, nor regulatory focus moderated the stress-buffering effect of job resources. As noted before, to be able to draw firm conclusions regarding the functionality of matching job resources in specific demanding situations at work, more longitudinal studies on the matching hypothesis are needed. In addition, given that previous studies have shown mixed results for the moderating effect of personal characteristics, and that the studies in Chapters 5 and 6 are, to the best of our knowledge, the only studies in which the moderating effect of specific active coping styles and regulatory focus have ever been examined, the moderating effect of these person variables could be further examined in future studies, both with respect to the long-term and short-term relation between demands, resources, and strain. Further, it is recommended that in future studies workers' personal characteristics will be measured on all measurements in time, possibly combined with a baseline measurement (e.g. a questionnaire survey). In addition, to improve the power of these studies, rather than including person variables as dichotomous variables, as was done in this thesis, person variables could be included as continuous variables.

Finally, there are two methodological issues that need further consideration in future research. First, the study samples in this thesis were not exceptionally large, but all the more homogeneous (i.e. mainly service sector / health care). In addition, one study was based on a

sample of students who did have work experience, but who were not part of the working population. To generalize findings to the working population in general, it is recommended that in future studies larger, multi-sector and multi-occupation samples will be included. If this type of studies is not feasible, researchers may at least focus on professions that are not related to the service sector or health care (see e.g. Van de Ven & Vlerick, 2010; Van de Ven, Vlerick, & de Jonge, 2008). The second issue that needs further consideration is that many scales of the DISC studies in Chapter 2 appeared to be unreliable. The same problem was encountered in the studies in Chapters 3, 5, and 6, particularly for the scales of the DISC questionnaire (i.e. DISQ), which had been used to measure cognitive, emotional, and physical job demands and job resources. To draw more firm conclusions regarding the DISC Model, it is recommended that in future studies researchers will include more reliable measures. Although the DISQ has already been revised several times based on new psychometric data (see DISQ 2.1 and DISQ-S 2.1, de Jonge et al., 2009a; de Jonge et al., 2009b), further improvement of the reliability of the DISQ scales should be strived for.

7.6 Concluding remarks

In this thesis, we tested two key assumptions underlying the DISC Model, namely the idea that (1) matching job resources are more functional resources than non-matching job resources to deal with specific types of demanding situations at work, and (2) workers who are faced with a specific type of demanding situation at work are generally inclined to use matching job resources to deal with these job demands. In general, it was concluded that the DISC Model as it stands now seems warranted, both regarding the two key assumptions underlying the DISC Model and the predictor variables included in the model (i.e. job characteristics). However, research on the DISC Model is still in its infancy, both in terms of the model's key principles and its theoretical underpinnings. In order to make predictions about the functionality of matching job resources and workers' self-regulatory behavior in specific demanding situations at work, researchers should become aware of the strengths and weaknesses of the DISC Model. Or, as Higgins (2006, p. 550) put it: 'to understand a theory and use it effectively, it is essential to learn its boundary conditions – where it makes predictions and where it is simply silent'. Although this thesis gave the initial impetus, more research on the DISC Model is badly needed.

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Appendix A

One example vignette (i.e. hypothetical emotional situation at work) followed by three example items of successively cognitive, emotional, and physical job resources:

*Suppose worker X finds him/herself in a situation at work in which s/he is faced with **severe emotional demands**, like dealing with clients, colleagues, or supervisors who are hard to please; displaying organizationally desired emotions that are inconsistent with ones current feelings; being faced with threatening situations, et cetera. What could worker X do to resist or diminish the emotional demands posed on him/her?*

To resist or diminish the emotional demands.....

1. Worker X will have the opportunity to vary complex tasks with simple tasks

Relevant		***Available***			***Use***		
Yes	*No*	*Yes*	*Limited*	*No*	*Yes*	*Limited*	*No*

2. Other people (e.g. clients, colleagues, or supervisors) will be a listening ear for worker X when s/he has faced a threatening situation.

Relevant		***Available***			***Use***		
Yes	*No*	*Yes*	*Limited*	*No*	*Yes*	*Limited*	*No*

3. Worker X will be able to use adequate technical equipment to accomplish physically strenuous tasks.

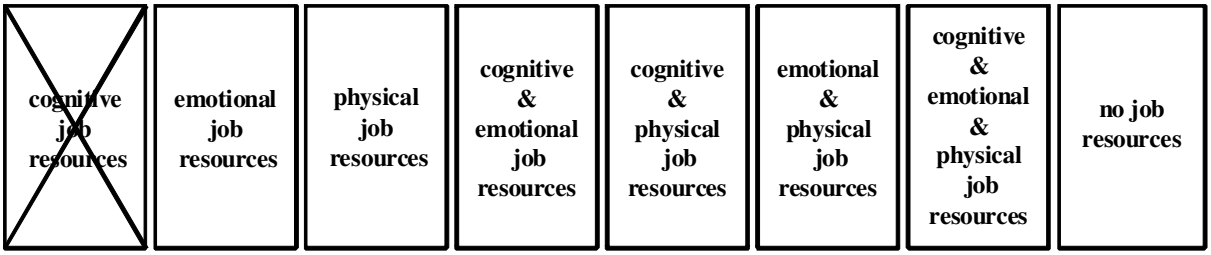
Relevant		***Available***			***Use***		
Yes	*No*	*Yes*	*Limited*	*No*	*Yes*	*Limited*	*No*

N.B. Participants were told to imagine themselves being worker X

Appendix B

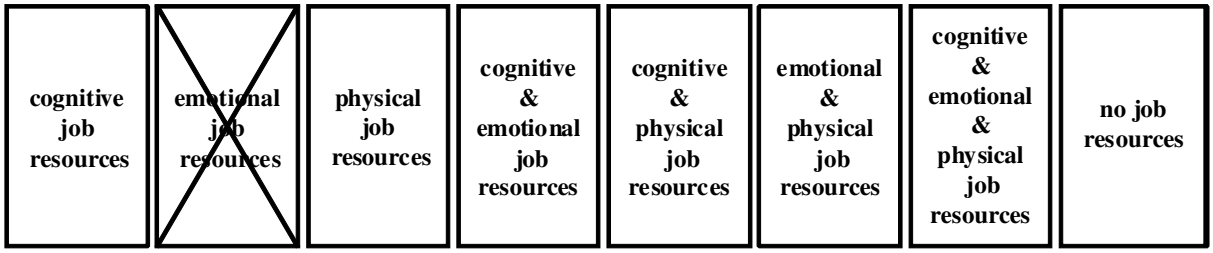
Examples of a cognitive, an emotional, and a physical vignette followed by the eight response options:

You work as an accountant in an audit office. Your main tasks are checking annual accounts, offering administrative support, and giving tax and financial advice to private individuals and companies. An entrepreneur who wants to export his product to Norway has asked you to advice him. How should he deal with the export and what may be the financial consequences? Should he open an office in Norway? And what about the sales tax when he supplies a Norwegian company? Though you have some experience with these subjects, it turns out to be a complex task that requires a lot of thinking. The client and you have agreed that you will advise him within two days. You are weighing the pros and cons, but you are unable to come up with a concrete advice. What kind(s) of job resources would you use in this situation?

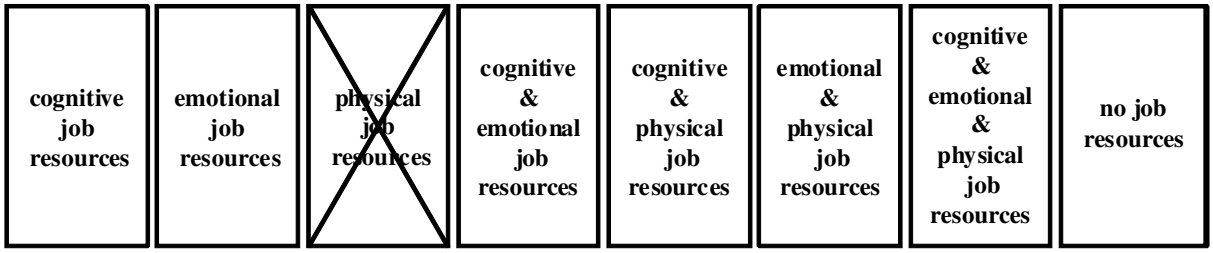


You work as a family guardian for the youth welfare foundation. It is your task to guide and support families that are faced with child-rearing problems. Most of the time, children can stay at home, but sometimes – by judicial decision – it is decided to place a child in care. Yesterday, you have made such a decision. It concerns a single-parent family. The mother, who tries to raise her seven-year-old daughter by herself, has an intellectual disability. Though you are of the opinion that the mother loves her daughter and would never hurt her, she has difficulty raising her. The mother leads a very unstructured life and tends to change her day-night rhythm and that of her daughter. Moreover, meals are often missed and personal hygiene is poor. Your guidance and that of other aid organizations seems no longer adequate. Today, you have informed the mother about your decision to place her daughter in care. This message is a great blow to her and she is completely upset. Her daughter is

everything to her. You feel sorry for the mother, but you have to stay professional. What kind(s) of job resources would you use in this situation?



You work as a cashier in a supermarket. It is two days till Christmas. Many people are already off from work and go out shopping. The evening has just begun and you have already spent an entire afternoon behind the cash desk. Due to the Christmas rush, the supermarket will be open till 10 p.m. and this evening, you will be working till closing time. You have to sit in the same posture for hours, and because there is limited space behind the cash desk, you have hardly any room to move. Moreover, the scanning of products and the handling of payments constantly require the same movement. Your back, neck, and shoulders start giving you trouble. However, you still have a couple of hours to go, and tomorrow you will have to work as well. What kind(s) of job resources would you use in this situation?



Summary

Job demands, job resources, and self-regulatory behavior: Exploring the issue of match

In the field of Industrial and Organizational psychology, several job stress models have been developed that aim to explain the relation between job demands, job resources, and job strain. One of these job stress models is the Demand-Induced Strain Compensation (DISC) Model. The aim of this thesis was to test two key assumptions underlying the DISC Model. The first key assumption was that specific types of job demands (i.e. cognitive, emotional, and physical job demands) can best be dealt with through the activation of job resources that correspond to the type of job demands concerned (i.e. matching job resources) rather than job resources that do not correspond to the type of job demands concerned (i.e. non-matching job resources). The second key assumption was that workers who are confronted with a specific type of demanding situation at work, are generally inclined to use matching job resources to deal with these job demands. To test these two key assumptions, five studies were designed that together make up a triptych. In the first part of the triptych, the first key assumption was tested (Chapter 2). The second key assumption was tested in the second and third part of the triptych. This latter assumption was tested from two different perspectives. More specifically, in the second part of the triptych (Chapters 3 and 4), two studies were designed to gain a better understanding of the self-regulation processes involved in the activation of job resources (i.e. alertness to available job resources, evaluation of the relevance of job resources, and decision making regarding the actual use of job resources). In the third part of the triptych (Chapters 5 and 6), the moderating effect of workers' personal characteristics (i.e. specific active coping styles and regulatory focus) on the stress-buffering effect of job resources was examined, assuming that these person variables facilitate/inhibit the activation of job resources in demanding situations at work. The studies in Chapters 2 to 6 are summarized below.

A review of 29 DISC studies (*Chapter 2*) was conducted to test both the matching hypothesis (i.e. moderating effects of job resources are more likely to occur in case of a match between job demands and job resources than in case of a non-match) and its extended version, the triple match principle (i.e. the likelihood of finding moderating effects of job resources increases as the level of match between demands, resources, and outcomes increases). Results

showed that the matching hypothesis and the triple match principle were partly supported with respect to the stress-buffering effect of job resources, whereas no support was found with respect to the activation-enhancing effect of job resources.

In *Chapter 3*, a quasi-experimental survey study with vignettes was conducted among 217 Dutch service workers. The aim of this study was to examine workers' beliefs about the availability, relevance, and use of specific types of job resources in similar types of demanding situations at work. Results revealed that workers who are faced with high job demands generally opt for matching job resources, both in terms of relevance and use. However, despite their preference for matching job resources, workers were also inclined to use less functional non-matching job resources. Because the activation of non-matching job resources seems to be an important aspect of people's self-regulatory behavior in demanding situations at work, a second vignette study was conducted among 92 undergraduates from a Dutch university of technology (*Chapter 4*). The aim of this study was to examine the extent to which people would use non-matching job resources as a substitute for matching job resources, and as a supplement to matching job resources. Results showed that, in case of high job demands, people were generally inclined to use matching job resources, and that they would use non-matching job resources more often as a supplement to matching job resources than as a substitute for matching job resources.

In *Chapter 5*, a longitudinal survey study was conducted among 317 Belgian teachers. The aim of this study was to examine whether stress-buffering effects of job resources on the longitudinal relation between job demands and job strain are more likely to occur for workers with a specific active coping style that corresponds to the type of job resources concerned than workers with a specific active coping style that does not correspond to the type of job resources concerned. Three types of active coping styles were distinguished (i.e. cognitive, emotional, and physical active coping styles). However, because neither type of active coping style interacted with job resources to moderate the longitudinal relation between job demands and job strain, there was no statistical rationale for testing the synergistic effect of matching (versus non-matching) active coping styles. In Chapter 6, a daily diary study was conducted among 64 Dutch nursing home nurses to examine whether within-person stress-buffering effects of job resources on the short-term relation between job demands and job strain (i.e. at day level) are more likely to be found for workers who are predominantly promotion focused than workers who are predominantly prevention focused. Results revealed that regulatory focus did not make a significant contribution to the prediction of job strain, implying that there was no support for the moderating effect of regulatory focus.

In all, the studies in this thesis suggested that, as far as the stress-buffering effect of job resources is concerned, matching job resources are more functional resources than non-matching job resources to deal with specific types of demanding situations at work. In addition, it can be concluded that, in case of high job demands, people generally seem to have a strong preference for matching job resources, both in terms of relevance and use. Although the activation of non-matching job resources also appears to be an important aspect of people's self-regulatory behavior in demanding situations at work, non-matching job resources seem particularly likely to be used as a supplement to matching job resources rather than as a substitute for matching job resources. Workers' personal characteristics (i.e. specific active coping styles and regulatory focus) did not moderate the stress-buffering effect of job resources, suggesting that the activation of job resources does not relate to these particular person variables. In anticipation of future research on the DISC Model, it can therefore be tentatively concluded that the DISC Model as it stands now seems warranted, regarding both the key assumption the DISC Model's predictions have been based on and the type of predictors (i.e. job characteristics) included in the model.

Samenvatting (Summary in Dutch)

Job demands, job resources, and self-regulatory behavior: Exploring the issue of match

Binnen de arbeids- en organisatiepsychologie zijn diverse werkstressmodellen ontwikkeld om de relatie tussen werkkenmerken en de gezondheid en het welbevinden van werknemers te verklaren. Een van deze werkstressmodellen is het Demand-Induced Strain Compensation (DISC) Model. Dit proefschrift omvat een reeks empirische studies die tot doel hadden twee kernassumpties te toetsen die ten grondslag liggen aan de principes van het DISC Model. Het onderzoek richt zich in het bijzonder op (1) de vraag of bepaalde combinaties van specifieke werkkenmerken van bijzonder belang zijn in de voorspelling van de gezondheid en het welbevinden van werknemers en (2) het verduidelijken van de rol die werknemers zelf spelen bij de totstandkoming van de relatie tussen specifieke werkkenmerken en de gezondheid en het welbevinden van werknemers.

Binnen het theoretisch raamwerk van het DISC Model worden de gezondheid en het welbevinden van werknemers verklaard door middel van twee werkkenmerken, te weten *taakeisen* en *hulpbronnen*. Taakeisen zijn die dingen die gedaan moeten worden in het werk en die enige mate van inspanning vergen. Hier kan gedacht worden aan het oplossen van complexe problemen, het te woord staan van agressieve cliënten, of het tillen van een zware last. Hulpbronnen, daarentegen, zijn mogelijkheden, data, personen, of dingen die kunnen worden ingezet om met de taakeisen om te gaan. Voorbeelden van hulpbronnen zijn autonomie (bijvoorbeeld de mogelijkheid om de eigen werkmethode te bepalen), emotionele steun van collega's, of ergonomische hulpmiddelen.

Eén belangrijke voorspelling van het DISC Model is dat naarmate de taakeisen van een werknemer toenemen (bijvoorbeeld wanneer men steeds frequenter en/of langduriger zware objecten moet tillen) en de werknemer over onvoldoende hulpbronnen beschikt om met deze taakeisen om te gaan, hij/zij meer *gezondheidsklachten* en een *verminderd welbevinden* zal ervaren. Echter, naarmate werknemers meer hulpbronnen to hun beschikking hebben om met hun taakeisen om te gaan, zullen de gezondheidsklachten en het verminderd welbevinden afnemen. Dit fenomeen, waarbij hulpbronnen de relatie tussen taakeisen en de gezondheid en het welbevinden van werknemers modereren, staat bekend als het *stress buffer effect* van hulpbronnen. Echter, taakeisen hoeven niet enkel tot negatieve uitkomsten te leiden. Naast het

stress buffer effect van hulpbronnen voorspelt het DISC Model namelijk ook een *activatie versterkend effect* van hulpbronnen. Volgens dit principe zullen werknemers die worden geconfronteerd met hoge (maar niet overweldigende) taakeisen en die voldoende hulpbronnen hebben om met deze taakeisen om te gaan, positieve effecten ondervinden. Hier kan gedacht worden aan leren, creativiteit, bevlogenheid, en persoonlijke groei. Werknemers die over onvoldoende hulpbronnen beschikken zullen deze positieve uitkomsten in mindere mate (of helemaal niet) ervaren.

Zowel het voorspelde stress buffer effect van hulpbronnen als het voorspelde activatie versterkende effect van hulpbronnen behoren niet exclusief toe aan het DISC Model; er bestaan diverse theorieën die gelijksoortige voorspellingen doen. Wat het DISC Model echter uniek maakt is de voorspelling dat beide moderatie effecten hoofdzakelijk zullen optreden indien er *overeenstemming* (ofwel een *match*) bestaat tussen het type taakeisen, het type hulpbronnen en het type uitkomsten. Het DISC Model maakt onderscheid tussen drie typen taakeisen, hulpbronnen en uitkomsten, te weten *cognitieve* ('hoofd'), *emotionele* ('hart'), en *fysieke* ('handen') taakeisen, hulpbronnen en uitkomsten. Taakeisen, hulpbronnen en uitkomsten zijn volledig met elkaar in overeenstemming indien zij alle drie cognitief van aard zijn, alle drie emotioneel van aard zijn, of alle drie fysiek van aard zijn. In dit geval is er sprake van een *drievoudige match*, en zullen stress buffer effecten en activatie versterkende effecten van hulpbronnen het vaakst optreden. Deze moderatie effecten zullen minder vaak optreden indien slechts twee van de drie constructen met elkaar in overeenstemming zijn, bijvoorbeeld wanneer hulpbronnen en uitkomsten beide cognitief van aard zijn en taakeisen emotioneel van aard zijn. In een dergelijke situatie spreekt men van een *tweevoudige match*. Tot slot zullen stress buffer effecten en activatie versterkende effecten van hulpbronnen het minst vaak optreden indien er geen overeenstemming bestaat tussen de drie constructen, bijvoorbeeld wanneer taakeisen cognitief van aard zijn, hulpbronnen emotioneel van aard zijn en uitkomsten fysiek van aard zijn (*non-match*). Dit principe, waarbij de kans op moderatie effecten toeneemt naarmate de overeenstemming tussen taakeisen, hulpbronnen en uitkomsten toeneemt, staat bekend als het *drievoudige match principe*.

Omdat er twee typen moderatie effecten worden onderscheiden (stress buffer effecten van hulpbronnen en activatie versterkende effecten van hulpbronnen), kent het drievoudige match principe twee uitvloeisels, te weten het *compensatie principe* en het *balans principe*. Het compensatieprincipe voorspelt dat stress buffer effecten van hulpbronnen vaker zullen voorkomen naarmate de overeenstemming tussen taakeisen, hulpbronnen en uitkomsten toeneemt. Het balans principe voorspelt dat activatie versterkende effecten van hulpbronnen

vaker zullen voorkomen naarmate de overeenstemming tussen taakeisen, hulpbronnen en uitkomsten toeneemt.

Zoals reeds gesteld had dit proefschrift tot doel twee kernassumpties te toetsen die ten grondslag liggen aan de principes van het DISC Model. De eerste assumptie die in dit proefschrift is getoetst, is dat werknemers die worden geconfronteerd met specifieke typen taakeisen (cognitieve, emotionele of fysieke taakeisen), beter gebruik kunnen maken van hulpbronnen die overeenstemmen met het type taakeisen (matchende hulpbronnen) dan hulpbronnen die niet overeenstemmen met het type taakeisen (niet-matchende hulpbronnen). Deze assumptie staat ook bekend als de *match hypothese*. De tweede assumptie die in dit proefschrift is getoetst is dat werknemers die worden geconfronteerd met specifieke typen taakeisen veelal gebruik zullen maken van matchende hulpbronnen teneinde met deze taakeisen om te gaan. Om deze twee kernassumpties te toetsen zijn er vijf studies ontwikkeld die samen een drieluik vormen. In het eerste deel van het drieluik is de eerste assumptie getoetst (hoofdstuk 2). De tweede assumptie is getoetst in het tweede en derde deel van het drieluik. Deze tweede assumptie is bestudeerd vanuit twee verschillende perspectieven. Zo bestaat het tweede deel van het drieluik uit twee studies (hoofdstukken 3 en 4) die tot doel hadden meer inzicht te krijgen in de zelf-regulatieprocessen die ten grondslag liggen aan de inzet van hulpbronnen in het werk. Het betreft hier het attent zijn op aanwezige hulpbronnen, het beoordelen van de relevantie van hulpbronnen en besluitvorming omtrent het werkelijke gebruik van hulpbronnen. In het derde deel van het drieluik is door middel van twee studies (hoofdstukken 5 en 6) onderzocht of persoonskenmerken van werknemers (specifieke actieve copingstijlen en regulatieve focus) het stress buffer effect van hulpbronnen modereren. De achterliggende gedachte is dat hulpbronnen pas als stress buffer zullen optreden indien zij werkelijk worden ingezet in stressvolle situaties op het werk. Van de persoonskenmerken die in hoofdstuk 5 en hoofdstuk 6 worden onderzocht wordt verwacht dat zij het gebruik van hulpbronnen in stressvolle werksituaties kunnen faciliteren dan wel hinderen. Hieronder volgt een samenvatting van de studies in hoofdstukken 2 t/m 6.

Hoofdstuk 2 betreft een overzichtsstudie bestaande uit 29 empirische studies naar het DISC Model. In deze overzichtsstudie is onderzoek gedaan naar zowel de match hypothese (moderatie effecten van hulpbronnen komen vaker voor indien taakeisen en hulpbronnen met elkaar overeenstemmen) als het drievoudige match principe (moderatie effecten komen vaker voor naarmate de overeenstemming tussen taakeisen, hulpbronnen en uitkomsten toeneemt). De resultaten ondersteunden de match hypothese en het drievoudige match principe deels met betrekking tot het stress buffer effect van hulpbronnen, terwijl er geen ondersteuning werd

gevonden voor de match hypothese en het drievoudige match principe met betrekking tot het activatie versterkende effect van hulpbronnen.

In *hoofdstuk 3* wordt verslag gedaan van een quasi-experimenteel vragenlijstonderzoek met vignetten. Het onderzoek is uitgevoerd onder 217 Nederlandse werknemers uit de dienstverlenende sector. Het beoogde doel van dit onderzoek was om meer inzicht te krijgen in de perceptie die werknemers hebben aangaande de aanwezigheid, relevantie en het gebruik van specifieke typen hulpbronnen in veeleisende situaties op het werk. De resultaten lieten zien dat werknemers die geconfronteerd worden met hoge taakeisen over het algemeen opteren voor matchende hulpbronnen, zowel wat betreft de relevantie van hulpbronnen als het gebruik van hulpbronnen. Ondanks hun voorkeur voor matchende hulpbronnen waren werknemers echter ook geneigd gebruik te maken van minder functionele niet-matchende hulpbronnen. Omdat het gebruik van niet-matchende hulpbronnen een belangrijk onderdeel lijkt te zijn van zelf-regulerend gedrag in veeleisende situaties op het werk, is er een tweede vignette studie uitgevoerd onder 92 studenten van een Nederlandse technische universiteit (*hoofdstuk 4*). In deze vignette studie is onderzocht in welke mate mensen niet-matchende hulpbronnen zouden gebruiken als substituut voor matchende hulpbronnen (ter vervanging van) en als supplement op matchende hulpbronnen (ter aanvulling op). De resultaten toonden aan dat, indien men geconfronteerd wordt met hoge taakeisen, mensen over het algemeen geneigd zijn matchende hulpbronnen te gebruiken, en dat men niet-matchende hulpbronnen vaker zou gebruiken als supplement op matchende hulpbronnen dan als substituut voor matchende hulpbronnen.

Hoofdstuk 5 betreft een longitudinaal vragenlijstonderzoek onder 317 Belgische leerkrachten. Het beoogde doel van deze studie was te toetsen of het stress buffer effect van hulpbronnen een grotere kans maakt om te worden gevonden bij werknemers met een specifieke actieve copingstijl die overeenstemt met het type hulpbronnen dan bij werknemers met een specifieke actieve copingstijl die niet overeenstemt met het type hulpbronnen. Actieve copingstijl verwijst hier naar de neiging kritieke situaties (bijvoorbeeld hoge taakeisen) actief aan te pakken. Er werden drie typen actieve copingstijlen onderscheiden, te weten cognitieve, emotionele en fysieke actieve copingstijl. Echter, omdat geen van deze specifieke typen actieve copingstijlen het stress buffer effect van hulpbronnen modereerde, bestond er geen statistische reden om het versterkende effect van matchende (versus niet-matchende) actieve copingstijlen te toetsen. In *Hoofdstuk 6* wordt een dagboekstudie beschreven welke is uitgevoerd onder 64 verpleegkundigen die werkzaam waren in twee Nederlandse verzorgingshuizen. Het design van deze studie maakte het mogelijk het

stressproces in kaart te brengen zoals dat binnen personen plaatsvindt. Het doel van deze studie was te toetsen of het stress buffer effect van hulpbronnen wordt gemodereerd door regulatieve focus. Dat wil zeggen, of het stress buffer effect van hulpbronnen een grotere kans maakt om te worden gevonden wanneer werknemers hoofdzakelijk een promotiefocus hebben (zelf-regulerend gedrag wordt gekenmerkt door een benaderingsstrategie en risicivol gedrag) dan wanneer werknemers hoofdzakelijk een preventiefocus hebben (zelf-regulerend gedrag wordt gekenmerkt door een vermijdingsstrategie en behoudend gedrag). De resultaten lieten echter zien dat regulatieve focus geen significante bijdrage leverde aan de voorspelling van gezondheidsklachten en een verminderd welbevinden, hetgeen impliceert dat er geen ondersteuning was voor het moderatie effect van regulatieve focus.

Samenvattend hebben de studies in dit proefschrift laten zien dat, waar het het stress buffer effect van hulpbronnen betreft, matchende hulpbronnen functioneler hulpbronnen zijn om met specifieke typen taakeisen om te gaan dan niet-matchende hulpbronnen. Verder kan worden geconcludeerd dat mensen die worden geconfronteerd met hoge taakeisen over het algemeen een sterke voorkeur lijken te hebben voor matchende hulpbronnen, zowel wat betreft de relevantie van hulpbronnen als het gebruik van hulpbronnen. Hoewel het gebruik van niet-matchende hulpbronnen ook een belangrijk onderdeel lijkt te zijn van zelf-regulerend gedrag in veeleisende situaties op het werk, blijken niet-matchende hulpbronnen toch veelal te worden gebruikt als supplement op matchende hulpbronnen en in mindere mate als substituut voor matchende hulpbronnen. De persoonskenmerken van werknemers (specifieke actieve copingstijlen en regulatieve focus) opereerden niet als moderator van het stress buffer effect van hulpbronnen, hetgeen suggereert dat het gebruik van hulpbronnen niet gerelateerd is aan deze specifieke persoonskenmerken. In afwachting van toekomstig onderzoek naar het DISC Model kan daarom voorlopig worden geconcludeerd dat het DISC Model in zijn huidige hoedanigheid gerechtvaardigd is, zowel met betrekking tot de kernassumpties die ten grondslag liggen aan de voorspellingen van het DISC Model, als het type predictoren (werkkenmerken) die in het model zijn opgenomen.

Dankwoord (Acknowledgements)

Ik zou graag een kort dankwoord willen richten aan de personen die de afgelopen vier jaar al dan niet bewust een bijdrage hebben geleverd aan de totstandkoming van dit proefschrift. De meeste dank ben ik verschuldigd aan mijn promotor, Jan de Jonge, die zeer direct betrokken is geweest bij alle facetten van mijn onderzoek. Jan, zonder jouw kennis en inzicht hadden dit proefschrift en bijbehorende papers er niet gelegen. Dank hiervoor.

Ten tweede zou ik graag mijn (oud-)collega's van de HPM groep willen bedanken. Marieke (ik had me geen betere kamergenoot kunnen wensen), Ellen (bedankt voor de fijne samenwerking), Anniek (bedankt voor het corrigeren van mijn papers), Eva, Christel, Frans, Harrie, Ad, Josette, Tanja, Sonja, Wendelien, Tjerk, Eric, Floor, Daphne, Darrel, Heather en Sjaña, jullie waren en zijn zeer fijne collega's en jullie hebben allemaal op jullie eigen manier een bijdrage geleverd aan de totstandkoming van mijn proefschrift. Ik ben blij dat ik de kans heb gekregen nog wat langer in jullie gezelschap te verkeren.

Verder wil ik graag mijn co-auteurs Christian Dormann (tevens mijn copromotor), Kevin Daniels, Peter Vlerick en Bart Van de Ven bedanken voor de fijne samenwerking. Ik hoop dat we deze in de toekomst kunnen voortzetten. [Further, I would like to thank my co-authors Christian Dormann (who is also my co-supervisor), Kevin Daniels, Peter Vlerick and Bart Van de Ven for the good collaboration. I hope we can continue working together in the future.]

Tot slot een woord van dank aan mijn ouders, familie en vrienden. Zonder jullie steun en begrip had ik de afgelopen jaren nooit zoveel tijd en energie in mijn promotieonderzoek kunnen steken. Dank voor jullie oprechte belangstelling, de broodnodige afleiding en een luisterend oor op z'n tijd.

About the Author

Marieke van den Tooren was born in Gouda (the Netherlands) on November 3, 1981. In 2000, she completed her pre-university education (VWO) at De Goudse Waarden in Gouda and continued to study Psychology at Leiden University. She obtained her Master's degree in Clinical and Health Psychology (with honors) at the end of 2004. In the following year, she followed the Research Master program at Leiden University. She completed the first year and then continued working as a PhD student at Eindhoven University of Technology. From 2006 to 2010, she worked at the Human Performance Management group at the department of Industrial Engineering and Innovation Sciences. This thesis is the result of her research on self-regulatory behavior in demanding situations at work. Since December 2010, Marieke works as a postdoctoral researcher at the Human Performance Management group.