



MARJO PENNONEN

Recovery from Work Stress

Antecedents, Processes and Outcomes



ACADEMIC DISSERTATION

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Tampere, November 2011

Marjo Pennonen (née Siltaloppi)

ABSTRACT

The present one-year longitudinal questionnaire study examined recovery from work stress among a sample of Finnish employees (Time I $N = 527$; Time II $N = 274$) from a variety of different jobs by using variable and person-oriented approaches. The general aim was to get a picture of the antecedents, processes and outcomes of recovery from a psychological perspective. The antecedents of recovery were examined in terms of psychosocial work characteristics (job demands and resources). Recovery processes were examined by recovery experiences (psychological detachment, relaxation, mastery, and control during off-job time) and off-job time activities (work-related, household, low-effort, social, and physical activities). The consequences of recovery covered psychological outcomes (need for recovery, job burnout, work engagement, and sleep problems). The main results of four studies showed, first, that the factor structure of the Finnish Recovery Experience Questionnaire (REQ) was valid in the employee sample studied. Second, psychological detachment fully mediated the effects of job demands on fatigue at work and mastery partially mediated the effects of job resources on work engagement. Third, psychological detachment and mastery were protective mechanisms against increased need for recovery in a situation of lack of job control, and relaxation protected against increased job exhaustion under high time demands. In addition, recovery experiences – psychological detachment and mastery in particular – had direct links to occupational well-being. Fourth, eight latent groups of need for recovery were identified, of which five groups had stable (low, moderately low, average, moderately high and high) need for recovery across one year and three showed change (mostly decreasing) in the level of need for recovery. Employees in the favorable (low and moderately low) need for recovery groups (38%) reported having more favorable work characteristics and better functioning recovery experiences and they spent more time on physical and social off-job activities than those in the unfavorable (high and moderately high) groups (23%). Fifth, five patterns of recovery experiences were identified. Over 70% of the employees belonged to a pattern with reasonably high stable levels of all four recovery experiences across the one-year follow-up. This pattern suffered least from

job burnout and sleep problems. Of the four remaining patterns, those with experiences of high levels of mastery and control during off-job time had highest work engagement, and among those with decreasing levels of all recovery experiences job exhaustion increased across time. The study findings suggest that recovery experiences and the patterns of them play a significant role in maintaining well-being at work. In addition, recovery experiences merit consideration both as mediating and moderating mechanisms in the work characteristics–psychological outcomes relationship. Besides recovery experiences, work characteristics and off-job activities are significant antecedents in maintaining need for recovery over time. With respect to practical implications this study illustrates that individuals should search situations where they have possibilities to optimize their recovery experiences and thus maximize their recovery processes.

CONTENTS

| | |
|---|----|
| LIST OF ORIGINAL PUBLICATIONS | 9 |
| 1. INTRODUCTION..... | 10 |
| 1.1 Challenges in working life | 10 |
| 1.2 Recovery from work stress: definitions and theories | 12 |
| 1.3 Approaches in examining recovery | 13 |
| 1.3.1 Recovery settings..... | 14 |
| 1.3.2 Recovery as a process..... | 15 |
| 1.3.2.1 Off-job activities | 16 |
| 1.3.2.2 Sleep | 18 |
| 1.3.2.3 Recovery experiences..... | 19 |
| 1.3.3 Recovery as an outcome | 22 |
| 1.4 The role of work characteristics in recovery | 25 |
| 1.4.1 The Job Demands-Resources model..... | 25 |
| 1.4.2 The role of recovery experiences in the context of the JD-R model..... | 28 |
| 1.4.2.1 The mediating role of recovery experiences | 28 |
| 1.4.2.2 The moderating role of recovery experiences | 30 |
| 1.5 Aims of this study..... | 32 |
| 2. METHODS | 34 |
| 2.1 Participants and procedure | 34 |
| 2.2 Measures..... | 36 |
| 2.2.1 Recovery experiences | 36 |
| 2.2.2 Psychosocial work characteristics | 37 |
| 2.2.3 Off-job activities..... | 38 |
| 2.2.4 Psychological well-being..... | 38 |
| 2.3 Data analyses | 40 |
| 3. OVERVIEW OF THE RESULTS | 43 |
| 3.1 Study I | 43 |
| 3.2 Study II..... | 45 |
| 3.3 Study III..... | 47 |
| 3.4 Study IV | 50 |

| | |
|--|----|
| 4. DISCUSSION | 53 |
| 4.1 Overall summary of results | 53 |
| 4.2 Different roles of recovery experiences in the recovery process | 54 |
| 4.2.1 Mediating role | 54 |
| 4.2.2 Direct and moderating roles | 58 |
| 4.3 Person-oriented view of long-term recovery..... | 59 |
| 4.3.1 Individual development of need for recovery across one year | 60 |
| 4.3.2 Patterns of recovery experiences across one year | 63 |
| 4.4 Methodological evaluation of the study | 66 |
| 4.5 Directions for future research and practical implications | 71 |
| TIIVISTELMÄ | 78 |
| REFERENCES | 81 |

LIST OF ORIGINAL PUBLICATIONS

- Study I Kinnunen, U., Feldt, T., Siltaloppi, M., & Sonnentag, S. (2011). Job demands-resources model in the context of recovery: Testing recovery experiences as mediators. *European Journal of Work and Organizational Psychology, iFirst*.
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1. INTRODUCTION

1.1 Challenges in working life

Individuals spend a large amount of time at work during their lives. Thus it is understandable that work along with family and health are the most important things in adults' lives, and closely after them in order of importance comes leisure time and human relationships (Pulkkinen, Nurmi, & Kokko, 2002). Today's working life is challenging in many ways. For example, knowledge work has increased, working life has become more demanding and competitive, and technological advances have made it possible to work almost anywhere and anytime (Härmä, 2006). Work without boundaries is a metaphor used quite often to describe today's work, which is not restricted by traditional organizational rules like regular office hours, a single workplace, fixed procedures, and limited responsibility (Allvin, Aronsson, Hagstrom, Johansson, & Lundberg, 2011). Thus, doing overtime and work related activities at home have become easier and more general. For example, 70% of upper white-collar workers sometimes bring work tasks home from work (Lehto & Sutela, 2008), and as many as half of all wage-earners do overtime (Ylöstalo & Jukka, 2008). These circumstances have also effects on non-work and family life (see Bulger, Matthews, & Hoffman, 2007).

More generally, in international comparison Finland is among those countries where both men's and women's employment rate is high, and where part-time work is quite rare (Eurostat, 2010). At the time of data collection for the present study (2007–2008), the global financial crisis had not yet occurred. The last data collection round was conducted in spring 2008, whereas the signs of the looming crisis were seen clearly in Finland only in the autumn of 2008 (see Mayer-Pirttijärvi, 2009). This was reflected in the evaluations concerning job insecurity, which clearly rose in 2009 compared to the situation in 2008 (Ylöstalo & Jukka, 2010).

All the foregoing challenges in working life may threaten employees' well-being by causing problems of recovery from work stress. Moreover, in modern society,

which is characterized by a hectic pace of life, efficiency and competitiveness in a global economy, it is possible that lack of recovery is a greater health problem than the absolute level of strain itself (Lundberg, 2005). Hence, recovery – a process that allows individuals to replenish their resources – is at risk.

Earlier research on occupational health and well-being has been dominated by studies that emphasize the negative side of well-being, that is, ill-health, like stress and burnout at work (Schaufeli & Bakker, 2004). This means that the strain process has received much more attention than the positive side of it, that is, the question of how individuals may keep themselves well-functioning and healthy. The key issue in this regard is the process of recovery that allows employees to retain and replenish their resources. From the viewpoint of recovery, it is not insignificant how an employee spends his or her leisure time after work, which is the time when recovery mainly occurs (Geurts & Sonnentag, 2006). Recovery from work stress is important, because if recovery is incomplete, strain reactions will accumulate and from that follow health problems in the long terms (McEwen, 1998; Meijman & Mulder, 1998). However, the recovery process is not yet well understood.

Within this context, the present study aims to examine recovery from work stress among a sample of employees in a variety of different jobs. The general aim is to get a picture of the antecedents, processes, and outcomes of recovery from a psychological perspective. A psychological perspective means primarily individuals' own evaluations of the experiences of situations, but it also refers to those psychological mechanisms and processes that promote or impede recovery. Thus, when individuals feel capable and ready to continue with their current demands or to meet new demands (Zijlstra & Sonnentag, 2006), they can be considered as having recovered from work stress (see also Siltaloppi & Kinnunen, 2007).

The introduction section starts with a presentation of the basic definitions and theories of recovery, after which I introduce three research approaches – emphasizing settings, processes, and outcomes – used in recovery studies. Of these, the two last are in the main focus in the present study. Then I discuss more specifically the role of work characteristics in the recovery process, and finally I articulate the aims of the study.

1.2 Recovery from work stress: definitions and theories

Recovery has been defined in many ways (see e.g., Demerouti, Bakker, Geurts, & Taris, 2009). The various definitions have in common that recovery is a process that takes place when the demands (stressors) imposed on the individual are no longer present. During the recovery process an individual's functioning returns back to its pre-stressor level, wherein strain is reduced (Meijman & Mulder, 1998). Thus, recovery can be regarded as an opposite process of the psycho-physiological activation that occurs under stressful conditions (Sonnentag & Natter, 2004). From a psychological perspective, an individual feels capable and ready to continue with his or her current demands or to meet new demands (Zijlstra & Sonnentag, 2006). From a physiological perspective, recovery is seen as a decrease in physiological strain indicators (e.g., the excretion of adrenaline and cortisol or elevated heart rate; e.g., Geurts & Sonnentag, 2006; Sonnentag & Geurts, 2009).

There are only few models and theories that attempt to explain the recovery process. Of these, I present the Effort-Recovery Model and the Conservation of Resources Theory, which have been utilized in recovery studies, and especially in studies based on the psychological viewpoint, as here. Unwinding following exposure to demands is necessary for the physiological and psychological recovery process and persistent failure to unwind is thought to be detrimental to health because it depletes the body's physiological restorative system (see McEwen, 1998, for the Allostatic Load Model).

The Effort-Recovery (E-R) Model (Meijman & Mulder, 1998; see also Demerouti et al., 2009; Geurts & Sonnentag, 2006) states that normal load reactions, which are unavoidable, are caused by effort expenditure at work. These load reactions include physiological as well as behavioral and subjective responses. In cases of exposure to workload for a long time with incomplete recovery, load reactions can accumulate and develop into more chronic reactions.

More specifically, the E-R model suggests that an employee must expend effort in order to respond to work demands and to accomplish his or her tasks while on duty. Work recovery can occur when an employee is no longer confronted with work demands. Thereby load reactions are released and the psycho-physiological

systems can return and revert to the baseline level, where no special demands are confronted. When recovery is incomplete and an employee is still in a sub-optimal condition, such as still tired from the previous work period, the employee has to expend extra effort to perform properly at work. Consequently, this kind of accumulation of load reactions may cause impaired well-being, like prolonged fatigue, chronic tension, sleep problems, and manifest diseases (Meijman & Mulder, 1998; Sluiter, Frings-Dresen, van der Beek, & Meijman, 2001; Van Hooff et al., 2005). Thus, according to the E-R model the core mechanism through which recovery occurs is the temporary relief from demands put on the employee.

The Conservation of Resources (COR) Theory (Hobfoll, 1998, 2002) assumes that people have a basic motivation to obtain, retain, foster, and protect those things they value. According to the theory, these valued things are called resources, which refers to categories including personal characteristics (e.g., high self-esteem, positive outlook), objects (e.g., home, car), conditions (e.g., secure work, financial security), and energies (e.g., knowledge, time). These resources are either valued in themselves or they are used as means of obtaining other valued resources. Stress occurs and recovery is needed when important resources are threatened, lost, or not gained after resource investment.

Applied to the context of work, if a work situation is unfavorable, an employee's resources, like vigor or self-esteem, are expended or threatened, which produces stress. To recover from that stress, an employee has to attempt to gain new resources or restore threatened or lost resources. This occurs, for example, during spare time, by having free time activities that may refill the energy reserves or positively contribute to an individual's self-esteem. Thus the COR theory suggests that recovery occurs when resources are regained by drawing on new resources, or by restoring threatened or lost resources.

1.3 Approaches in examining recovery

Recovery as a phenomenon can be approached from different perspectives. Sonnentag and Geurts (2009) have divided the facets of recovery into recovery settings, recovery as a process, and recovery as an outcome. It is good to note that quite often recovery is examined simultaneously from several perspectives. This

also concerns this present study, in which the process and outcome perspectives are emphasized. Of the settings, free time after work is central in this study. When employees have a day shift this free time is usually spent in the evenings, but among employees having a non-day shift free time may occur at almost any time.

1.3.1 Recovery settings

Recovery is assumed to occur in certain temporal and situational settings. Such settings include, for example, within-day work breaks, free evenings or free days, weekends, and vacations. *Within-day work breaks* contain coffee and lunch breaks, transitions between duties or other various types of informal breaks, often called micro-breaks. Some studies have examined frequency (e.g., Dababneh, Swanson, & Shell, 2001), timing (e.g., Boucsein & Thum, 1997), and length of work breaks (Lisper & Eriksson, 1980). According to these studies, work breaks can be effective in increasing productivity and against the effects of fatigue, but to the best of my knowledge there is only one published study regarding the question of the recovery activities of within-day work breaks (Troughakos, Beal, Green, & Weiss, 2008). This study found that service employees who engaged in more respite activities during daily work breaks experienced higher levels of positive emotions and lower levels of negative emotions during these breaks and exhibited higher levels of positive affective displays after the breaks. The results therefore propose that restful and enjoyable activities during work breaks provide greater recovery.

Studies exploring the impact of *leisure time in the week and at weekends* are also rare, but the results claim that effective use of these times for recovery is vital to health. At the day level, those who felt that they sufficiently recovered during leisure time experienced a higher level of work engagement during the subsequent work day, and further this high level of engagement helped them in proactive behavior, as in initiative and pursuing learning goals (Sonnentag, 2003). Also, on weekday evening, engaging in recovery activities such as social and physical activities, had a positive effect on well-being, contrary to work-related activities that resulted in higher need for recovery and impaired well-being (Sonnentag, 2001; Sonnentag & Natter, 2004; Sonnentag & Zijlstra, 2006). A study regarding the weekends indicated that experiencing ongoing non-work stressors and lack of social

activities during weekends predicted burnout and poor well-being after the weekend (Fritz & Sonnentag, 2005). In conclusion, leisure during the week and at weekends promotes recovery when spent in relaxing or stimulating activities, but avoiding work-related activities.

Research on the impact of *vacations* has provided support for the idea that breaks and vacations promote recovery (e.g., Eden, 2001; Fritz & Sonnentag, 2006). For example, experienced burnout diminished immediately after the vacation and returned to pre-vacation level four weeks later (Westman & Etzion, 2001). In another study (Fritz & Sonnentag, 2006), health complaints and exhaustion decreased significantly during vacation, and after vacation less effort expenditure was necessary to fulfill the daily requirements of work, but a fade-out effect for health complaints occurred two weeks after vacation. It is indeed typical that the positive effects of vacation are short-term and fade within weeks of returning to work (Eden, 2001; Fritz & Sonnentag, 2006), and as at day and weekend levels, also in vacations the activities in which an employee participates are essential from the viewpoint of recovery. Engaging in relaxing and non-taxing activities during vacation proved to be activities with the most positive effect of vacation on well-being in the study by Fritz and Sonnentag (2006).

1.3.2 Recovery as a process

According to Sonnentag and Geurts (2009), approaching recovery as a process refers to the mechanisms proposed to underlie the recovery occurrence. These mechanisms may refer to the activities an employee engages in during off-job time – which were already briefly discussed above – or they may also refer to psychological processes related to these activities. As Sonnentag and Fritz (2007) have argued, maybe it is not a specific activity *per se* that helps to recover, but the processes and mechanisms (e.g., relaxation) behind it. These processes are labeled recovery experiences by Sonnentag and Fritz (2007). Sleep can also be categorized in the activities that operate behind the process aspects of recovery, that is, because sleep is a mechanism that reduces fatigue and supports restoration of resources (Åkerstedt, Nilsson, & Kecklund, 2009). In the present study, the main attention is paid to recovery experiences and their role in the recovery process, but off-job

activities were also examined. Thus recovery experiences and those off-job time activities examined in this study are presented. Because of the essential role of sleep in the recovery process, I also describe it here, even if it was not examined from the process perspective in this study.

1.3.2.1 Off-job activities

Work-related activities during off-job time include activities where an employee continues duties after working hours, for example by preparing future assignments or answering work e-mails. Because such activities encumber psychobiological systems similar to those used at work, they are expected to have a negative impact on recovery on the basis of the E-R model (Meijman & Mulder, 1998). Earlier studies have confirmed, for example, that pursuing work related activities during leisure has been found to be related to high need for recovery (Sonnentag & Zijlstra, 2006) and poor well-being before going to sleep (Sonnentag, 2001). Also, it has been found that involuntary overtime was associated with high fatigue and low satisfaction (Beckers et al., 2008). In addition, the use of communication technologies to perform tasks outside working hours was associated with the employee's work-to-life conflict (Boswell & Olson-Buchanan, 2007).

Similarly, *household activities*, like cleaning and cooking, have an obligatory character because most of these activities cannot be ignored. They also require effort and can be demanding and fatiguing (Bekker, de Jong, Zijlstra, & van Landeghem, 2000; Grandey & Cropanzano, 1999). On the other hand, household activities draw on different resources than those needed in most jobs (Sonnentag, 2001). Thus household activities may have both conducive and prohibitive effects on recovery. In the study by Sonnentag and Zijlstra (2006), household activities had no effect on need for recovery. Also, in a diary study conducted by Sonnentag (2001) among teachers, time spent on household activities had no effect on well-being (e.g., self-estimated mood and recovery from the workday) before going to sleep.

Low-effort activities refers to activities such as lying on the sofa, listening to music, or reading a book, which are passive activities requiring little or no effort, especially the kind of effort normally needed at work. Therefore they make no

demands on the individual's psychobiological system, thus the functional systems can return to their normal pre-stressor level, which is claimed to promote recovery (Sonnentag, 2001). On the other hand, it has been argued that passive low-effort activities are detrimental to well-being because they are related to leisure apathy and boredom (cf. Iso-Ahola, 1997). The study results concerning the effect of low-effort activities on recovery have been mixed. Sonnentag (2001) found that among teachers time spent on low-effort activities had a positive impact on well-being, including recovery (e.g., good mood) from work. Instead, the results by Rook and Zijlstra (2006) showed that low-effort activities were not conducive to recovery after work (e.g., subjective feelings of concentration and motivation), but they were associated with increased fatigue. Further, in Sonnentag and Natter's (2004) study, low-effort activities had no effect on recovery.

Social activities refers to activities that focus on social contacts including meeting friends or family, dining out with others, or phoning other people. Sonnentag (2001) proposes two mechanisms through which social activities can have a recovery function. First, by meeting others we open up channels for social support, which is an important external resource that helps in restoring other resources, like positive mood. Thus social activities may contribute to recovery. Social support has been found to have positive effects on well-being (Bakker, Demerouti, & Euwema, 2005; Viswesvaran, Sanchez, & Fisher, 1999). Second, during off-job social activities, no demands are imposed on resources similar to those needed in most work-related tasks. Even individuals in the customer service or educational domains, who are faced with high requirements for social interaction at their workplaces (cf. Zapf, 2002), have more choice with respect to their interaction partners in leisure than at work, and can decide to meet others who do not require demanding forms of emotion regulation. As a consequence, recovery processes can take place. The research results, however, have been inconsistent. Sonnentag and Zijlstra (2006) found that social activities during leisure were related to low need for recovery. By contrast, in other studies social activities were not conducive to recovery (Rook & Zijlstra, 2006; Sonnentag & Bayer, 2005), and Sonnentag and Natter (2004) found that among flight attendants involvement in social activities was related to stronger feelings of depression at bedtime. An explanation for this finding evinced by the researchers was that among this special professional group

social activities seemed to draw additionally on their resources because flight attendants spent much time with their co-workers during leisure when travelling. So their freedom to choose who to meet was limited.

Physical activities, behaviors including sports, exercise, physical training etc., require effort, but they draw on resources different from those needed in most jobs. Instead, physical activities stimulate physiological and psychological processes (e.g., positive mood), which improve not only an individual's physical health but also mental health (Brown, 1990; McAuley, Kramer, & Colcombe, 2004). Thus physical activities are assumed to promote recovery. Many physiological explanations have been offered to explain the positive effects of physical activities: First, levels of endorphins are elevated following exercise (Grossman et al., 1984) and may increase good mood; second, exercise raises body temperature, which may explain the elevated mood after exercise (Raglin & Morgan, 1985); and the third explanation refers to the increased secretion of noradrenalin, serotonin, and dopamine that have an antidepressant effect (Cox, 2002). From a psychological perspective it is possible that when engaging in physical activities an individual has an opportunity to detach from work and daily stressors (Yeung, 1996). In addition, the completion of a heavy task, like exercise, brings about a sense of mastery and self-efficacy beliefs, which may facilitate recovery (Demerouti et al., 2009; Sonnentag & Jelden, 2009). The study results show that physical activities have a propitious effect on recovery. Sonnentag and Zijlstra (2006) found that physical activities during off-job time were related to low need for recovery. In the study by Winwood, Bakker, and Winefield (2007) those reporting higher levels of exercise and active leisure activities reported, for example, better sleep quality and recovery between work periods. Sonnentag (2001) indicated that time spent on physical activities had a positive impact on well-being before going to sleep.

1.3.2.2 Sleep

Sleep is essential in order to complete the recovery process. In fact, sleep is a vital period for recovery. Studies on sleep suggest that the functions of sleep include recovery at the cellular, network, and endocrine system levels, energy conservation and ecological adaptations, and a role in learning and synaptic plasticity (Mignot,

2008). Many functions of the organism are restored during sleep. Because sleep actively restores brain physiology to normal levels, this also results in restored alertness, memory capacity, and mood (Åkerstedt et al., 2009). Both quantity (on adults on average 7–9 h sleep per night; Carskadon & Dement, 2005) and quality of sleep are important for recovery and daily performance, too (Craig & Cooper, 1992).

Instead, sleep deprivation and sleep fragmentation have many negative consequences, including hormonal effects (e.g., biochemical, thyroid activity, adrenal, or sex hormone changes), and pulmonary effects, like decreases in forced expiratory volume and forced vital capacity (Bonnet & Arand, 2003). These changes also affect the process of recovery. An individual has fewer energy resources available after a night of poor sleep, because poor sleep hinders replenishment of resources for self-regulation (Muraven & Baumeister, 2000). Also, sleep problems and lack of sleep are associated with mood changes, tension, stress, fatigue, anger, absenteeism, reduced productivity, deteriorated performance, increased risk of fatigue-related accidents, and even immune function impairment (Harrison & Horne, 1999; Lavidor, Weller, & Babkoff, 2003; Sallinen et al., 2008; Åkerstedt, 2006; Åkerstedt et al., 2002). In Rook and Zijlstra's (2006) diary study sleep quality was a significant predictor of recovery.

1.3.2.3 Recovery experiences

Even if specific off-job time activities have their influence on recovery, the psychological mechanisms behind these activities may play a significant role (Sonnentag & Fritz, 2007). It is possible that individuals differ with respect to the specific activities in which they engage and which they experience as recovering, but the psychological processes relevant to recovery behind these activities may be similar to each other. Sonnentag and Fritz (2007) call these underlying attributes *recovery experiences*; they consist of psychological detachment from work, relaxation, mastery, and control. It is probable that there are also other experiences that are helpful for recovery, such as the experience of pleasure (Sonnentag & Geurts, 2009), humor, associated laughter (Demerouti et al., 2009), and feeling happy (Oerlemans, Bakker, & Demerouti, 2011; see also Oerlemans, Bakker, &

Veenhoven, 2011). But herein, I will discuss the four recovery experiences presented by Sonnentag and Fritz (2007) more specifically because they are in the main focus in this study.

The first two experiences have their roots in the E-R model (Meijman & Mulder, 1998), and the last two in the COR theory (Hobfoll, 1998, 2002). According to the E-R model, psychological detachment and relaxation may help recovery, because they imply that no further demands are made on the functional systems (e.g., neuroendocrine and cardiovascular systems) and internal resources (e.g., self-regulation) called upon during work. On the basis of the COR theory, mastery and control build up resources such as energy or feelings of control, which help to restore threatened internal resources; therefore they may contribute to recovery.

Psychological detachment describes an individual's sense of being away from work during off-job time (Etzion, Eden, & Lapidot, 1998). It is not only being physically away from the workplace but also to stop thinking about work-related issues (Sonnentag & Bayer, 2005). The idea is that an individual is disengaged from all kinds of work-related issues that cause effort, load, or negative affect. If an individual does not detach from work during leisure, work-related thoughts continue to consume resources which will hinder the recovery process. Instead, if an individual succeeds in detaching psychologically from work, no further demands are put on the psychobiological system and recovery can occur (Sonnentag & Fritz, 2007). Also, empirical evidence suggests that psychological detachment is helpful in recovery. Sonnentag and Fritz (2007) showed that psychological detachment was negatively related to health complaints, emotional exhaustion, depressive symptoms, need for recovery, and sleep problems. Further, many diary studies have shown that individuals who experienced psychological detachment from work during off-job time reported better mood and less fatigue at the end of the evening and the next morning (Sonnentag & Bayer, 2005; Sonnentag, Binnewies, & Mojza, 2008). In addition, it has been shown that psychological detachment during the weekend was positively related to state of being recovered (feelings of being refreshed and well-rested) at the beginning of next week (Binnewies, Sonnentag, & Mojza, 2010).

Relaxation refers to processes characterized by increased positive affect and low sympathetic activation (see Sonnentag & Fritz, 2007). Recovery can occur both at a physical level, such as by reducing one's physical activity, and at a mental level,

e.g., by pursuing conscious relaxation exercises like meditation (Sonnentag & Geurts, 2009). Relaxation may also be a result of activities that are felt to be relaxing, such as listening to music or reading a novel. Relaxation does not require any kind of effort of the individual, conversely it reduces demands and activation and increases positive affect; thus relaxation is assumed to help recovery. Study results lend support to the expectation. For example, Sonnentag and Fritz (2007) showed that relaxation was negatively related to need for recovery, health problems, emotional exhaustion, and sleep problems. Also, Sonnentag and colleagues (2008) showed that relaxation in the evening was related to morning serenity. Further, it was found that relaxation during the weekend was positively related to a state of being recovered on Monday morning (Binnewies et al., 2010).

The *mastery* experience implies experiences of new challenges, learning new things, or broadening one's horizon (Sonnentag & Fritz, 2007; Sonnentag & Geurts, 2009). Such experiences may take place while pursuing mastery-related off-job activities, like practicing a new language or sport, or traveling to a foreign country. This may require effort investment, but the idea is that mastery experiences should challenge the individual without overtaxing his or her capabilities. Mastery experiences are expected to promote recovery because they help to build up new internal resources, such as skills, competencies, self-efficacy, and positive mood (Sonnentag & Fritz, 2007). The empirical evidence so far available suggests that mastery experiences are related to recovery. Mastery has proved to be negatively related to need for recovery, emotional exhaustion, and depressive symptoms (Sonnentag & Fritz, 2007), and mastery in the evening was related to morning positive activation (Sonnentag et al., 2008). In addition, higher levels of mastery experiences during a vacation were related to lower levels of exhaustion on the employee's return to work (Fritz & Sonnentag, 2006).

Control refers to self-determination during off-job time; an individual has the ability to choose which activity to pursue, and when and how to pursue this chosen activity. Because the experience of control may increase self-efficacy and feelings of competence by satisfying one's general desire to control events in life (Sonnentag & Fritz, 2007), it may be an external resource that promotes recovery. This view has received some support. Sonnentag and Fritz (2007) found that control was

negatively related to need for recovery, health complaints, emotional exhaustion, depressive symptoms, and sleep problems, and positively related to life satisfaction.

As discussed above, the earlier study results have provided some support for the functionality of recovery experiences in the recovery process. However, all previous studies so far have been variable-oriented (Bergman & Trost, 2006), that is, each variable (e.g., relaxation) and its relation to other variables (e.g., psychological outcomes) have been in the main focus. Thus there is a gap in the existing knowledge of how individuals use these recovery experiences simultaneously, that is, we do not know what kinds of profiles of recovery experiences exist, and further, which are typical and atypical profiles of recovery experiences. Due to the lack of knowledge regarding these profiles, we also do not know how these potentially different profiles are related to recovery outcomes. Therefore this kind of person-oriented approach, in which an individual is regarded as the unit of measurement, is needed. In the present study both person-oriented and variable-oriented approaches to recovery were in use.

1.3.3 Recovery as an outcome

Besides studying recovery in terms of settings and processes, it can be examined as an outcome, that is, as a state of being recovered. This view considers recovery as the result of successful or defective recovery process. Sonnentag and Geurts (2009) distinguish between three types of recovery outcomes which it is possible to measure: psychological (e.g., fatigue), physiological (e.g., cortisol excretion, cardiovascular reactivity) and behavioral (e.g., performance). I will focus only on the psychological outcomes as they were examined in the present study based on individuals' own experiences. More specifically, I discuss in more detail the outcomes of need for recovery, job burnout, work engagement, and sleep quality.

Need for recovery refers to an individual's desire to have a break from work demands in order to replenish internal resources when fatigue builds up (Sluiter, van der Beek, & Frings-Dresen, 1999). It is characterized by temporary feelings of overload, irritability, social withdrawal, lack of energy for new effort, and impaired performance, which can be observed especially during the last hours of work or immediately after work (van Veldhoven & Broersen, 2003). However, due to

incomplete recovery in leisure time, need for recovery may remain at a high level and have substantial individual health consequences (van Veldhoven, 2008). Typical examples of need for recovery experiences are that employees find it difficult to relax after the working day, they cannot concentrate on their off-job activities, they may feel that leisure is not enough to recuperate, and they feel tired when they start a new shift (Winwood, Winefield, & Lushington, 2006).

When employees have the time and the opportunity to satisfy their need for recovery, for example by resting or by engaging in proper leisure activities, their need for recovery will be fulfilled (Sonnentag & Zijlstra, 2006). Need for recovery has been used as an indicator of insufficient recovery, which describes the early stage of a long-term strain process leading to prolonged fatigue (e.g., Jansen, Kant, & van den Brandt, 2002). According to earlier studies, there is some evidence that need for recovery is associated with psychosomatic and sleep complaints, and complaints of emotional exhaustion (Sluiter et al., 1999), increased inter-occupational turnover (de Croon, Sluiter, Blonk, Broersen, & Frings-Dresen, 2004), desire to reduce working hours or change jobs within the company (De Raeve, Kant, Jansen, Vasse, & van den Brandt, 2009), development of cardiovascular diseases (Van Amelsvoort, Kant, Bültmann, & Swaen, 2003), and sickness absence (Sluiter, de Croon, Meijman, & Frings-Dresen, 2003; de Croon, Sluiter, & Frings-Dresen, 2003). Jansen and colleagues (2002) showed that even if need for recovery, fatigue, and psychological distress are frequently co-morbid, they are clearly different concepts. In addition, although need for recovery is described as a temporary feeling, its perception has turned out to be quite stable over time, especially in a stable work environment (de Croon, Sluiter, & Frings-Dresen, 2006; Sluiter et al., 1999).

Job burnout can be considered as an outcome of long-term incomplete recovery and is defined as a three-dimensional syndrome characterized by exhaustion, cynicism, and reduced professional efficacy (Maslach, Jackson, & Leiter, 1996; Maslach, Schaufeli, & Leiter, 2001). *Exhaustion* is considered to be the core symptom of the syndrome. It refers to feelings of being depleted of one's emotional and physical resources, overstrain, and fatigue as a result of long-term involvement in an over-demanding work situation. The state of exhaustion is chronic and not relieved by daily or weekly rest (Maslach et al., 2001; Schaufeli & Enzmann, 1998).

Thus, the depletion of an individual's overall energy due to prolonged work stress is the core in the concept of job exhaustion. Therefore, job exhaustion can be considered a more serious sign of the long-term strain process than need for recovery. *Cynicism* refers to an indifferent, distant, cynical, callous, and negative attitude towards one's work. *Reduced professional efficacy* refers to loss of competence and productivity, and the tendency to evaluate one's accomplishment at work negatively.

Work engagement is considered a positive antipode of burnout, and it is defined as a positive, fulfilling, work-related state of mind (Bakker, Schaufeli, Leiter, & Taris, 2008; Schaufeli, Bakker, & Salanova, 2006; Schaufeli, Salanova, González-Romá, & Bakker, 2002). It has been described as relatively stable optimal functioning at work signaling sufficient recovery. Work engagement consists of vigor, dedication, and absorption. *Vigor* is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties. Recovery may have a positive effect on the experience of vigor, because recovered individuals will be able and willing to invest effort and to be resilient when confronted with stressful situations (Sonnentag, 2003). *Dedication* refers to being profoundly involved in one's work and experiencing enthusiasm, inspiration, a sense of significance, pride, and challenge at work. Recovered individuals will have enough resources available to become involved in their work; instead, if recovery is incomplete, individuals will be reluctant to dedicate themselves to work because it would draw upon their resources (Hobfoll, 1998; Sonnentag, 2003). *Absorption* is perceived as being fully concentrated and happily engrossed in one's work, while time passes quickly and an employee has difficulties in detaching from work. When recovered, it is easier to concentrate fully on the task at hand and to ignore irrelevant cues (Sonnentag, 2003). In the diary study by Sonnentag (2003), a positive relation between day-level recovery (recovery before starting to work) and day-level work engagement (work engagement before leaving the workplace) was detected.

Sleep quality can be conceptualized as both a recovery process (see p. 18) and as a recovery outcome. Adequate recovery during free-time should improve sleep quality (Sonnentag & Geurts, 2009), which got support in Tucker, Dahlgren, Akerstedt, and Waterhouse's (2008) study. The study showed that being satisfied

with one's evening activities was associated with improved subsequent sleep. Sleep problems, in turn, can be considered outcomes of long-term incomplete recovery and in the long run impaired sleep leads to burnout (Åkerstedt et al., 2009). Unsatisfactory sleep quality contains various aspects like difficulties in falling asleep, difficulties with sleeping continuously, and too early awakening. It is known that inability to stop thinking about work during off-job time, which may be a sign of incomplete recovery, is a strong predictor of sleep problems (Cropley, Dijk, & Stanley, 2006; Åkerstedt et al., 2002).

1.4 The role of work characteristics in recovery

When recovery from work stress is discussed, it is important to look more thoroughly at work itself, too. In addition to Sonnentag and Geurts' (2009) division of recovery approaches (settings, processes and outcomes), recovery can be approached from the perspective of antecedents. Work characteristics can be seen as such antecedents either promoting or hindering recovery. In this study work is described in terms of work stress models. Of the existing work stress models, the *Job Demands-Resources (JD-R) Model* (see Bakker & Demerouti, 2007) was regarded as the most helpful. The JD-R model attempts to explain both the well-being and ill-health of employees through psychosocial work characteristics (Bakker & Demerouti, 2007; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Schaufeli & Bakker, 2004). Thus, the model is useful in the context of recovery, because well-being as an outcome signals adequate recovery, whereas ill-health refers to the consequences of incomplete recovery. Next, after the JD-R model is demonstrated, I shall describe the role of recovery experiences in the context of the JD-R model.

1.4.1 The Job Demands-Resources model

The first basic assumption of the JD-R model is that, regardless of the type of job, psychosocial work characteristics can be categorized into two groups: job resources and job demands. *Job demands* refers to physical, psychological, social, and organizational aspects of the job that require physical and/or mental effort (e.g.,

Demerouti et al., 2001). Such job demands are, for example, heavy workload, time pressure, and role conflict (Bakker & Demerouti, 2007). However, according to Bakker and Demerouti (2007), job demands are not necessarily negative; they may turn into negative job stressors when meeting these demands requires major effort from which the employee has not adequately recovered (Meijman & Mulder, 1998). *Job resources* refers to those features of the job that are functional in achieving work goals, reducing job demands, and stimulating personal growth, learning (see Rau, 2006), and development (Demerouti et al., 2001). Such job resources are, for example, job control, social support, and decision latitude (Bakker & Demerouti, 2007).

According to the second basic assumption of the JD-R model, two different underlying processes – the health impairment process and the motivational process – play a role in the development of ill-health and well-being (Bakker & Demerouti, 2007). In the first health impairment process, chronic job demands exhaust employees' mental and physical resources and may therefore lead to the depletion of energy. As a result, job demands are related to strain, including the development of fatigue, burnout and health problems. In the second motivational process, job resources are assumed to have motivational potential, which leads to engagement with and commitment to work. Job resources may have such a motivational role because they foster employees' growth, learning, and development, or they are instrumental in achieving work goals.

There are several studies which have provided evidence for the idea that job demands and resources are responsible for the two different processes (see Bakker & Demerouti, 2007, for a review). First, both cross-sectional and longitudinal studies have identified positive associations between job demands and dimensions of burnout (e.g., Hakanen, Schaufeli, & Ahola, 2008; Schaufeli, Taris, & van Rhenen, 2008; for reviews see Halbesleben & Buckley, 2004; Schaufeli & Enzmann, 1998) and it has also been shown that job demands are related to high need for recovery (e.g., de Croon et al., 2004; De Raeve, Vasse, Jansen, van der Brandt, & Kant, 2007; Jansen, Kant, Van Amelsvoort, Nijhuis, & van den Brandt, 2003; Machin & Hoare, 2008; van der Hulst, van Veldhoven, & Beckers, 2006). Second, a positive relationship between job resources and work engagement has been found in several cross-sectional (e.g., Bakker, Hakanen, Demerouti, &

Xanthopoulou, 2007; Hakanen, Bakker, & Schaufeli, 2006; Schaufeli & Bakker, 2004) and in a few longitudinal studies (Hakanen et al., 2008; Mauno, Kinnunen, & Ruokolainen, 2007).

There is also evidence showing the intertwined effects between motivational and health impairment processes. In line with the third basic assumption of the JD-R model, lack of resources (e.g., lack of job control and social support) has been linked to fatigue and burnout in both cross-sectional (e.g., Schaufeli & Bakker, 2004) and longitudinal studies (e.g., Hakanen et al., 2008; see Lee & Ashforth, 1996, for a review). Although the JD-R model (Schaufeli & Bakker, 2004) does not hypothesize any relationship between job demands and engagement, there are studies reporting either a negative or positive relationship. First, a negative relationship – although not strong – emerged in the longitudinal studies by Hakanen and colleagues (2008) and Mauno and colleagues (2007): high job demands were related to low work engagement over time. Second, high job demands (e.g., work pressure) were positively related to each work engagement dimension in the study by Schaufeli and colleagues (2008) among managers. In addition, there are studies in which long working hours have been linked to high work engagement (e.g., Kinnunen, Feldt, & Mäkikangas, 2008). However, according to a recent meta-analysis (across 111 unique samples), job demands have been related to work engagement more often negatively than positively (Halbesleben, 2010). Altogether, the role of job demands in relation to work engagement seems not to be fully established, likely due to the fact that job demands are not necessarily negative job stressors (Bakker & Demerouti, 2007).

In sum, the JD-R model suggests that job demands are factors inhibiting recovery, whereas job resources are factors facilitating recovery. In the present study, weekly working hours, time demands, and demands in decision-making at work were examined as job demands, and job control, justice of the supervisor, social support from the supervisor and co-workers were examined as job resources. These work characteristics are among the important ones according also to other work stress models, such as the Job Demands-Control model, the Effort-Reward Imbalance model and the Organizational Injustice model (see e.g. Kivimäki et al., 2006).

1.4.2 The role of recovery experiences in the context of the JD-R model

Next I discuss the role of recovery experiences within the JD-R model. In the present study recovery experiences were examined both as mediators and moderators in the link between work characteristics and well-being and ill-health. These mediating and moderating roles of recovery experiences have received only limited attention so far. Both roles are significant as they determine the recovery process. First, mediation gives further information about why work characteristics might be related to well-being or ill-health. In other words, do recovery experiences function as intermediary mechanisms between work characteristics and well-being or ill-health? Second, moderation answers the question as to under what conditions the link might occur. That is, do recovery experiences modify the connection between work characteristics and well-being or ill-health? Finding moderators for the relationship between job demands and ill-health is particularly important because high job demands are very common in contemporary working life. Although the following discussion is mainly based on the JD-R model, the E-R model and the COR theory are also utilized as the recovery experiences have their theoretical roots in these two models.

1.4.2.1 The mediating role of recovery experiences

It has been shown that stress-related physiology, that is physiological recovery, plays a mediation role in explaining why job stressors may produce poor well-being and health problems (e.g., Cox & Ferguson, 1994; Geurts & Sonnentag, 2006). Instead, to the best of my knowledge recovery experiences have so far been studied as mediators in only one study by Sonnentag, Kuttler, and Fritz (2010), which showed that psychological detachment was a partial mediator between job stressors and strain reactions in a sample of protestant pastors. More specifically, in that study high workload, emotional dissonance, and low spatial work-home boundaries were related to poor psychological detachment from work, which in turn predicted high levels of emotional exhaustion and need for recovery. Thus, the present study is among the first to examine this mediation link.

The potential mediation link examined in the present study was based on the following reasoning: As already stated, job demands can be seen as factors which inhibit recovery and promote the process impairing health, whereas job resources facilitate recovery and maintain the motivational process (see Demerouti et al., 2009). In line with the health impairment process, job demands may challenge psychological detachment and relaxation during non-work time, and poor detachment and relaxation are, in turn, linked to increased fatigue at work. This view is based on the fact that exposure to high job demands (e.g., high workload) may increase the risk of ruminating about work after the working day is over (see Cropley & Purvis, 2003). This suggests that employees may have difficulties in psychological detachment from work. As a consequence, they may also have problems in relaxation due to the prolonged activation and negative affect related to work. Finally, these processes – rumination, prolonged activation and negative affect – taxing the same systems activated on the job maintain fatigue in line with the E-R model (Meijman & Mulder, 1998).

It is also possible that job demands are linked to decreased mastery experiences and control during non-work time. As job demands exhaust employees' mental and physical resources (Bakker & Demerouti, 2007), they may not have enough effort left for mastery experiences, that is, to tackle new challenges or learn new things during leisure time. In the same way, high job demands may increase the feeling of being out of control during non-work time, for example, by decreasing leisure time or by being cognitively occupied with work affairs. Consequently, the employees' resources (e.g. self-esteem, competence, mood) may not be restored through mastery and control, which is reflected in elevated levels of fatigue.

Consistent with the motivational process, job resources may promote especially mastery experiences and control during non-work time and these two recovery experiences, in turn, are proposed to promote work engagement signaling adequate recovery. This view is based on the COR theory (Hobfoll, 1998), according to which individuals with a strong resource pool will invest their resources in order to improve their condition and obtain new resources. Thus resources tend to accumulate and generate other resources. Employees who have high resources on the job are likely to have more internal resources (e.g., energy, self-efficacy) available for learning and decision-making during non-work time. As a result, they

may spend their leisure time in gaining mastery experiences or perceive having more control over leisure time (see Sonnentag & Fritz, 2007). These experiences in turn help – via restoring or creating such resources as self-efficacy – to recover and maintain motivation in the form of work engagement.

Contrary to job demands, it is possible that job resources promote psychological detachment and relaxation during non-work time as high job resources (e.g., social support) may decrease the risk of ruminating or having negative affect towards the job after work. However, it may also be that high job resources increase employees' positive thoughts about the job during leisure time. In this case, although detachment from work during leisure time does not occur, recovery may not suffer as positively reflecting about one's job may – as a resource-providing experience (Binnewies, Sonnentag, & Mojza, 2009) – even improve well-being (Fritz & Sonnentag, 2005). If the level of work-related positive affect is high, it may also hinder relaxation to some extent through a high activation level, but in the case of positive activated affect lack of relaxation may not be so detrimental to well-being, either. As a consequence, a less uniform relation can be expected between job resources on the one hand and psychological detachment and relaxation on the other.

On the basis of the JD-R model and the strong evidence supporting the main effects of job demands on ill-health and job resources on well-being, direct links between these phenomena are also expected. Therefore, the mediation role of recovery experiences is assumed to be only partial. In addition, it is possible that other mechanisms also function as mediators in these relationships, supporting partial mediation.

1.4.2.2 The moderating role of recovery experiences

In this study the moderator role of recovery experiences was also examined, as it is important to identify factors which may buffer against the harmful effects of job stressors on well-being. In this regard, the present study was likewise among the first to be published on the topic. Although Sonnentag and Fritz (2007) have assumed that all four recovery experiences may be conceptualized as moderators in the relationship between job stressors and occupational well-being, there are only a

few studies so far which have examined this issue. These studies have been either limited to specific stressors such as work-family conflict (Mauno, Rantanen, & Kinnunen, 2009; Moreno-Jimenez et al., 2009) and job insecurity (Kinnunen, Mauno, & Siltaloppi, 2010) or they have studied only one recovery experience, namely psychological detachment as a moderator (Sonnentag, Binnewies, & Mojza, 2010). These studies have shown, for example, that in an insecure job situation relaxation buffered against increased need for recovery from work, and psychological detachment against impaired vigor at work (Kinnunen et al., 2010). In addition, psychological detachment buffered the relation between job demands and an increase in psychosomatic complaints and between job demands and a decrease in work engagement across one year (Sonntag, Binnewies et al., 2010).

In the present study the line of reasoning for the moderating role of recovery experiences among the work characteristics–well-being/ill-health outcomes relationship was as follows: As processes by which individuals try to restore their energy resources, recovery experiences can affect the strain process. This may occur, for example, on the basis of the stressor reactivity model (Bolger & Zuckerman, 1995; see also Kammeyer-Mueller, Judge, & Scott, 2009). Stressor reactivity indicates the extent to which an individual is likely to express strain reactions to the situation perceived as stressful. It can be expected that individuals with well-functioning recovery experiences (i.e., high levels of detachment, relaxation, mastery, and control) may have less strain when job stressors are experienced than individuals with poor recovery experiences. Thus, with the help of recovery experiences, individuals in stressful job situations can replenish their resources and maintain their well-being. This means that the link between work characteristics and occupational well-being can be moderated by recovery experiences.

Because job exhaustion is considered a more serious sign of the long-term strain process than need for recovery, it is likely that recovery experiences have a stronger moderating role at the beginning of the strain process, that is, in relation to need for recovery. However job exhaustion, as the core symptom of burnout and as a long-term strain indicator, may be more difficult to buffer against. In addition, this may apply in the same way to work engagement because it is described as the positive antipode of burnout.

1.5 Aims of this study

Since there is a lack of knowledge of recovery, that is, the recovery process is not so far well understood, the present study aimed to shed new light especially on recovery from the process and outcome perspective. The general aim was to get a picture of the antecedents, processes, and outcomes of recovery from a psychological perspective.

The study consists of four original publications which complement each other and the gaps in the present recovery literature. In the first two studies (I, II) the approach to recovery is variable-oriented, that is, each variable and its relations to others are in the main focus (Bergman & Trost, 2006). Instead, in the two last studies (III, IV) the approach to recovery is person-oriented, which means that the individual is regarded as the unit of measurement. This kind of person-oriented approach fills both the theoretical and methodological gaps in approaching recovery. For example, the fact that in reality people may have several recovery experiences in use at the same time and successful recovery may be the result of a certain pattern of experiences can be taken into account using this approach.

The main objectives of the study are listed below (see also Figure 1). The hypotheses of the study, which are based on the theories, models, and earlier research results presented in this introduction section, are expounded in pursuance of the results. They can also be found in each article.

- 1) Is the factor structure of the Finnish Recovery Experience Questionnaire (REQ) valid? (Studies I, IV)
- 2) Do recovery experiences function as partial mediators in the link between work characteristics–well-being/ill-health outcomes? (Study I)
- 3) Do recovery experiences moderate the relationship between work characteristics and the psychological outcomes of recovery? (Study II)
- 4) What kind of employee subgroups can be identified in terms of the level of need for recovery and changes therein in the course of one year and do certain antecedents of recovery (work characteristics, recovery experiences and off-job activities) differ between these subgroups? (Study III)
- 5) What kind of subgroups of employees with unique and distinctive patterns of mean-level stability and change in recovery experiences across one year can be

found and how do these patterns identified differ over time in work and family-related background factors and psychological outcomes (job burnout, work engagement, and sleep problems)? (Study IV)

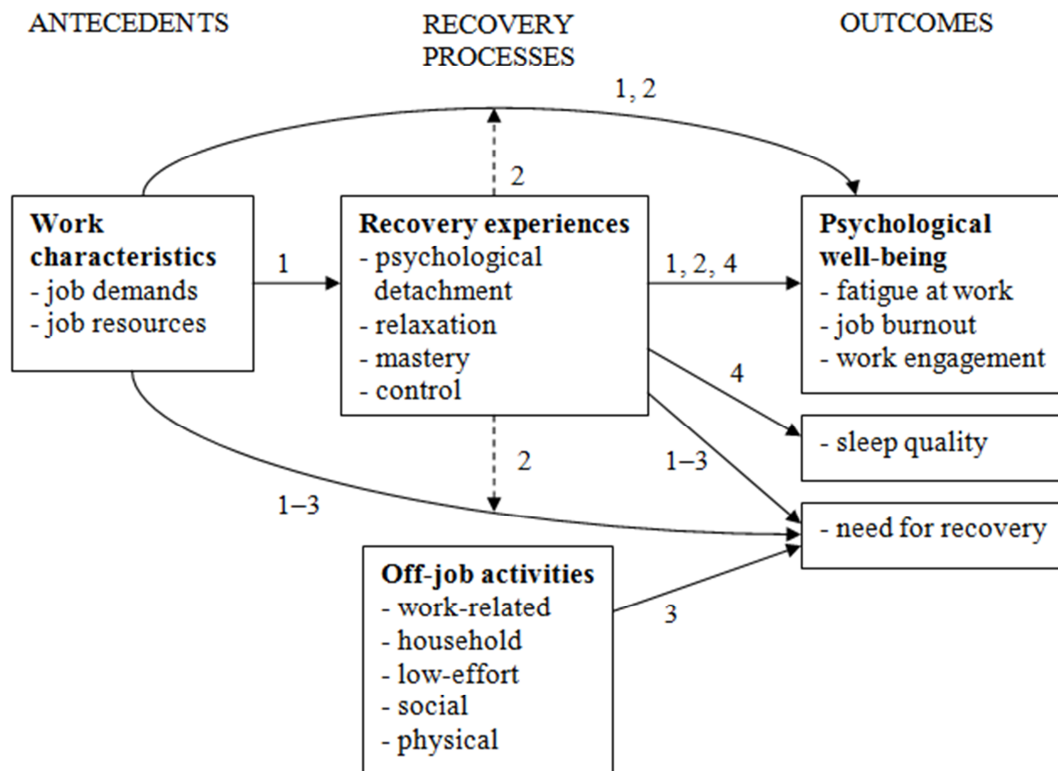


Figure 1. The framework of the study in outline. Figures 1–4 refer to Studies I–IV.

2. METHODS

2.1 Participants and procedure

This study was a part of a research project entitled “The Role of Recovery from Job Strain in Maintaining Occupational Well-being” (see Kinnunen & Mauno, 2009), conducted among five organizations located in Tampere, a Finnish city with about 200 000 inhabitants. The organizations were chosen to represent various areas: business, telecommunications and information technology, hotel and catering, travel services, and education. The organizations were recruited from the client organizations of one occupational health services company. This study was conducted in two stages so that the same individuals were investigated both cross-sectionally (Studies I, II) and longitudinally (Studies III, IV).

In the first stage (Time I, spring 2007) a questionnaire was distributed to each employee of the organizations (altogether 1,042 employees) at their workplace and in the second stage (Time II, spring 2008) to those who responded a year earlier and who were still employed in the same organizations ($n = 431$). At Time I 527 employees (response rate 50.6%) and at Time II 274 employees (response rate 63.8%) completed the questionnaire after a reminder and returned it to the researchers by mail. Of the employees, 96 had changed jobs after the first stage (and 65 of these were from the private sector), and therefore unable to participate at Time II.

Table 1 presents the background characteristics of the participants in both the cross-sectional and longitudinal studies. It can be seen that the majority of the participants were women, living with a partner, well-educated, and working in the public sector. In analyzing sample attrition at Time II, I compared the respondents of the longitudinal sample ($n = 274$) with the non-respondents ($n = 253$). The respondents and the non-respondents did not differ in most background factors (marital status, number of children, educational level, working schedule, or type of employment contract). However, there were also some differences: the respondents

worked in the public sector more often than the non-respondents (59.5% vs. 40.5%, $p < .001$) and among the respondents there were more women than among the non-respondents (56.3% vs. 43.7%, $p = .033$). Also, the respondents were older than the non-respondents (average age 44.9 vs. 39.6, $p < .001$) and the respondents worked more hours per week than the non-respondents (44.2 vs. 42.3, $p = .028$). All these differences are related to the first mentioned issue, that is, the employees in the public sector participated at Time II more likely than the others; the employees in the public sector were more often women, older and worked more weekly than the employees in the private sector.

Table 1. Background characteristics of the participants in cross-sectional and longitudinal studies.

| Background factors | Cross-sectional (Studies I, II) ($n = 527$) | | Longitudinal (Studies III, IV) ($n = 274$) | |
|--------------------------|---|------|--|------|
| | n | % | n | % |
| Gender | | | | |
| women | 277 | 52.9 | 156 | 57.4 |
| men | 247 | 47.1 | 116 | 42.6 |
| Age | | | | |
| under 35 years | 158 | 30.4 | 57 | 21.1 |
| 35–49 | 199 | 38.3 | 108 | 40.0 |
| 50 years and over | 163 | 31.3 | 105 | 38.9 |
| Living with a partner | | | | |
| yes | 403 | 77.1 | 217 | 80.1 |
| no | 120 | 22.9 | 54 | 19.9 |
| Children living at home | | | | |
| yes | 223 | 43.0 | 146 | 45.7 |
| no | 296 | 57.0 | 123 | 54.3 |
| Education | | | | |
| high | 309 | 60.0 | 170 | 63.7 |
| low | 206 | 40.0 | 97 | 36.3 |
| Employment sector | | | | |
| public | 279 | 52.9 | 166 | 60.6 |
| private | 248 | 47.1 | 108 | 39.4 |
| Employment contract type | | | | |
| permanent | 354 | 68.2 | 186 | 68.6 |
| temporary | 165 | 31.8 | 85 | 31.4 |
| Working schedule | | | | |
| regular day shift | 277 | 71.8 | 207 | 76.1 |
| other | 148 | 28.2 | 65 | 23.9 |
| Working hours | | | | |
| 40 or less | 273 | 53.0 | 136 | 50.6 |
| over 40 | 242 | 47.0 | 133 | 49.4 |

2.2 Measures

The original publications provide detailed information on the measures used in Studies I–IV. Therefore, the following description of study indicators, that is, recovery experiences, psychosocial work characteristics, off-job activities, and psychological well-being, provides a concise summary.

2.2.1 Recovery experiences

Recovery experiences in off-job time, that is, psychological detachment, relaxation, mastery, and control, which describe the process of recovery, were measured using the 16-item Finnish Recovery Experience Questionnaire (REQ, original English version by Sonnentag & Fritz, 2007) in Studies I–IV. The original questionnaire was translated from English into Finnish, and then another translator, blind to the original English version, performed a back translation. This version was then compared with the original English questionnaire. The responses were rated on a 5-point scale (1 = *totally agree*, 5 = *totally disagree*) with respect to employees' off-job time. *Psychological detachment* was measured with a four-item scale, e.g. “I distance myself from my work” and “I don't think about work at all”. *Relaxation* was measured with four items in Study I, e.g. “I do relaxing things” and “I use the time to relax”. Because of a detailed analysis showed a cross-loading for one relaxation item (“I kick back and relax”) on the psychological detachment factor, that relaxation item was removed from Studies II–IV. *Mastery* was measured with a four-item scale, e.g. “I seek out intellectual challenges” and “I do things that challenge me”. Also, *control* was measured with a four-item scale, e.g. “I feel like I can decide for myself what to do” and “I take care of things the way that I want them done”. The items were recoded so that a high score on each scale indicated a high level of the experience studied. The Cronbach's alphas for psychological detachment were .89 at Time I and .88 at Time II, for relaxation .81–.83 at Time I and .79–.80 at Time II, for mastery .83–.84 at Time I and .83 at Time II, and for control .85 at Time I and .87 at Time II.

2.2.2 Psychosocial work characteristics

Psychosocial work characteristics, which can be seen as antecedents of recovery, were evaluated by job demands (time demands, demands in decision-making and weekly working hours) and job resources (job control, justice of the supervisor, social support of the supervisor and social support of co-workers). These work characteristics were examined, because they are among the most important ones according to several work stress models, i.e. the JD-R model, the Job Demands-Control model, the Effort-Reward Imbalance model and the Organizational Injustice model (see e.g. Kivimäki et al., 2006). Except for weekly working hours all work characteristics were assessed with the QPSNordic Questionnaire (Lindström et al., 2000). The responses were rated on a 5-point scale (1 = *very seldom or never*, 5 = *very often or always*). On the scales regarding superior and co-workers there was also an option of “no immediate supervisor/co-workers”. Those choosing this option were excluded from the analysis.

Of job demands, *time demands* at work included four items, e.g. “Do you have too much to do?” and “Does your job require you to work fast?”, and were measured in Studies I–III. *Demands in decision-making* consisted of three items, e.g. “Does your work require quick decisions?” and “Does your work require maximum attention?”, and were measured in Study I. The Cronbach’s alphas for time demands were .76–.78 at Time I and .77 at Time II, and for demands in decision-making .63 at Time I. In addition, *weekly working hours* (including all duties) were asked by a single question in Studies I and III. Also, in Studies II and IV weekly working hours operated as controls. Besides, in Study I the latent factor of *job demands* was used. The latent factor was formed from the mean scores of time demands and demands in decision-making and from the single question of weekly working hours.

Of job resources, *job control* was assessed with four items, e.g. “Can you decide yourself when you are going to take a break?” and “Can you influence decisions that are important for your work?” in Studies I–III. *Justice of the supervisor* consisted of three items, e.g. “Does your immediate superior distribute the work fairly and impartially?” and “Does your immediate superior treat the workers fairly and equally?”, and was measured in Studies I–III. *Support of the supervisor* consisted of three items, e.g. “If needed, can you get support and help with your work from your

immediate superior?” and “Are your work achievements appreciated by your immediate superior?”, and was assessed in Study III. *Social support of co-workers* was evaluated with two items, which were “If needed, can you get support and help with your work from your co-workers?” and “If needed, are your co-workers willing to listen to your work-related problems?” in Study I. The Cronbach’s alphas for job control were .73–.74 at Time I and .74 at Time II, for justice of the supervisor .83–.84 at Time I and .83 at Time II, for support of the supervisor .88 at Time I and .85 at Time II, and for social support from co-workers .84 at Time I. Also, in Study I the latent factor of *job resources*, which contained the mean scores of job control, social support of co-workers, and justice of the supervisor, was used.

2.2.3 Off-job activities

Free time activities, which describe the process of recovery, were examined as antecedents of recovery outcomes in the present study. They were assessed by *work-related activities* (e.g. finishing or preparing for work duties), *household activities* (e.g. cooking, doing the dishes, shopping), *low-effort activities* (e.g. watching TV, lying on the sofa), *social activities* (e.g. meeting friends, making a phone call), and *physical activities* (e.g. cycling, dancing) in Study III. Each of them was assessed with one single item “How often do you spend your time on this off-job activity?” on a four-point scale (1 = *never*, 4 = *nearly always*). This procedure with a similar classification of off-job activities was used by Sonnentag (2001).

2.2.4 Psychological well-being

Outcomes of recovery were assessed by the following measures. *Need for recovery*, that is, the short-term effects of a day of work were assessed by nine items (e.g. “After a working day I am often too tired to start other activities” and “At the end of working day, I am really feeling worn-out”) from the Need for Recovery Scale (Van Veldhoven & Broersen, 2003) in Studies I–III. The questionnaire was translated from English into Finnish, and after that the cross-cultural accuracy of the translation was checked and it was backtranslated into English. The responses were rated on a four-point scale (1 = *never*, 4 = *always*), so that high scores reflected high

levels of need for recovery. The Cronbach's alphas for the scale were .89 at Time I and .88 at Time II.

An individual's *own recovery evaluation* was assessed with a single question "How well do you generally feel to recover from the strain caused by your job after the working day?" on a five-point scale (1 = *very well*, 5 = *very poorly*) in Study I. This item proved to behave in a similar way as need for recovery and job exhaustion (see Study I).

Burnout was measured with the Maslach Burnout Inventory-General Survey (MBI-GS, Maslach et al., 1996) in Study IV, of which construct validity has been shown to be good in Finland, but its clinical validity has not been confirmed (Kalimo, Hakanen, & Toppinen-Tanner, 2006; see also Ahola, 2007). Also, in Studies I and II the core dimension of burnout, that is, *exhaustion*, was measured. The MBI-GS consisted of exhaustion with five items, cynicism with five items, and reduced professional efficacy with six items. Respondents were asked to indicate how often, if ever, they experienced each of the situations described in the statements. The items were rated on a seven-point scale (0 = *never*, 6 = *daily*) and scored and recoded so that high scores indicated burnout. The Cronbach's alphas for exhaustion were .93 at Time I and .87 at Time II, for cynicism .87 at Time I and .84 at Time II, and reduced professional efficacy .81 at Time I and .79 at Time II. In addition, in Study IV a weighted sum score ($0.4 \times \text{exhaustion} + 0.3 \times \text{cynicism} + 0.3 \times \text{reduced professional efficacy}$; see Ahola, 2007; Kalimo, Pahkin, Mutanen, & Toppinen-Tanner, 2003; Kalimo et al., 2006) was calculated. Further, in Study I the latent factor of *fatigue at work* was used. This contained the mean scores of job exhaustion and need for recovery, and the single item of an individual's own recovery evaluation.

Work engagement was measured with the nine-item Utrecht Work Engagement Scale (Schaufeli et al., 2006), of which construct validity has been found to be good in Finnish occupational samples (Seppälä et al., 2009). The scale consists of vigor, dedication, and absorption, and each of these included three items, which were rated on a seven-point scale (0 = *never*, 6 = *daily*) so that high scores indicated work engagement. Sample items of vigor are "At my job, I feel strong and vigorous" and "At my work, I feel bursting with energy", of dedication "I am proud of the work that I do" and "I am enthusiastic about my work", and of absorption "I get carried

away when I'm working" and "I am immersed in my work". All of these were used in Studies I and IV, and the Cronbach's alphas for vigor were .88 at Time I and .90 at Time II, for dedication .89 at Time I–II, and for absorption .83 at Time I and .85 at Time II. In addition, in Study IV a total sum score of work engagement was calculated, of which Cronbach's alphas were .93 at Time I and .89 at Time II. Also, in Study I the latent factor of work engagement, which contained mean scores of vigor, dedication, and absorption, was used. Further, in Study II the core dimensions of work engagement, that is, vigor and dedication were used (González-Romá, Schaufeli, Bakker, & Lloret, 2006). Those two scales correlated so highly ($r = .71, p < .001$) that they were combined into a single scale, for which the Cronbach's alpha was .83.

Sleep problems were assessed in Study IV with two items from the Basic Nordic Sleep Questionnaire (Partinen & Gislason, 1995), which were "How well have you been sleeping during the past three months?" (1 = *very well*, 5 = *badly*) and "How often have you had insomnia or impaired sleep quality during the past three months?" (1 = *never or less than once per month*, 5 = *daily or almost daily*). Thus, high scores denote sleep problems. The Cronbach's alphas were .90 at Time I and .87 at Time II. The use of subjective measures of sleep quality has been proved to correlate well with objective measures (Johns & Doré, 1978).

In addition, the following background factors were used as covariates: gender (Studies II–IV), age (Studies II–IV), partner relationship/marital status (Studies III–IV), children living at home (Studies III–IV), level of education (Studies II–IV), employment sector (Studies II and IV), employment contract type (Studies III–IV), working hours per week (Studies II and IV), and working schedule (Study IV).

2.3 Data analyses

All data analysis methods used in Studies I to IV are classified in Table 2 and described more specifically in the original publications. Therefore, the main analysis methods are outlined in the following only on a general level.

In order to be sure that the Finnish Recovery Experience Questionnaire (REQ) had a four-factor structure (i.e., psychological detachment, relaxation, mastery and control during off-job time) a series of Confirmatory Factor Analyses (CFA) was

performed in Study I. In addition, in order to ensure that the structure was also valid over a one-year follow-up time a longitudinal CFA was used in Study IV.

In Study I, the goal was to extend the JD-R model by taking into account recovery experiences as important mediating mechanisms between work characteristics and well-being/ill-health. Therefore, Structural Equation Modeling (SEM) was chosen as the method of analysis, because it has been highly recommended for analyzing the latent structures and indirect effects of the study variables (MacKinnon, 2008).

In Study II, the goal was to examine the direct and moderator roles of recovery experiences in the relationship between psychosocial work characteristics and occupational well-being. Thus hierarchical multiple regression analysis was used as the main method of analysis in these analyses (Baron & Kenny, 1986). In Studies I–II the approach was variable-oriented, that is, each variable and its relations to others was in the main focus (Bergman & Trost, 2006).

In Studies III and IV, the goal was to identify homogeneous groups of need for recovery (Study III) and recovery experiences (Study IV) across one year. To identify statistically naturally occurring homogenous groups of individuals Mixture Modeling (MM; Muthén & Muthén, 1998–2007; Study III) based on means and Latent Profile Analysis (LPA; Muthén, 2001; Study IV) based on factor scores were used. In Studies III–IV, the approach was person-oriented, which means that the individual is regarded as the unit of measurement. Because it is assumed that the population is heterogeneous, it is possible to identify different groups of individuals who share similar associations among variables across time (Bergman & Trost, 2006).

After identifying groups, in Study III, the aim was to examine how the groups differed in the antecedents of need for recovery over one year. For that purpose multivariate analysis of covariance (MANCOVA) and univariate analysis of covariance (ANCOVA) for repeated measures were used. In Study IV, the goal was to examine how the groups differed in psychological outcomes across one year. To investigate these relations ANOVA/ANCOVA for repeated measures was used. Also, paired-samples t-test was used to analyze the groups separately, and the chi-square test or one-way analysis of variance (ANOVA) was used to examine the differences in background characteristics between the groups.

Mplus 5.2 program (Muthén & Muthén, 1998–2007) was used as a statistical tool in performing CFA, SEM, MM, and LPA, and other analyses were performed using the SPSS 16.0 for Windows statistical package.

Table 2. Summary of the Studies: Data, research aims, variables, and main data analysis methods used in Studies I–IV.

| | Data | Research aims | Variables in main analyses | Main data analyses |
|-----------|--------------------------------------|--|--|--|
| Study I | Cross-sectional (<i>n</i> = 527) | To test construct validity of the Finnish REQ To enter the JD-R model by taking into account recovery as an important mediating mechanism between work characteristics and well-being/ill-health | Recovery experiences detachment, relaxation, mastery, control Job demands time demands, demands in decision-making, weekly working hours Job resources job control, social support of co-workers, justice of the supervisor Fatigue at work need for recovery, own recovery evaluation, job exhaustion Work engagement vigor, dedication, absorption Recovery experiences detachment, relaxation, mastery, control Psychosocial work characteristics time demands, job control, justice of the supervisor Need for recovery Job exhaustion Work engagement vigor, dedication Recovery experiences detachment, relaxation, mastery, control Psychosocial work characteristics time demands, weekly working hours, job control, support of the supervisor, justice of the supervisor Off-job activities work-related activities, household activities, low-effort activities, social activities, physical activities Need for recovery Recovery experiences detachment, relaxation, mastery, control Burnout exhaustion, cynicism, reduced professional efficacy Work engagement vigor, dedication, absorption Sleep problems | Confirmatory factor analysis (CFA) Structural equation models (SEM), bootstrapping |
| Study II | Cross-sectional (<i>n</i> = 527) | To examine the direct and moderator roles of recovery experiences in the relationship between psychosocial work characteristics and occupational well-being | | Hierarchical multiple regression analysis |
| Study III | Longitudinal (<i>n</i> = 274) | To identify homogeneous need for recovery groups across 1 year To examine how the groups differ in antecedents of need for recovery over 1 year | | Mixture modeling Multivariate analysis of covariance (MANCOVA)/univariate analysis of covariance (ANCOVA) for repeated measures |
| Study IV | Longitudinal (<i>n</i> = 274) | To test construct validity of the Finnish REQ over time To investigate patterns of recovery experiences across 1 year To examine how the patterns differ in psychological outcomes over 1 year | | Longitudinal confirmatory factor analysis (CFA) Latent profile analysis (LPA) Chi-square test One-way analysis of variance (ANOVA) ANOVA/ANCOVA for repeated measures Paired-samples t-test |

3. OVERVIEW OF THE RESULTS

3.1 Study I

The aim of this study was to extend the original Job Demands-Resources (JD-R) model by taking into account recovery as an important mediation mechanism between work characteristics and well-being/ill-health. First, we hypothesized that the Finnish REQ has four dimensions, namely psychological detachment, relaxation, mastery, and control (Hypothesis 1), which received support by a series of CFAs.

Second, we supposed that recovery experiences – especially psychological detachment and relaxation – partially mediate the relationship between job demands and fatigue at work (Hypothesis 2). The results of SEM revealed that psychological detachment fully mediated the effects of job demands on fatigue at work, thus, Hypothesis 2 received partial support (see Figure 2), so there was no direct link from job demands to fatigue at work.

Third, we assumed that recovery experiences – especially mastery and control – partially mediate the relationship between job resources and work engagement (Hypothesis 3). The results of SEM gave partial support for Hypothesis 3 as they showed that mastery partially mediated the effects of job resources on work engagement. This means that there was also a direct link from job resources to work engagement.

Finally, we expected that job resources have a negative direct link to fatigue at work (Hypothesis 4) and that job demands have a negative direct link to work engagement (Hypothesis 5). Lack of job resources contributed to fatigue at work in line with our Hypothesis 4. Contrary to our Hypothesis 5, the direct link between job demands and work engagement was positive; the higher the level of job demands, the higher the level of work engagement. The hypothesized model explained 69% of the variance in fatigue at work and 39% of the variance in work engagement.

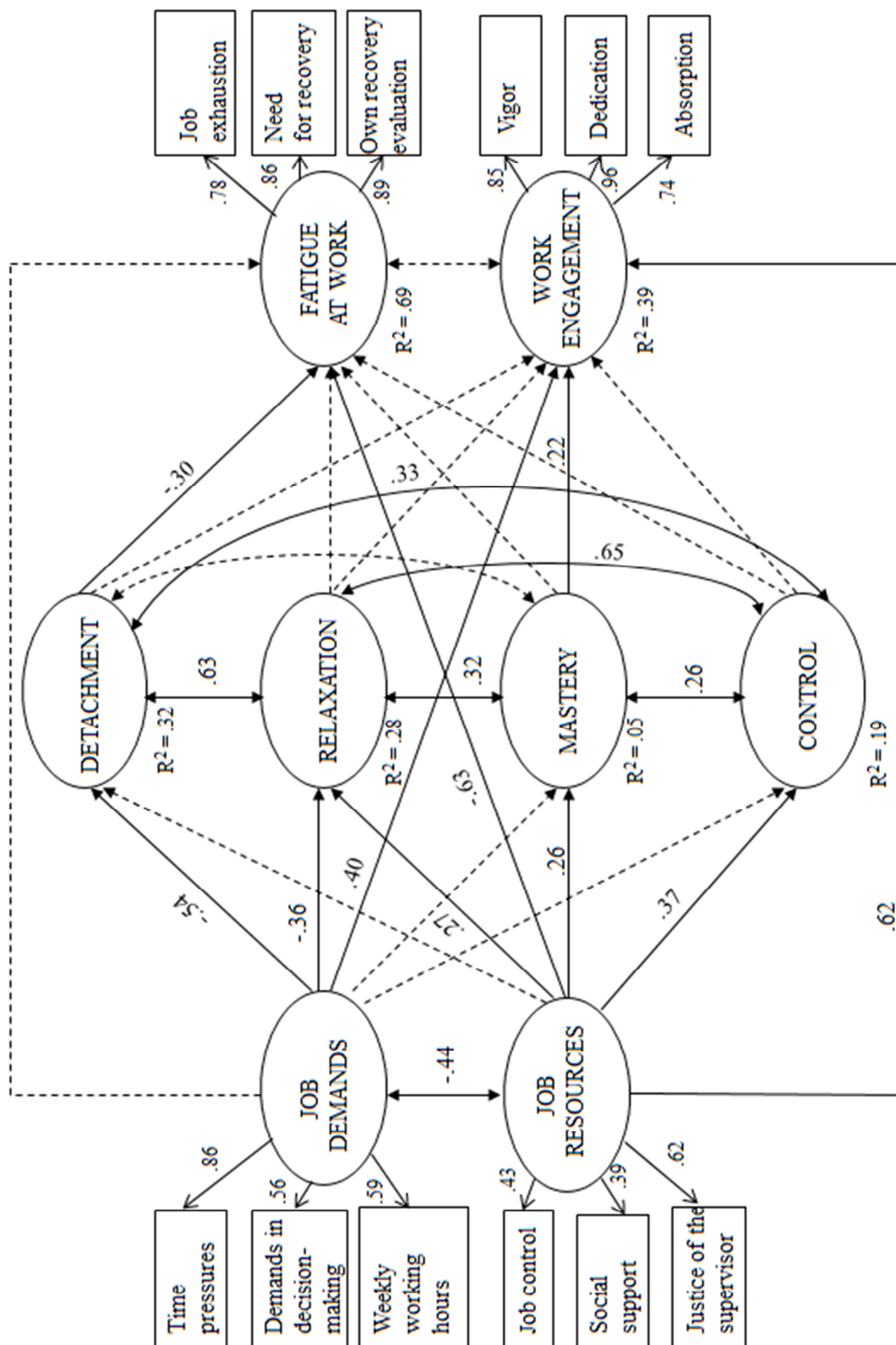


Figure 2. The partial mediation model. The dotted lines are nonsignificant.

3.2 Study II

The aims of the study were to examine the direct links of psychosocial work characteristics and recovery experiences to occupational well-being as well as the moderator role of recovery experiences in the relation between psychosocial work characteristics and occupational well-being. First, we expected that the four recovery experiences are negatively related to need for recovery and job exhaustion and positively related to work engagement (Hypothesis 1). The results of the regression analyses showed that psychological detachment ($p < .001$) contributed most to the explanation of need for recovery and job exhaustion. In addition, lack of control ($p < .001$) explained need for recovery, and low mastery explained both need for recovery ($p < .05$) and job exhaustion ($p < .05$). Further, mastery ($p < .001$) and psychological detachment ($p < .01$) contributed to work engagement. Thus Hypothesis 1, expecting direct links from all recovery experiences to all occupational well-being indicators, received only partial support. Altogether, need for recovery (15%) was better explained by recovery experiences than job exhaustion (5%) and work engagement (7%).

Second, we expected that time demands at work are related more robustly than job control and perceived justice of the supervisor to need for recovery and job exhaustion (Hypothesis 2a). However, this Hypothesis 2a did not receive support, because all work characteristics were significantly related to need for recovery and job exhaustion. Also, we expected that job control and perceived justice of the supervisor are more robustly related to work engagement than are time demands at work (Hypothesis 2b), which was fully supported. Overall, work characteristics explained need for recovery (24%) and job exhaustion (28%) better than work engagement (13%).

Third, we assumed that recovery experiences buffer against the negative effects of time demands, lack of job control, and lack of justice of the supervisor more robustly on need for recovery than on job exhaustion and work engagement (Hypothesis 3). The results showed a few significant moderator effects: the interaction terms between job control and detachment ($\beta = .09$) and job control and mastery ($\beta = .08$) on need for recovery, as well as time demands and relaxation ($\beta = -.08$) on job exhaustion were significant (see Figures 3a–c). To be precise,

employees with high detachment reported less need for recovery, both generally and especially in a low control situation, compared to those with low detachment. Further, less need for recovery was reported under the condition of low job control with high mastery experiences compared to that with low mastery off-job experiences. Also, employees reported more job exhaustion under conditions of high time demands and low relaxation, whereas employees with high relaxation were better protected from the negative effects of high time demands on job exhaustion. Thus, Hypothesis 3 received partial support; there were two significant moderator effects on need for recovery and one on job exhaustion, and none for work engagement.

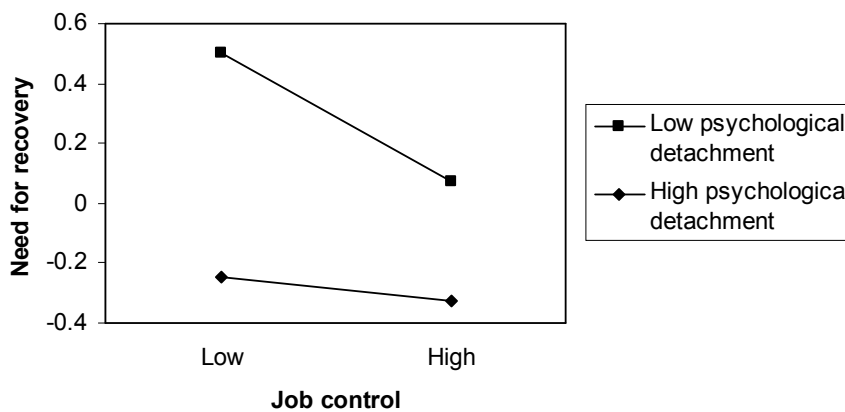


Figure 3a. Significant interaction effect between job control and psychological detachment on need for recovery.

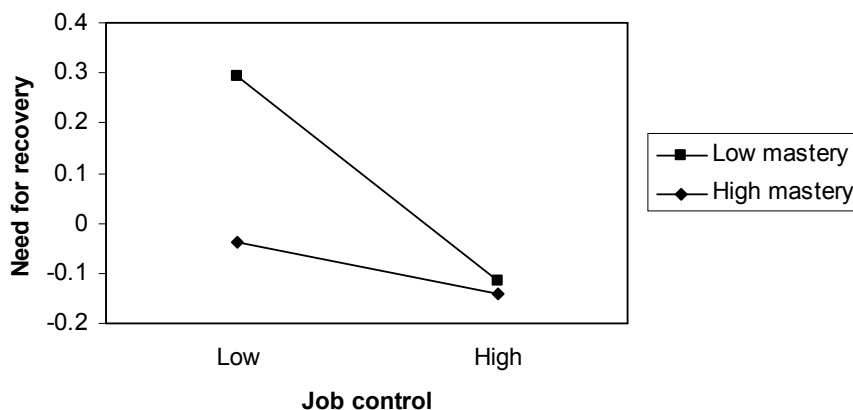


Figure 3b. Significant interaction effect between job control and mastery on need for recovery.

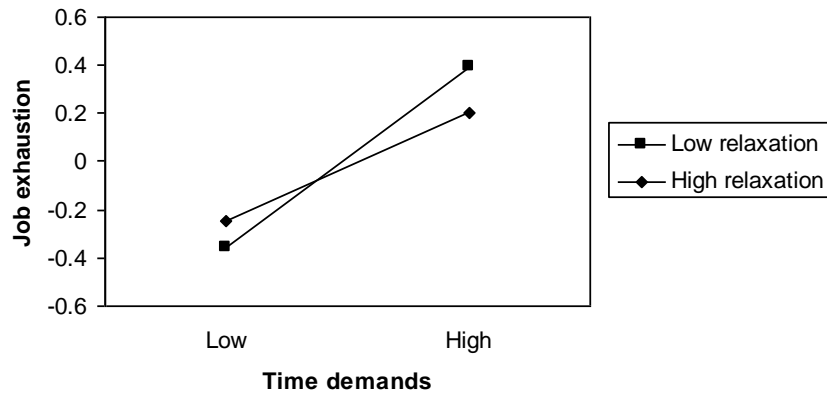


Figure 3c. Significant interaction effect between time demands and relaxation on job exhaustion.

3.3 Study III

The study aimed at identifying groups of employees who share similar mean levels and changes in need for recovery across one year and finding out whether factors regarded as antecedents of need for recovery distinguish between the different groups of need for recovery. First, we expected in particular to find employee groups with stable levels (Hypothesis 1a), but the expectation of groups with changing levels was also considered possible (Hypothesis 1b), although less likely. Five need for recovery groups (low, moderately low, average, moderately high, and high) with a stable level and three with a changing (mostly decreasing) level were identified using mixture modeling (see Figure 4).

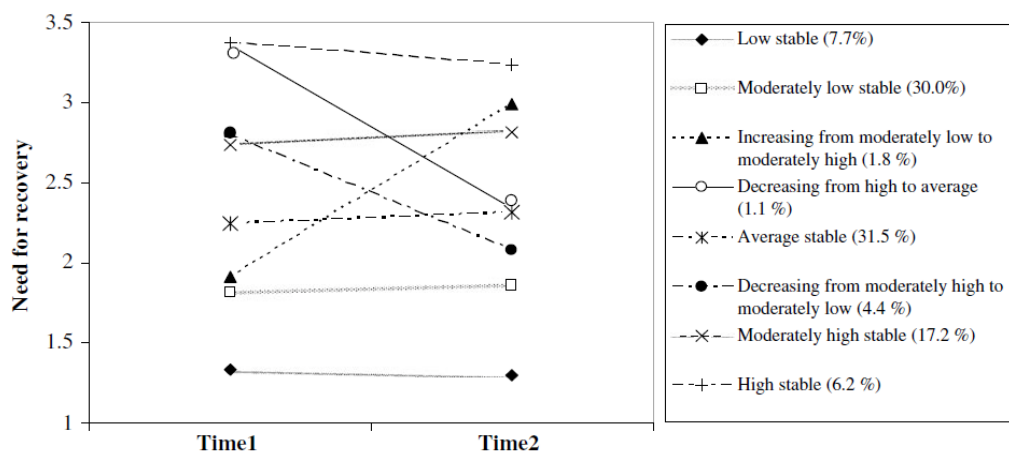


Figure 4. Latent groups of need for recovery over one year.

Second, we anticipated that high need for recovery groups (moderately high and high, altogether 23% of employees) experience higher levels of job demands and lower levels of job resources across one year compared to low need for recovery groups (moderately low and low, altogether 38% of the employees) (Hypothesis 2). The MANCOVA for repeated measures with significant covariates (age and type of employment contract) revealed that a significant multivariate effect was found for the need for recovery group ($p = .004$, partial η^2 (η_p^2) = .06). At the univariate level (ANCOVA) there was a main group of need for recovery effect for time demands at work, job control, supervisor support, and justice of the supervisor ($p < .001$, $\eta_p^2 = .08-.13$). In all these cases those belonging to low and moderately low need for recovery groups experienced fewer time demands ($p = .002-.005$, Cohen's $d = .63-1.09$) and higher levels of job control ($p < .001$, $d = .64-.96$), supervisor support ($p = .003-.005$, $d = .90$), and justice of the supervisor ($p = .002-.003$, $d = .83-.98$) than those in high need for recovery group. Thus, the associations between need for recovery groups and psychosocial work characteristics were in line with our expectations (Hypothesis 2) with one exception: there were no differences in working hours between the need for recovery groups.

Also, we assumed that low need for recovery groups have better functioning (i.e. higher levels of) recovery experiences across one year compared to high need for recovery groups (Hypothesis 3). After adjusting for significant covariates (children living at home and level of education) MANCOVA for repeated measures showed a significant multivariate effect for need for recovery group ($p < .001$, $\eta_p^2 = .30$). At the univariate level (ANCOVA) there was also a main group of need for recovery effect for psychological detachment ($p < .001$, $\eta_p^2 = .22$), relaxation ($p < .001$, $\eta_p^2 = .24$), mastery ($p = .032$, $\eta_p^2 = .04$), and control ($p < .001$, $\eta_p^2 = .22$) (see Table 3). These effects showed that those in the low and moderately low need for recovery groups ($p < .001$, $d = .58-1.51$) but also in the average need for recovery group (at least $p = .040$, $d = .39-1.03$) reported higher levels of detachment, relaxation, and control than those in the moderately high and high need for recovery groups. Thus the results were in line with Hypothesis 3.

Table 3. Differences in recovery experiences and off-job activities between five latent groups of need for recovery.

| | 1) Low stable need for recovery (<i>n</i> = 21) | | 2) Moderately low stable need for recovery (<i>n</i> = 82) | | 3) Average stable need for recovery (<i>n</i> = 86) | | 4) Moderately high stable need for recovery (<i>n</i> = 47) | | 5) High stable need for recovery (<i>n</i> = 17) | | Group effect ^a |
|---|---|----------------|--|----------------|---|----------------|---|----------------|--|----------------|----------------------------------|
| Off-job elements | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | <i>F</i> value |
| Psychological detachment ^e | 3.38 | 3.26 | 3.45 | 3.39 | 2.93 | 2.99 | 2.47 | 2.58 | 1.96 | 2.10 | 17.06*** 1–3 > 4–5 2 > 3 |
| Relaxation ^{c, e} | 4.03 | 3.93 | 4.02 | 3.91 | 3.59 | 3.57 | 3.34 | 3.33 | 2.94 | 3.22 | 18.69*** 1–2 > 3–5 3 > 4–5 |
| Mastery ^b | 3.64 | 3.70 | 3.54 | 3.45 | 3.33 | 3.22 | 3.34 | 3.05 | 3.49 | 3.15 | 2.69* |
| Control ^{c, d, e} | 4.10 | 4.18 | 3.98 | 3.86 | 3.57 | 3.72 | 3.36 | 3.29 | 2.84 | 2.99 | 16.86*** 1–3 > 4–5 1 > 3 |
| Work-related activities ^{b, e} | 2.62 | 2.43 | 2.24 | 2.24 | 2.62 | 2.54 | 2.49 | 2.34 | 3.24 | 3.24 | 3.27* 1–2 < 5 |
| Household activities ^{a, d} | 3.10 | 2.90 | 3.06 | 3.05 | 3.21 | 3.07 | 3.24 | 3.17 | 3.29 | 3.24 | 1.20 |
| Low-effort activities ^{d, e} | 2.86 | 2.81 | 3.00 | 2.96 | 2.84 | 2.82 | 3.02 | 2.83 | 2.71 | 2.88 | .89 |
| Social activities ^{a, c, e} | 2.50 | 2.55 | 2.76 | 2.72 | 2.58 | 2.48 | 2.45 | 2.43 | 2.41 | 2.53 | 3.08* 2 > 4 |
| Physical activities ^f | 2.90 | 2.86 | 2.81 | 2.84 | 2.67 | 2.60 | 2.51 | 2.45 | 2.59 | 2.59 | 2.72* 2 > 4 |

Note. T1 = Time I, T2 = Time II. Neither time nor interaction effect was detected; therefore they are not reported in the table.

^aPairwise comparisons with Bonferroni's test.

* $p < .05$; *** $p < .001$.

Used covariates: ^a gender, ^b age, ^c marital status, ^d children living at home, ^e level of education, ^f contract type

Furthermore, we expected that employees in the high need for recovery groups would spend more time doing work-related activities and less time on physical and social activities during off-job time across one year compared to the low need for recovery groups (Hypothesis 4). The results of ANCOVA for repeated measures showed three significant main effects of the recovery group. First, a significant group effect for time spent on work-related activities ($p = .012$, $\eta_p^2 = .05$) emerged; those in the high need for recovery group spent more time on work-related activities compared to the low and moderately low need for recovery groups ($p = .008$ – $.043$, $d = .76$ – 1.07). Second, there was a group effect for time spent on social activities ($p = .017$, $\eta_p^2 = .05$); those in the moderately low need for recovery group spent more

time on social activities than those in the moderately high need for recovery group ($p = .009$, $d = .47$). Third, there was a group effect for time spent on physical activities ($p = .031$, $\eta_p^2 = .04$), which showed that those in the moderately low need for recovery group spent more time on physical activities than those in the moderately high need for recovery group ($p = .040$, $d = .49$). The results were therefore also in line with Hypothesis 4. With regard to household activities and low-effort activities we set no hypotheses, and the results showed that there were no significant effects for them.

3.4 Study IV

In this study, the aim was to examine patterns of recovery experiences and their links to psychological outcomes over one year. More specifically, our first aim was to discover whether there were subgroups of employees with unique and distinctive patterns of mean-level stability and change in recovery experiences across one year. Because recovery experiences have not previously been studied from a person-oriented viewpoint, it was only possible to speculate about the number and characteristics of the subgroups, and thus we set no exact hypotheses.

At first we tested the construct validity of the Finnish REQ over time by calculating a longitudinal CFA model, which proved that the structure of the Finnish REQ was time invariant. To examine the patterns of recovery experiences across two measurements, the factor scores of each recovery experience at Time I and Time II obtained from the longitudinal CFA model were simultaneously included in the Latent Profile Analysis (LPA). As a result, five distinct patterns of recovery experiences were obtained: 1) reasonably high stable levels of all four recovery experiences ($n = 198$, 72%), 2) high mastery and control experiences ($n = 12$, 4%), 3) high relaxation and mastery and increasing control ($n = 29$, 11%), 4) decreasing levels of recovery experiences ($n = 12$, 4%), and 5) low levels of all four recovery experiences ($n = 23$, 9%).

After that, we examined whether the five patterns of recovery experiences would differ from each other in background factors. They did not differ from each other by gender, age, and working schedule but in six background factors (having a partner, living with children, education, weekly working hours, employment sector and

employment contract type) were differences. First, in pattern 1, with reasonably high levels of recovery experiences, it was typical to live without a partner and children, have lower than master's level education and work in the private sector. In addition, employees belonging to this pattern had a smaller number of weekly working hours compared to those in pattern 2. Second, besides high working hours, in pattern 2 with high mastery and control experiences, it was typical to have no children living at home. Third, in pattern 3 with reasonably high levels of relaxation and mastery and increasing control across time, it was typical to have a high level of education and work in the public sector. Fourth, in pattern 4 with decreasing levels of recovery experiences, those employed on a temporary basis were overrepresented compared to others. Finally, in the low recovery experiences pattern 5, it was typical to live with a partner and children.

After the patterns were identified, the second main aim was to investigate how the patterns differed in psychological outcomes (job burnout, work engagement, and sleep problems) across one year to ascertain which kinds of patterns of recovery experiences best promote psychological outcomes. The results of the ANOVA/ANCOVA for repeated measures first revealed two significant interaction effects, one for job exhaustion ($p < .05$, $\eta_p^2 = .04$), and another for job burnout ($p < .05$, $\eta_p^2 = .05$), meaning that the level of exhaustion and burnout changed differently in the patterns of recovery experiences over one year (see Table 4). Paired samples t-tests showed that job exhaustion ($p < .05$) increased in the pattern of decreasing levels of recovery experiences. However, the increase in burnout in the same pattern did not reach statistical significance ($p = .08$). Second, there seemed to be a main effect of the pattern on every psychological outcome (p at least $< .05$, $\eta_p^2 = .02-.05$) except for dedication to work. Those belonging to the pattern with high levels of mastery and control had lower levels of reduced professional efficacy ($p < .01$, $d = 1.25$) and higher levels of vigor and absorption as well as total work engagement ($p < .05$, $d = 1.04-1.21$) than those in the pattern with reasonably high levels of relaxation and mastery and increasing control. Furthermore, those in the pattern with reasonably high recovery experiences suffered less from burnout and sleep problems ($p < .05$, $d = .51-.55$) than those in the pattern with high relaxation and mastery and increasing control and they had a higher level of reduced professional efficacy ($p < .05$, $d = .86$) than those in the pattern with high mastery and control experiences.

Altogether, the person-oriented approach to recovery experiences indicated that the most typical pattern consisted of reasonably high levels of all four recovery experiences, which best promoted long-term psychological well-being.

Table 4. Differences in psychological outcomes between five patterns of recovery experiences.

| | 1) High recovery experiences (<i>n</i> = 198) | | 2) High mastery and control (<i>n</i> = 12) | | 3) High relaxation and mastery, increasing control (<i>n</i> = 29) | | 4) Decreasing recovery experiences (<i>n</i> = 12) | | 5) Low recovery experiences (<i>n</i> = 23) | | Time effect | Pattern effect ^a | Pattern × time effect |
|---|---|----------------|---|----------------|--|----------------|--|----------------|---|----------------|----------------|-----------------------------|-----------------------|
| | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | T1 <i>M</i> | T2 <i>M</i> | <i>F</i> value | <i>F</i> value | <i>F</i> value |
| Exhaustion | 1.66 | 1.71 | 2.48 | 2.27 | 2.47 | 2.23 | 1.90 | 2.83 | 2.20 | 2.20 | .86 | 3.33* | 2.48* |
| Cynicism | 1.35 | 1.54 | 1.18 | 1.58 | 2.13 | 1.91 | 1.75 | 2.30 | 2.03 | 1.98 | 2.26 | 2.92* | 1.49 |
| Reduced professional efficacy ^{b, c} | 1.55 | 1.64 | .82 | .92 | 2.15 | 1.79 | 1.32 | 1.56 | 1.66 | 1.61 | .93 | 3.49** (2 < 1, 3) | 1.46 |
| Burnout | 1.54 | 1.64 | 1.59 | 1.65 | 2.27 | 2.00 | 1.68 | 2.29 | 1.66 | 1.96 | 1.49 | 3.06* (1 < 3) | 3.08* |
| Vigor ^a | 4.47 | 4.24 | 5.17 | 4.75 | 3.75 | 3.99 | 4.42 | 3.78 | 4.03 | 4.03 | .86 | 2.82* (2 > 3) | 2.05 |
| Dedication | 4.51 | 4.32 | 5.33 | 5.00 | 3.77 | 4.18 | 4.50 | 4.19 | 4.39 | 4.25 | 1.26 | 2.27 | 2.36 |
| Absorption ^{a, c, d} | 4.37 | 4.25 | 5.42 | 5.22 | 4.07 | 4.18 | 4.17 | 4.25 | 4.45 | 4.22 | 4.72* | 2.43* (2 > 3) | .32 |
| Work engagement ^a | 4.45 | 4.28 | 5.31 | 4.99 | 3.87 | 4.12 | 4.36 | 4.07 | 4.29 | 4.17 | 1.89 | 2.86* (2 > 3) | 1.38 |
| Sleep problems | 2.23 | 2.39 | 2.88 | 2.50 | 2.79 | 2.93 | 2.67 | 3.00 | 2.43 | 2.54 | .82 | 3.06* (1 < 3) | 1.43 |

Note. T1 = Time I, T2 = Time II, M = mean

^a Pairwise comparisons with Bonferroni's or Dunnett's test. The numbers in parentheses show which patterns (1–5) differ from each other

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

Used covariates: ^a partner relationship, ^b children living at home, ^c education, ^d working hours per week

4. DISCUSSION

4.1 Overall summary of results

The main study findings are summarized as follows: First, the study (Studies I, IV) demonstrated that the Finnish REQ measuring the four recovery experiences, psychological detachment, relaxation, mastery and control during off-job time, turned out to have good construct validity. Although the Finnish REQ might still benefit from some scale development, in particular, this perception concerns the relaxation scale and its item 2.

Second, the study (Study I) showed that psychological detachment fully mediated the effects of job demands on fatigue at work and mastery partially mediated the effects of job resources on work engagement. Moreover, lack of job resources contributed to fatigue at work. Job demands showed, however, a direct positive link to work engagement. The results suggest that recovery merits consideration as a mediating mechanism in the JD-R model.

Third, the study (Study II) showed that recovery experiences – psychological detachment and mastery in particular – had direct links to occupational well-being (need for recovery, job exhaustion, and work engagement). It seemed that psychological detachment was the most powerful recovery experience; its relation to low levels of need for recovery and job exhaustion was most significant. Psychological detachment and mastery were protective mechanisms – buffers – against increased need for recovery in a situation of lack of job control. Also, relaxation protected against increased job exhaustion under high time demands. Altogether, the study findings suggest that recovery experiences play a significant role in maintaining well-being at work.

Fourth, in the study (Study III) eight subgroups of employees in need for recovery across one year were identified. Five of these groups indicated stable (low, moderately low, average, moderately high, and high) need for recovery and three showed change (mostly decreasing) in the level of need for recovery across one

year. Employees in the favourable (low and moderately low) need for recovery groups (38%) reported more favourable work characteristics and better functioning recovery experiences and spent more time on physical and social off-job activities than those in the unfavourable (high and moderately high) groups (23%). Thus, the antecedents – work characteristics, off-job activities and recovery experiences – examined play a significant role in maintaining need for recovery over time.

Fifth, the study (Study IV) revealed five patterns of recovery experiences across one year. Over 70% of the employees belonged to a pattern with reasonably high stable levels of all four recovery experiences across the one-year follow-up. This pattern seemed to suffer least from job burnout and sleep problems. Of the four remaining patterns, those with experiences of high levels of mastery and control during off-job time had highest work engagement, and among those with decreasing levels of all recovery experiences job exhaustion increased across time. Also, work- and family-related background factors were related to these patterns, for example, in the pattern with high levels of all recovery experiences it was typical to live without a partner and children and work reasonably few weekly working hours. Consequently, patterns of recovery experiences play a significant role in maintaining long-term psychological well-being.

4.2 Different roles of recovery experiences in the recovery process

As expected, recovery experiences had different roles in the relationship between work characteristics and occupational well-being/ill-health (Studies I and II). The mediating and moderating roles – in addition to the direct links of recovery experiences to occupational well-being/ill-health – are discussed first.

4.2.1 Mediating role

This study contributes to new insights into mediators in the health impairment and motivational processes. On mediators, there is only one earlier study (Sonnentag, Kuttler et al., 2010), which showed a partial mediator link of

psychological detachment between job stressors and strain reactions. At the same time, these findings extend the JD-R model in the direction of examining recovery experiences as mediating mechanisms. In this study (see Study I), of the four recovery experiences, only psychological detachment functioned as a mediator in the health impairing process (job demands–fatigue at work) and mastery functioned as a mediator in the motivational process (job resources–work engagement) in the context of the JD-R model (e.g., Bakker & Demerouti, 2007).

High job demands – time pressures, demands in decision-making and long working hours – were linked to poor psychological detachment from work, which in turn was related to high fatigue at work. Thus exposure to high job demands was linked to the risk of having difficulties in psychological detachment from work (e.g., Sonnentag & Bauer, 2005; Sonnentag & Fritz, 2007). This may occur, for example, through rumination of work-related matters in the evening (see Cropley & Purvis, 2003), which taxes the same systems activated while on the job. This, in turn, maintains fatigue in line with the E-R model (Meijman & Mulder, 1998; see also Sonnentag, Binnewies et al., 2010). This mediation link turned out to be full, as job demands were not directly linked to fatigue at work.

However, relaxation did not mediate the link between job demands and fatigue at work, although high job demands challenged relaxation. A technical explanation for this non-existent link may be the fact that relaxation correlated highly with detachment and control. Therefore, although at the correlational level there were associations between relaxation and fatigue at work, when all recovery experiences were examined simultaneously, these direct links disappeared. Neither mastery nor control functioned as mediators in the health impairment process. Job demands did not challenge mastery and control during leisure time, which suggests that job demands did not exhaust an employee's mental and physical resources to the extent that it would jeopardize his or her effort to address new challenges during leisure time or feeling control over non-work time. This explanation received some support from Study IV, which revealed that there was a small group of employees who were highly dedicated to their work (pattern 2 “high mastery and control”). They worked in challenging jobs (mostly as teachers and researchers), had long working hours and presumably they also experienced other demands at work. Because of their

dedication they were not able or they did not even want to detach from their work or relax during off-job time. However, simultaneously, they felt control and mastery.

Job resources – job control, social support from colleagues and justice of the supervisor – were linked to mastery experiences, which in turn were related to high work engagement. In addition, job resources were directly linked to work engagement. This partial mediation role of mastery was based on the COR theory (Hobfoll, 1998). The finding contributed to earlier research on the JD-R model by showing for the first time the mediation role of mastery in the motivational process. Thus, employees who have high resources on the job are likely to have more internal resources (e.g., energy, self-efficacy) available for mastery experiences during non-work time, and via restoring threatened or creating new resources these experiences help to recover and maintain work engagement.

High job resources were positively linked to control during leisure time, but the link from control to engagement was not significant. Theoretically, it is possible that control over non-work time is not a sufficient condition to promote work engagement. Its power may be conditional on mastery experiences during leisure time, and therefore only when control leads to experiences increasing intrinsic motivation is work engagement promoted. This is due to the fact that intrinsic motivation towards work plays a central role in work engagement. Another more technical explanation is related to the fact that at the correlational level the positive link from control to the core dimensions of work engagement (vigor and dedication) seemed to exist, but there was no link to the third dimension (absorption). This lacking link may be behind the obtained results, because work engagement was conceptualized via all its components in Study I.

Contrary to expectations, there was no link from job resources to detachment, although job resources seemed to promote relaxation during off-job time. This may be related to the fact that high job resources may increase the person's positive thoughts about his or her job during leisure time. Therefore, psychological detachment does not occur. Positive thoughts may, however, promote relaxation through positive affect (see e.g., Sonnentag & Fritz, 2007). The missing links from psychological detachment and relaxation to work engagement may be related to the role of absorption in work engagement. At the correlational level, psychological detachment was negatively associated with absorption, whereas relaxation had no

link to it. Thus, absorption behaved differently (i.e., the less detachment, the more absorption) compared to vigor, which was positively associated with psychological detachment and relaxation (i.e., the less detachment and relaxation, the less vigor). This further corroborates the view that absorption is not among the core dimensions of work engagement (e.g., González-Romá et al., 2006). Another explanation for the missing links from detachment and relaxation to work engagement may be that for some people psychological detachment and relaxation are managed easily, but work engagement does not appear if they do not find their work challenging or momentous, that is, work represents “just work” for them or their main goals are not work-related. Instead, it is worth noting that in Study IV, those who belonged to the small pattern 2 “high mastery and control” experienced less detachment and relaxation. However, simultaneously their work engagement as well as professional efficacy was high, probably because of their reasonably high mastery and control experiences but also because they were more dedicated to work or their work tasks were similar to their goals.

Moreover, lack of job resources contributed to fatigue at work (see e.g., Hakanen et al., 2008; Schaufeli & Bakker, 2004). Job demands were related to work engagement, but contrary to the expected negative link, job demands showed a direct positive link to work engagement. These findings give demonstrate the intertwining effects between the motivational and health impairment processes. However, as already said, the latter finding was not in line with the expectation, which was based on the fact that the majority of studies have supported a negative link between job demands and work engagement (see Halbesleben, 2010). This finding suggests that the role of job demands is not fully established and that job demands examined in the present study might belong to the so-called challenge stressors, which motivate the individual to increase his or her effort and performance, including work engagement (see Gilboa, Shirom, Fried, & Cooper, 2008). Thus, it is worth considering whether long weekly working hours are always part of the so-called job demands. For example, those who are dedicated and engaged may want to hoard work tasks and work long weekly working hours, in which case working hours are not experienced as demanding, but work is considered challenging and motivating, which is seen in feelings of work engagement. Thus the

role of job demands in relation to work engagement deserves more attention in the future.

4.2.2 Direct and moderating roles

Overall, of the direct links between recovery experiences and well-being/ill-health indicators, it seems that psychological detachment and relaxation, which are based on the E-R model (Meijman & Mulder, 1998), have at the correlational level more robust links to negative well-being indicators. Instead, those recovery experiences based on the COR theory (Hobfoll, 1998), that is, mastery and control, are linked more robustly to the positive indicator of work engagement. These findings can be interpreted to lend support to the view based on the JD–R model (Demerouti et al., 2001) that work engagement is particularly the result of resources; in this case, the result of recovery experiences aiming at gaining internal resources. Altogether, the results suggest that psychological detachment especially but also relaxation, mastery and control in off-job time, are prerequisites for psychological recovery, and further, if psychological recovery does not occur, need for recovery, job exhaustion and lowered work engagement follow. These findings are fully in line with earlier studies (Fritz & Sonnentag, 2006; Sonnentag & Bayer, 2005; Sonnentag et al., 2008; Sonnentag & Fritz, 2007) which have also shown that recovery experiences promote various outcomes of recovery.

The moderator findings of this study contribute to the research of recovery. This study showed that psychological detachment, mastery, and relaxation proved to be significant moderators in the relationship between psychosocial work characteristics and ill-health. More specifically, psychological detachment and mastery were protective mechanisms against increased need for recovery under poor job control. It is possible that individuals who managed to psychologically detach from work or experience high mastery in off-job time despite a situation of low job control, had their major goals related to off-job time. In other words, if individuals have meaningful, interesting activities at off-job time, such as mastery-related sport or hobby or family-related activities, they may be so motivated by these that negative work-related issues stay in the background and recovery occurs. However, for those who do not have any special activities in off-job time, it may be difficult to transfer

thoughts from work elsewhere in a situation of low job control, whereupon rumination (see Cropley & Purvis, 2003) hinders the recovery process. Relaxation showed a protective effect against job exhaustion under high time demands. Capability to relax is equally important under high time demands because relaxation impacts an individual's physiological responses to stress, so that his or her body does not remain at a high activation level (McEwen, 1998; see also Feldt, Kinnunen, Rönkä, Kinnunen, & Rusko, 2007). The balance of this physiological system between activation and rest/recovery is important from a long-term health perspective (Lundberg & Cooper, 2011). Thus, the hypothesis that recovery experiences may have a more robust moderator role at the beginning of the strain process, that is, in relation to need for recovery than in relation to job exhaustion, gained partial support; there were more significant moderator effects on need for recovery. No moderator effects were found for work engagement.

The results suggest that different recovery experiences may function as moderators in different job conditions. However, regarding lack of justice of the supervisor, the recovery experiences did not provide any relief. On the contrary, lack of justice of the supervisor had a strong direct link to the indicators of well-being, confirming that it is a major source of psychosocial strain at work (Elovainio, Kivimäki, Vahtera, Virtanen, & Keltikangas-Järvinen, 2003; Kivimäki, Elovainio, Vahtera, & Ferrie, 2003). All in all, these moderator findings suggest that although recovery experiences cannot change job conditions, with the help of these recovery experiences employees in these job conditions can replenish their resources and maintain their well-being. However, the moderator findings were quite modest and they should be confirmed in future studies.

4.3 Person-oriented view of long-term recovery

A person-oriented perspective (e.g., Bergman & Trost, 2006) means that the focus is in differences among individuals instead of variables, as was the case in the Studies I and II. Using this kind of approach, first, the individuals closely resembling each other with respect to need for recovery and its change across one year was identified (Study III). Second, those employees whose levels and changes in recovery experiences were as similar as possible over the one-year follow-up time

were looked for (Study IV). Thus, a person-oriented approach by analyzing the mean level stability and change in groups which are not pre-defined can best detect naturally occurring development (see e.g., Hättinen et al., 2009; Mäkikangas, Hyvönen, Leskinen, Kinnunen, & Feldt, 2011). As the aim was to study recovery from a long-term perspective it is necessary to have an extended period of follow-up time. The one-year time lag was considered sufficient to reveal meaningful variation both in need for recovery and recovery experiences, but also in antecedents and other outcomes of recovery.

4.3.1 Individual development of need for recovery across one year

High need for recovery for a prolonged period of time is considered to be an indicator of failing recovery that may have substantial individual health consequences (van Veldhoven, 2008). Therefore, in order to identify those at risk, it is important to examine mean level stability and change in need for recovery over time and factors contributing to both of these. In Study III five groups with a stable level of need for recovery, and three with a changing (either increasing or decreasing) level of need for recovery over one year were identified. As expected, the majority of the employees belonged to the stable groups. Instead, the greater number of obtained stable groups than expected suggests that the level of need for recovery is sensitive in distinguishing between employees. The change groups consisted of only a few employees, and were therefore excluded from further analyses.

The associations of these identified need for recovery groups with psychosocial work characteristics revealed, in line with expectations (e.g., Sonnentag & Zijlstra, 2006), that high stable need for recovery groups (i.e. high and moderately high, altogether 23% of employees) experienced more time demands at work compared to low stable need for recovery groups (i.e. low and moderately low, altogether 38% of employees). In addition, low and moderately low stable need for recovery groups experienced higher levels of job resources (control at work, support, and justice of the supervisor) compared to the high stable need for recovery group. Thus, the results showed the crucial role of work characteristics in determining the level of

need for recovery from work with one exception: there were no differences in working hours between the need for recovery groups. This is probably due to the fact that 90% of the employees worked full time.

The associations of the need for recovery groups with recovery experiences were in line with earlier results (e.g., Sonnentag & Fritz, 2007). Those in the low stable need for recovery groups had better functioning recovery experiences, that is, higher levels of psychological detachment, relaxation, and control during non-work time, than those in the high stable need for recovery groups. Thus, it seems that recovery experiences as strategies to restore energy resources promote recovery. Only mastery did not show any clear differences between the need for recovery groups. This may be related to the fact that to gain mastery experiences may put additional demands on the individual (Sonnentag & Fritz, 2007) and therefore they may not always be recovering (see Meijman & Mulder, 1998). Another explanation may be related to the questionnaire on recovery experiences. The special group of individuals who work in psychologically demanding knowledge work, like some participants in this study (e.g., teachers and researchers), may have answered positively to the items of off-job time mastery (e.g., “I seek out intellectual challenges” and “I do things that challenge me”) even if they have done work-related tasks in off-job time. In that case their recovery is prevented, and they may belong to the high need for recovery groups, but their mastery experiences are at a high level. Thus, this criticism that the origin of the experiences remains open is good to keep in mind when using this questionnaire.

The relations of off-job time activities with need for recovery groups were also in line with the expectations. The results showed, first, that those in the high stable need for recovery group spent more time doing work-related activities over the year compared to the low stable need for recovery groups (e.g., Sonnentag & Zijlstra, 2006). Thus, work-related activities draw on the same resources as those already called upon during working time, which likely, on the basis of the E-R model (Meijman & Mulder, 1998), explains the associations. However, in line with the results obtained, it is also possible that work-related activities prevent people from detaching from work and relaxing during off-job time, which may be behind the association of work-related activities and the high need for recovery group.

Second, those in the moderately high stable need for recovery group spent less time on social activities than those in the moderately low stable need for recovery group. This finding was also consistent with expectations. Earlier studies have not been unanimous (Rook & Zijlstra, 2006; Sonnentag & Bayer, 2005; Sonnentag & Natter, 2004), but our study lent support to Sonnentag and Zijlstra's (2006) results. Besides giving social support, social activities may enable individuals to detach from work and relax, which promote recovery.

Third, those in the moderately high stable need for recovery group spent less time doing physical activities than those in the moderately low stable need for recovery group. This finding was also consistent with earlier results (e.g., Rook & Zijlstra, 2006; Sonnentag & Zijlstra, 2006), showing support for the idea that because physical effort during off-job time draws on resources different from those needed in most jobs, physical effort has a refreshing effect (see Meijman & Mulder, 1998). Also, the positive outcomes of physical activities have been explained by physiological effects (e.g., levels of endorphins; Grossman et al., 1984). Besides, it is possible that physical activities stimulate psychological processes (e.g., positive mood, detachment from work), which improve recovery (Sonnentag & Jelden, 2009).

Instead there were no associations between need for recovery groups and time spent on household activities and low-effort activities. These findings seem to lend support to earlier studies showing mixed results for these activities (e.g., Rook & Zijlstra, 2006; Sonnentag, 2001). It is possible that there are both intra-individual variation and variation between different household activities behind the mixed findings of household activities and their links to recovery. Some individuals may experience household activities positively, while others do not. Further, when an individual is overloaded from work and thus has less resources for them, household activities may be felt more obligatory and stressful than after a less burdensome working day (see also Demerouti, Taris, & Bakker, 2007). Moreover, the extent to which household activities are considered stressful may be dependent on the person's own inclination to do them. If the person does housework on his or her own initiative they may be seen more positively than in the case, for example, when doing them at the spouse's request. As this study showed (Study IV), employees felt more control in off-job time if they lived alone (without a partner or children); in

that case an individual probably has more opportunities to decide when to do housework.

Overall, this first longitudinal, person-oriented study on need for recovery contributed to recovery research by showing that work characteristics, off-job activities, and recovery experiences were related to the different kinds of need for recovery groups. Thus the results indicate that besides work characteristics recovery processes – recovery experiences and physical and social off-job activities – contribute to maintaining well-being.

4.3.2 Patterns of recovery experiences across one year

Of the recovery experiences, five patterns were identified across one year in Study IV. The great majority (72%) of the employees belonged to pattern 1 with reasonably high levels of all four recovery experiences across time. This pattern was typical of those living without a partner and children and employed in the private sector in positions with less than master's level university education. Work in the private sector (e.g., in hotel and catering and business) was not so-called knowledge work as in the public sector (i.e., in education), which may enable employees in the private sector to achieve better detachment from work. Also, the fact that the employees in this pattern lived alone may promote their experience of control, because they do not have any obligations from others. Thus the life and work situation of the employees in this pattern seemed to enable all recovery experiences during off-job time, which was positively seen in terms of job burnout and sleep quality; this pattern suffered least from job burnout and sleep problems across the one-year follow-up.

Higher control and mastery experiences compared to detachment and relaxation during off-job time were needed to promote high work engagement. Thus, the levels of relaxation and detachment played a less important role in this regard. This was the case in the small pattern 2 with only 12 employees, whose weekly working hours were highest and for them it was also typical to have no children living at home. This pattern had the highest level of work engagement, especially high vigor and absorption, and also the lowest level of reduced professional efficacy. Thus, in line with the COR theory (Hobfoll, 1998), and the JD–R model (Bakker &

Demerouti, 2007) work engagement seems to be the result of resources; in our case, the result of recovery experiences aiming at gaining internal resources. At the same time, these same recovery experiences – control and mastery – had the potential to promote professional efficacy, which suggests that professional efficacy may be a part of work engagement, as has also been earlier proposed (e.g. Schaufeli et al., 2002). On the other hand, perhaps employees in pattern 2 were so dedicated to their work that they used their spare time to enhance their professional knowledge and skills; thus they experienced a lot of mastery, but they could not or did even not want to detach or relax. As a consequence, they also had high professional efficacy. Similarly, maybe employees in pattern 2 worked high working hours by their own choice, in which case working hours are not necessarily experienced as demands. Further, in pattern 2, as in pattern 1, employees had no children living at home, which seems to be connected to high control during off-job time and promote their recovery.

The worst situation in terms of long-term recovery was in pattern 3, consisting of 29 employees with reasonably high levels of relaxation and mastery and increasing control experiences across time. In this pattern employees suffered most from sleep problems and had the lowest levels of work engagement, especially vigor and absorption, as well as the highest burnout score, in particular, reduced professional efficacy was high. The differences were generally statistically significant compared to either one of the two first mentioned patterns 1 and 2. It was typical that the employees in pattern 3 were highly educated and working in the public sector. Therefore it seemed that these employees tried to relax and gain mastery experiences during off-job time, which was not successful in terms of psychological well-being. It may be that in this pattern mastery experiences imposed additional demands on the individuals instead of being conducive to recovery (Sonnetag & Fritz, 2007). Perhaps their mastery experiences were attempts to cope with their work demands by taking care of work related tasks or by learning skills required at work in leisure time. Also, their detachment from work was especially poor. Probably because of poor detachment, relaxation was not successful. It is possible that one has to be first able to detach from one's job before relaxation during leisure time succeeds and its positive effects on well-being are possible. For example, lying on the sofa may be relaxing, but not if thinking about work-related things. This

explanation holds especially if work related thoughts are negative. Troubles in detaching from work may explain the presence of sleeping problems, a further risk for burnout (Åkerstedt, 2006). However, gaining more control over off-job time seemed to improve the situation; psychological outcomes showed an improving (although not statistically significant) trend across time. In all, the employees in this pattern had demanding and challenging work from which they had difficulties in recovering.

In pattern 4 with decreasing recovery experiences across time this decrease was reflected in the simultaneous increase in job exhaustion and decrease in vigor. Also, other psychological outcomes showed a deteriorating trend, although they were non-significant due to the small group size (only 12 employees). However, increasing job exhaustion and decreasing vigor are conceivably reflected in the simultaneously diminishing recovery experiences, in other words, it is possible that exhausted individuals do not have the energy for recovery experiences. Quite interestingly, this decreasing pattern of recovery experiences was typical for temporary workers, which suggests that the job insecurity inherent in temporary work (Sverke & Hellgren, 2002) may partly explain the decrease in recovery (cf. Kinnunen et al., 2010). The reason for this may be derived from temporary workers' need to show that they earn the following contract, which may be draining.

There was also a pattern with reasonably low levels of all recovery experiences. This pattern 5, consisting of 23 employees, was typical of employees living with a partner and children. Despite fairly low levels of recovery experiences, employees in this pattern showed average psychological well-being compared to the other patterns. In this pattern, where employees had children living at home, they experienced low control during off-job time, which could be explained by their childcare obligations. Thus employees did not have enough time of their own and feel control or they did not have time to take part in mastery-related activities or relaxing activities. Despite that family life (living with a partner and children) may help to detach oneself from work, as seems to be the case in this pattern 5, where detachment was the highest among the recovery experiences. Through detaching from work family life might promote to maintain well-being (e.g. Binnewies et al., 2010).

Altogether, the person-oriented approach to recovery experiences indicated that the most typical pattern consisted of reasonably high levels of all four recovery experiences, that is, to a certain degree they all are needed to promote long-term psychological well-being. However, contrary to diary studies showing psychological detachment from work to be a powerful recovery experience in particular (Binnewies et al., 2010; Sonnentag & Bayer, 2005; Sonnentag et al., 2008), it was not necessary for successful recovery in a small group of employees with high mastery and control experiences during off-job time. This refers to the point that lack of detachment from work is not always detrimental. It has been shown that positive work reflection during off-job time may even increase psychological well-being (Fritz & Sonnentag, 2006). The double role of detachment, i.e. when it is beneficial to well-being and when it is not so important, deserves further attention in future.

These results extend the previous variable-oriented research which has used mainly cross-sectional designs (Sonnentag & Fritz, 2007) and studied only some of the four recovery experiences (Fritz & Sonnentag, 2006; Sonnentag & Bayer, 2005; Sonnentag et al., 2008). In real life recovery experiences function simultaneously, which makes it important to study them with a person-oriented approach and longitudinally.

4.4 Methodological evaluation of the study

This study is not without limitations, and the following should be kept in mind when considering the study results.

Use of self-reports. All the data were based on self-reports, which is a clear limitation, because common method variance may have influenced the results (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Despite this, it has been asserted that common method variance does not automatically inflate associations measured with self-report measures (Spector, 2006). In fact, it should have inflated all the relations and not just some of them. In addition, the main constructs of the study were separate from each other (see Study I). It is also good to keep in mind that individuals are likely the best judges of their own experiences.

Study designs and causal relations. Studies I and II were cross-sectional, thus reliable conclusions in relation to causal directions of effects could not be drawn. Even if Studies III and IV were longitudinal, the analyses showed only concurrent differences and changes between the phenomena examined. For instance, if the results indicated that exiguous experiences of recovery experiences impair occupational well-being, it may be also so that employees with impaired occupational well-being cannot enjoy positive recovery experiences. Further, the data contained only two measurement points in Studies III and IV, which allowed only the investigation of linear but not conceivable non-linear development. In addition, the time-lag in the present study was one year, but it is difficult to give theoretical bases for the chosen follow-up time, although it was deemed appropriate in the present study and also used in another longitudinal study where the role of psychological detachment in recovery was under study (Sonnentag, Binnewies et al., 2010).

Generalizability of the results. The results rest on questionnaires filled out by employees in five organizations. The sample was a convenience sample, as the participating organizations were recruited from the client organizations of one local company supplying occupational health services. Although the heterogeneity of the sample adds to the generalizability of the findings, in generalizing the results outside the fields and occupations studied, one should be cautious. The recovery needs are probably different in manual work and in jobs with high physical demands compared to office work and jobs with high mental demands. Also, when generalizing the findings, it should be noted that the response rate was 50.6% at the first stage and 63.8% at the second stage, so the response rates could have been higher. However, in general the response rates were not lower than in other typical studies conducted in organizations (see Baruch & Holtom, 2008). The respondents represented the original population in terms of gender at Time I, which was the only available background information. The analyses of the sample attrition in the follow-up showed that the respondents at Time II did not differ from the non-respondents in many terms (marital status, number of children, educational level, working schedule, or type of employment contract). However, there were also some differences, for example, women and employees from the public sector were over-represented among the respondents at Time II. These differences were related to the

fact that most of the employees who had changed their working place and were thus not able to participate at Time II worked originally in the private sector.

Theories and models influencing in the background of the study. The theories and models used in this study complemented each other, but attention should still be paid to some issues. *The E-R model's* main attention is focused on the idea that the compensation responses at work can develop into negative load reactions under the influence of exposure to work demands with insufficient recovery (Meijman & Mulder, 1998). An employee must expend effort in order to respond to work demands and to accomplish his or her tasks on duty. However, there is a difference in the effort needed between very demanding work and work without challenges. In the latter case, an employee does not need much effort in order to accomplish his or her task on duty and he or she may even feel that the work does not offer enough challenges. One must remember that in this case, the employee may need recovery not to be delivered from high effort but from the feelings of frustration. Besides, according to the E-R model, recovery from work can occur when an employee is no longer confronted with work demands. The model therefore sees recovery as passive; recovery refers to relief from job demands. Also, it is good to remember that an employee may face some demands in non-work life, too (e.g., problems with relationships and health), in which case the same bodily systems stay active during leisure, making recovery more difficult.

The COR theory assumes that people have a basic motivation to obtain, retain, foster, and protect those things they value (Hobfoll, 1998, 2002). One may ask whether the motivation is as strong in all people, and also whether, for example, differences in target-orientation, competitive spirit, and how easily one becomes frustrated (e.g., Ryckman, Thornton, & Gold, 2009) play a role in the motivation process. These things may affect how easily an individual can retain and protect values related to resources and recovery. However, the approach to recovery in the COR theory is active; it pays attention to potentially recovering activities and experiences.

In addition, according to *the JD-R model* (e.g., Demerouti et al., 2001), job resources refers to those features of the job that are functional in achieving work goals, reducing job demands, and stimulating personal growth, learning and development. However, it is possible that job resources are experienced differently

depending on what goals an employee set for his or her work. Thus, two employees doing same work with different work goals may experience job resources differently. For example, a person whose main goals at work are performing well and developing his or her abilities, likely experiences challenging work as an important job resource, while someone whose main work goal is to enjoy fellow workers' company may not experience challenging work as an important resource, but for him or her good atmosphere at the workplace may be the major resource at work. Thus, the JD-R model does not pay attention to individual differences. Further, the JD-R model does not hypothesize any relationship between job demands and work engagement, but earlier studies have reported mixed relationships in this regard (see Halbesleden, 2010). The results are probably confused because some work characteristics, e.g., time demands, are not necessarily straining for everybody. These matters of models require further attention and development in the future.

Measures used. The measures used in this study were either validated earlier in Finnish studies or validated in the present study. However, attention should be paid to several issues. First, the Finnish REQ – like the original one – measures four mechanisms: psychological detachment, relaxation, mastery, and control. In this study one item from the original relaxation scale was removed (“I kick back and relax”) due to the observed cross-loading on two factors. In the future, this amendment should be verified. Second, the purpose of the mastery scale is to examine mastery-related off-job activities that offer an individual challenges or opportunities to learn new skills without overtaxing his or her capabilities (Sonnentag & Fritz, 2007). However, this overtaxing element has not been taken into account in the items (e.g., “I seek out intellectual challenges” and “I do things that challenge me”). Therefore, participants may have done demanding activities, like work-related tasks during leisure, and answered by approving these items. Third, in this study one of the main aims was to study recovery experiences, but in the future the processes can be extended to cover other possible mechanisms, like the experience of pleasure (Sonnentag & Geurts, 2009), humor, associated laughter (Demerouti et al., 2009), and feeling happy (Oerlemans, Bakker, & Demerouti, 2011), too. Fourth, only the most important work characteristics, off-job activities, and well-being/ill-health indicators were investigated. More diverse measures would

have the potential to expand our understanding of the phenomena. For example, when examining occupational well-being, it would have been possible to measure job satisfaction. Objective information like register-based sickness absences would have strengthened the results, too. Fifth, it is worth noting that in Study I the variable “own recovery evaluation” was measured with a single-item measure of which the reliability cannot be evaluated. In addition, the measure of demands in decision-making suffered from low reliability. Further, in this study working hours were measured as work demands. Even if working hours have proved to be meaningful regarding to recovery, it should be noted that employees may work high working hours either by their own desire or obligation, which may have effects on the connections of working hours with the outcomes, such as work engagement. Finally, some of the subgroups identified in Studies III and IV were small in size. That is why, in Study III the small change groups were omitted from the further analyses.

Explanation rates and effect sizes in the analyses. When thinking about the results of the study from a more practical perspective than from their statistical significance, explanation rates and effect sizes have a central role. In Study I the explanation rates were reasonably high; 69% of the variance in fatigue at work and 39% of the variance in work engagement were explained by the Job Demands-Resources-Recovery (JD-R-R) model (see Study I). The explanation rates of the recovery experiences varied between .05 and .32. Mastery experiences had a particularly low explanation rate. As the model included only work-related variables, this finding suggests that mastery experiences in particular depend either on such job characteristics not included in the model or on other than work-related variables, for example, personality (Sonnentag & Fritz, 2007). The latent variables used in Study I enabled us to take measurement errors into account, which generally strengthens the relationships obtained. In Study II the total explanation rates for the outcomes of recovery ranged from 23% (work engagement) to 47% (need for recovery), but the moderator effects explained only one percent of the variance in need for recovery and job exhaustion. However, as moderator effects are difficult to detect even such low explanation rates have been considered important (Evans, 1985). In Studies III–IV the subgroup differences in antecedents (Study III) and outcomes (Study IV) of recovery were tested. In these the effect sizes of the

detected differences between the subgroups varied from small ($d \geq .32$) to large ($d \leq 1.51$) using Cohen's d (small $d = .20$, medium $d = .50$, large $d = .80$, see Cohen, 1988, 1992) as a criterion. In most cases they were at least at the level of medium. Thus, I may conclude that the results have relevance in real life.

Strengths of the study. Despite these limitations, the study also has certain strengths. First of all, this present study contributed to a better understanding of the mechanisms underlying the recovery process. It was among the first to examine both the mediator and moderator role of recovery experiences in the relationship between work characteristics and occupational well-being/ill-health. In addition, this study extended the JD-R model to relate to recovery. Besides these, the study brought new insight into the research on work-life balance, that is, spillover processes between work and non-work domains (see e.g., Bulger et al., 2007), by revealing recovery processes that functioned well. This suggests that they helped to prevent spillover from work to non-work life. Second, the Finnish REQ proved to be a valid measure to assess recovery experiences for both research and practical purposes. Overall, the constructs and measures used in this study were mainly validated. Third, this study is among the first to examine recovery experiences from a long-term perspective, allowing us to demonstrate that recovery experiences are successful in maintaining psychological well-being across one year. Fourth, novel statistical methods that accurately captured the mean level stability and change both in need for recovery and in recovery experiences in the subgroup level were in use. This kind of person-oriented approach enabled us to find a more elaborate picture of the development of employees' need for recovery and recovery experiences over time. This information is useful in occupational health care to identify those at risk.

4.5 Directions for future research and practical implications

Some topics for future research were already briefly introduced when discussing the study results. In addition, the critical methodological comments discussed above call for further research, too. Nevertheless, I have aggregated recommendations for future research in this chapter, and also propose some practical guidelines for employees, managers, organizations, and occupational health care.

This study revealed that recovery experiences had direct links to occupational well-being, but also that psychological detachment served as a mediator in the health impairment process, and mastery in the motivational process as well as psychological detachment, relaxation, and mastery showed some moderator effects in the relationship between work characteristics and occupational well-being. However, longitudinal studies are needed to confirm these results (see Sonnentag, Binnewies et al., 2010). Also, in the future the mutual relationships of recovery experiences should be examined more thoroughly. By this I mean that their possible hierarchical nature should be investigated. It seems that some of them may function as premises for the existence of some others. For example, is relaxation state only possible when the employee is disengaged from work? After all, I would like to encourage researchers to further test the JD-R-R model (see Study I) among different samples. Further, the Finnish REQ proved to be a valid measure to assess employees' recovery experiences both in cross-sectional and longitudinal studies, thereby, it is spurred to use it in the future, for example, in studies and occupational health care.

Further studies are also needed to confirm the results in the subgroups of need for recovery and recovery experiences. For that purpose especially bigger samples of various types of jobs are needed. Further, in Study III the change groups of need for recovery were small and omitted from the further analyses. Thus, in the future, with bigger samples it would be possible to obtain useful information about the relations between change groups and their antecedents. In addition, more follow-up studies using several measurement points and different time lags are called for. Diary studies might be best to clarify the short-term process nature of recovery. As an alternative to these modes of research, an experimental or an intervention study can be considered, wherein it is possible to manipulate the recovery process and observe outcomes (see Hahn, Binnewies, Sonnentag, & Mojza, 2011). Such studies give a better position to reveal the causal pathway of the recovery process. Moreover, the use of physiological measures along with questionnaires could provide new insights in future research (see Rydstedt, Cropley, Devereux, & Michalianou, 2009), for example by showing how well objective physiological data are related to subjective experiences (e.g., recovery experiences). It is also possible to ask family members (e.g., see Sonnentag & Krueger, 2006), co-workers or managers how they perceive

their partners', co-workers' or subordinates' recovery, because sometimes people near at hand may perceive changes in others' behavior, performance, and energy level. This kind of multi-source examination would enhance the validity of the study findings based on self-reports. In addition, at the same time it would be possible to study how lack of recovery influences behavior at home (e.g., being irritable and less attentive) and family life (e.g., conflicts with family members) (cf. Amstad & Semmer, 2009).

Even if this study expanded our knowledge about recovery as a process, we still need to know more about the factors that enable recovery experiences, so that employees can optimize their recovery. This study proved that family and work situations were associated with employees' recovery experiences. In the future, in order to deepen the understanding, further research should focus on factors describing individual differences and situations in work and family life. To be precise, besides, for example, age (see e.g., Kiss & De Meester, 2005; Mohren, Jansen, & Kant, 2010), gender (see Mohren et al., 2010), and education, an individual's health, ways of life (eating and drinking habits), self-efficacy (see Hahn et al., 2011), coping styles (Cropley & Millward, 2009), positive affect, goals, work ethic (cf., Furnham, 1990), work motivation (see Trougakos & Hideg, 2009), and commitment to work might also be relevant research questions regarding to recovery. They might be investigated as potential mediators or moderators. For example, if an employee is depressed or distressed he or she may not have energy to engage in certain off-job time activities or experience recovery experiences, which complicate recovery process, and that in turn may worsen an employee's health. Further, individuals differ in the degree to which they want to segment or integrate their work and off-job time lives (e.g., Kossek, Lautsch, & Eaton, 2006). Probably employees who favor segmentation may find it easier to psychologically detach from work and thus recover, but on the other hand those employees preferring integration may even consider work as a hobby and think of the good sides of work in leisure time, which does not necessarily weaken the recovery process (see Fritz & Sonnentag, 2005). Positive work reflection is indeed one question which needs clarification. In addition, regarding to off-job time, home demands as well as home resources should have more attention relating to recovery in the future (see Demerouti et al., 2009).

Jobs and work tasks are different, so presumably the recovery process is not similar in all jobs. Even if the sample used in this study included employees in different kinds of jobs, we still need to broaden the picture in this regard. For example, it has been shown that shift work is a challenge to health (e.g., Härmä, 2006; Jansen, Van Amelsvoort, Kristensen, van den Brandt, & Kant, 2003; Åkerstedt, Kecklund, Gillberg, Lowden, & Axelsson, 2000). Besides possible sleeping problems, shift workers may have difficulties in meeting their friends and participating in regular hobbies because of their working hours, so it would be advisable to pay special attention to recovery in shift work. Also, remote work's relation to recovery needs more attention, because it may be more difficult to detach from work if the workplace is at home. Further, it should be paid special attention to upper white-collar jobs, leadership tasks, and the entrepreneurs, because these are jobs where the mental load is high – a typical feature in today's working life. In addition, in this study some of the loss in follow-up was due to workplace changes. However, it was not possible to study these employees who changed jobs. Thus in the future the role of workplace changes in relation to recovery would deserve more research attention. Also, in this study only certain work characteristics were measured, thus, in the future we need a broader picture of work characteristics as antecedents of recovery, such as job insecurity (see Kinnunen et al., 2010) or conflicts at work.

This study showed that off-job time activities were related to need for recovery. Although the relation between off-job time activities and recovery experiences has been shown in some studies (e.g., Siltaloppi & Kinnunen, 2009), this relation needs still more research attention. For example, spending a long, pleasant evening with friends may help to detach from work and relax, but at the same time it may hinder the restoration of physiological resources that are also needed in order to recover (see also Sonnentag & Geurts, 2009). For another example, watching TV after a wearing workday may be relaxing, but probably not before an individual is mentally detached from work. For a third example, it might be relevant how pleasing an individual finds the off-job time activities in which she or he participates. Even if physical and social activities have been proven to have a restorative impact, if an individual does them unwillingly, their restorative influence is at least doubtful.

Finally, with regard to future research, it is worth noting that researchers should focus on the cyclical processes of recovery (see also Sonnentag & Geurts, 2009). Even if recovery research has been divided into research on recovery settings, recovery as a process, and recovery as an outcome, so-called recovery outcomes may also influence subsequent recovery processes. For example, when the need for recovery is low and there is no fatigue, an individual feels energetic, and thus may decide to take part in social or physical activities in leisure time. To examine recovery as this kind of a more complex process, multi-level structural equation modeling with diary study data might offer an appropriate opportunity.

From a practical point of view, the present study showed that recovery experiences play a significant role in maintaining well-being. Recovery experiences had both direct as well as mediator and moderator effects between psychosocial work characteristics and occupational well-being. In addition, besides work characteristics and recovery experiences, off-job activities were related to the development of need for recovery. This information is useful in occupational health care to identify those at risk and the accompanying risk factors for unfavorable development. More specifically, it is recommended that occupational health care measures should target both the job (e.g., how time demands and control at work are organized) and the individual's leisure time (e.g., how psychological detachment occurs or how leisure time is spent). It is also worth noting that there are probably many different optimal ways to recover from work stress, thus it is expedient to help an individual to find his or her personal preferences and capabilities to recover.

As this study showed, job demands and resources had an essential influence on recovery as a process as well as on recovery outcomes. Also, it is noteworthy that in this study (Study III) no differences appeared between need for recovery groups and working hours, thus, the quality of work is especially important for employees' recovery. In addition, lack of job resources may be as harmful as existence of job demands for recovery (see Studies I and II). Therefore, in organizations, for example, managers should take care of work arrangements so that demands and resources are in balance. In order to succeed in this, for example, familiarization with work tasks and the organization, discussions on career development, and offering real time education should be properly arranged. Also, it is essential to construct a good workplace climate, and managers should remember that their

leadership style (justice and support of the supervisor) may influence employees' recovery and well-being. Further, besides successful work arrangements, managers should be aware that off-job time is important for employees' recovery. It is important that in off-job time individuals have time to replenish their resources, which helps improving their occupational well-being (e.g., increased work engagement), as shown in this study, but it may also enable higher levels of job performance (Binnewies et al., 2009, 2010). Thus, in organizations it is important to take care of work-time arrangements and have guidelines for possible overtime. Unlimited availability should not be required. In addition, organizations can directly support an employee's leisure time recovery by supporting sports and cultural facilities.

Along with organizations and managerial culture, employees have prime influence on their own recovery. As this study illustrated, individuals should seek out situations during their leisure time where they can optimize their recovery experiences, for example, by participating in social and physical activities (see also Oerlemans, Bakker, & Demerouti, 2011). Instead, it is good to avoid double load, so that an individual is burdened both at work and home. Also, employees should learn to listen to their own signs of high need for recovery (e.g., temporary feelings of overload, irritability, and social withdrawal), so that they can try to reduce extra loads. In addition, employees should take care of their personal and family lives not only in order to be able to enjoy life as a whole but also in order to prevent possible family conflicts from encroaching on work and recovery (see Mauno et al., 2009). It may be also essential for recovery that an individual has a feeling that he or she has enough own time (Siltaloppi & Kinnunen, 2009) and that the off-job time activities are pleasing and accord with individual preferences (Tucker et al., 2008).

Note that beside an employee's own activity in leisure time, it is good to be active with relation to work, too. For example, if an employee encounters a problematic work situation, it is advisable to take up the problem with managers or co-workers. These may help to solve the problem, or at least it may reduce an employee's dwelling on it during leisure, which, in turn, promotes recovery (see Crompton & Millward, 2009). Further, this study showed that social support at work was connected to recovery, thus, it is good to remember that an employee can contribute to co-workers' recovery by behaving well, for example, offering help or

giving positive feedback. In addition, it may be worthwhile to review one's own values and goals so that work life and off-job life are meaningful, which may also have an influence on recovery.

TIIVISTELMÄ

Tämän päivän työelämä on haastavaa monin tavoin. Esimerkiksi tietotyö on lisääntynyt ja teknologian kehitys on mahdollistanut ajasta ja paikasta riippumattoman työskentelyn. Työstä on siis tullut rajatonta, mikä on vaikeuttanut työkuormituksesta palautumista ja aiheuttanut uhkia työntekijän hyvinvoinnille. Tässä väitöskirjassa tarkasteltiin työkuormituksesta palautumista psykologisesta näkökulmasta. Työkuormituksesta palautumisella tarkoitetaan prosessia, jonka aikana yksilön voimavarat ja toiminnot palautuvat takaisin työpäivän aiheuttamaa kuormitusta edeltävälle tasolle. Psykologinen näkökulma puolestaan viittaa yksilön omiin kokemuksiin palautumisen onnistumisesta sekä palautumista edistäviin psykologisiin mekanismeihin.

Tutkimuksen päähuomio oli palautumisen mekanismeissa, joilla tarkoitetaan palautumista edistäviä prosesseja. Tällaisia prosesseja ovat vapaa-ajalla tapahtuva psykologinen irrottautuminen työstä, rentoutuminen, taidon hallintakokemukset ja kontrolli (Sonnentag & Fritz, 2007). Mekanismeista kaksi ensimmäistä pohjautuvat ponnistelujen ja palautumisen malliin (Meijman & Mulder, 1998), jonka mukaan palautumista voi tapahtua silloin, kun niitä psykofysiologisia systeemejä, jotka aktivoituvat työssä, ei kuormiteta enää vapaa-ajalla. Näin tapahtuu psykologisessa irrottautumisessa ja rentoutumisessa vapaa-ajalla. Mekanismeista kaksi jälkimmäistä pohjautuvat voimavarojen säilyttämisteoriaan (Hobfoll, 1998), jonka mukaan yksilö pyrkii saavuttamaan ja säilyttämään arvostamia asioita. Mallin mukaan palautumista tapahtuu silloin, kun taidon hallintakokemukset (esim. uusien taitojen oppiminen) ja kontrolli (esim. yksilö voi päättää mitä, kuinka ja milloin tekee) vapaa-ajalla auttavat rakentamaan uusia ja palauttamaan uhattuja voimavaroja.

Yleisellä tasolla tutkimuksen tavoitteena oli saada kuva työkuormituksesta palautumisesta prosessina sekä palautumiseen vaikuttavista edeltävistä tekijöistä ja palautumisen seurauksista. Työstä palautumiseen vaikuttavina edeltävinä tekijöinä tutkittiin työn piirteitä (työn voimavaroja ja vaatimuksia), palautumista prosessina tutkittiin palautumisen mekanismien lisäksi vapaa-ajan toimintoina (palkkatyön teke-

minen vapaa-ajalla, kotityöt, leipäily ja oleilu, sosiaaliset suhteet ja fyysiset toiminnot) ja palautumisen seurauksina tutkittiin psykologisia seurauksia (kokemus palautumisesta, palautumisen tarve, väsymys työssä, työuupumus, työn imu ja uniongelmat).

Väitöskirja koostuu neljästä osatutkimuksesta, jotka perustuivat poikkileikkaus- ($N = 527$) ja pitkittäis- ($N = 274$) aineistoihin. Aineistot kerättiin kyselynä viiden eri aloilla (matkapalvelu, kauppa, informaatioteknologia, hotelli- ja ravintola-ala ja koulutus) toimivan organisaation työntekijöiltä vuoden aikavälillä. Aineistoja analysoitiin sekä muuttuja- että henkilökeskeisellä otteella.

Tutkimuksella oli viisi päätavoitetta. Ensimmäisenä tavoitteena oli tutkia, onko palautumisen mekanismeja mittaavan suomenkielisen kyselyn faktorirakenne sama kuin alkuperäisessä kyselyssä. Osatutkimuksessa I kyselyn faktorirakenne osoittautui validiksi ja tutkimuksessa IV faktorirakenne osoittautui validiksi myös yli ajan.

Toisena tavoitteena oli tutkia, toimivatko palautumisen mekanismit välittävinä mekanismeina (mediaattoreina) työn piirteiden ja hyvinvoinnin / pahoinvoinnin välillä. Osatutkimuksessa I selvisi, että psykologinen irrottautuminen toimii täydellisenä välittävänä mekanismina työn vaatimusten ja työssä koetun väsymyksen välillä sekä taidon hallintakokemukset toimivat osittaisena välittävänä mekanismina työn voimavarojen ja työn imun välillä.

Kolmantena tavoitteena oli selvittää, muuntavatko (moderoivatko) palautumisen mekanismit työn piirteiden ja palautumisen psykologisten seurausten välistä yhteyttä. Osatutkimuksen II mukaan psykologinen irrottautuminen ja taidon hallintakokemukset toimivat suojaavina mekanismeina lisääntyneen palautumisen tarvetta vastaan tilanteessa, jossa koettiin vähäisiä vaikutusmahdollisuuksia työhön. Myös rentoutuminen suojasi lisääntyvältä uupumusasteiselta väsymykseltä tilanteessa, jossa koettiin paljon työn aikapaineita. Lisäksi palautumisen mekanismit, erityisesti psykologinen irrottautuminen ja taidon hallintakokemukset, olivat suorassa yhteydessä työhyvinvointiin.

Neljäntenä tavoitteena oli selvittää, minkälaisia työntekijöiden osaryhmiä on mahdollista identifioida palautumisen tarpeen tason ja siinä tapahtuvien muutosten avulla vuoden aikavälillä. Edelleen tutkittiin, eroavatko nämä osaryhmät tietyissä palautumista edeltävissä tekijöissä (työn piirteet, palautumisen mekanismit ja vapaa-ajan toiminnot) toisistaan. Osatutkimuksen III pitkittäisaineistosta tunnistettiin kah-

deksan osaryhmää, joissa palautumisen tarpeen taso tai muutos oli erilainen vuoden aikavälillä. Viidessä näistä ryhmistä palautumisen tarpeen taso osoittautui pysyväksi ja kolmessa muuttuvaksi (pääasiassa laskevaksi) vuoden aikavälillä. Työntekijät, jotka kuuluivat suotuisaan (vähäisen ja kohtuullisen vähäisen) palautumisen tarpeen ryhmään (38 %), arvioivat työnsä piirteet myönteisemmiksi ja palautumisen mekanismit onnistuneemmiksi ja he viettivät enemmän aikaa fyysisissä ja sosiaalisissa vapaa-ajan toiminnoissa kuin työntekijät, jotka kuuluivat epäsuotuisiin (korkean ja kohtuullisen korkean) palautumisen tarpeen ryhmiin (23 %).

Viidentenä tavoitteena oli tutkia, millaisia keskenään samanlaisia mutta toisistaan mahdollisimman erilaisia työntekijöiden osaryhmiä aineistosta löytyy palautumisen mekanismien tason ja niissä tapahtuvien muutosten avulla vuoden aikavälillä. Lisäksi tutkittiin, kuinka nämä ryhmät – erilaiset palautumisen mekanismien profiilit – eroavat työhön ja perheeseen liittyvissä taustatekijöissä sekä palautumisen psykologisissa seurauksissa (työuupumus, työn imu ja uniongelmat). Osatutkimuksessa IV löytyi viisi palautumisen mekanismeiltaan erilaista profiiliryhmää. Työntekijöistä yli 70 % kuului ryhmään, jossa käytettiin suhteellisen paljon kaikkia neljää palautumisen mekanismia vuoden aikavälillä. Tämä ryhmä myös kärsi vähiten työuupumuksesta ja uniongelmistä. Neljästä muusta ryhmästä ne, jotka kokivat paljon taidonhallinnan ja kontrollin kokemuksia vapaa-ajalla (4 %), kokivat myös eniten työn imua, ja puolestaan ryhmässä, jossa arviot kaikista palautumisen mekanismeista laskivat vuoden aikana (4 %), havaittiin samanaikaista uupumusasteisen väsymyksen kasvua.

Johtopäätöksenä tutkimuksen tuloksista voidaan todeta, että palautumisen mekanismeilla ja niiden yhdistelmillä (profiileilla) on keskeinen merkitys työhyvinvoinnin ylläpidossa. Lisäksi palautumisen mekanismit ansaitsevat huomiota sekä välittävänä että muuntavina tekijöinä työn piirteiden ja psykologisten seurausten välisessä suhteessa. Palautumisen mekanismien lisäksi myös työn piirteillä ja vapaa-ajan toiminnoilla on merkittävä asema palautumisen tarpeen kehittämisessä. Käytännön tasolla tämä tutkimus osoittaa, että yksilöiden tulisi etsiä mahdollisuuksia optimoida psykologisen työstä irrottautumisen, rentoutumisen, taidonhallinnan ja kontrollin kokemuksensa vapaa-ajalla ja siten myös palautumisprosessinsa.

REFERENCES

- Ahola, K. (2007). *Occupational burnout and health*. People and Work Research Reports, 81. Helsinki: Finnish Institute of Occupational Health.
- Allvin, M., Aronsson, G., Hagstrom, T., Johansson, G., & Lundberg, U. (2011). *Work without boundaries: Psychological perspectives on the new working life*. Chichester, UK: John Wiley & Sons.
- Amstad, F. T., & Semmer, N. K. (2009). Recovery and the work-family interface. In S. Sonnentag, P. L. Perrewé, & D. C. Ganster (Eds.), *Current perspectives on job-stress recovery* (pp. 125–166). Bingley, UK: Emerald.
- Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology*, 22, 309–328.
- Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology*, 10, 170–180.
- Bakker, A. B., Hakanen, J. J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement particularly when job demands are high. *Journal of Educational Psychology*, 99, 274–284.
- Bakker, A. B., Schaufeli, W. B., Leiter, M., & Taris, T. (2008). Work engagement: An emerging concept in occupational health psychology. *Work & Stress*, 22, 187–200.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.
- Baruch, Y., & Holtom, B. (2008). Survey response rate levels and trends in organizational research. *Human Relations*, 61, 1139–1160.
- Beckers, D. G. J., Van der Linden, D., Smulders, P. G. W., Kompier, M. A. J., Taris, T. W., & Geurts, S. A. E. (2008). Voluntary or involuntary? Control over

overtime and rewards for overtime in relation to fatigue and work satisfaction. *Work & Stress*, 22, 33–50.

- Bekker, M. H. J., de Jong, P. F., Zijlstra, F. R. H., & van Landeghem, B. A. J. (2000). Combining care and work: Health, mood states, cognitive functioning and stress in male and female academics. *International Journal of Behavioral Medicine*, 7, 28–43.
- Bergman, L., & Trost, K. (2006). The person-oriented vs. variable-oriented approach: Are they complementary, opposite, or exploring different worlds? *Merrill-Palmer Quarterly*, 52, 601–632.
- Binnewies, C., Sonnentag, S., & Mojza, E. (2009). Daily performance at work: Feeling recovered in the morning as a predictor of day-level job performance. *Journal of Organizational Behavior*, 30, 67–93.
- Binnewies, C., Sonnentag, S., & Mojza, E. (2010). Recovery during the weekend and fluctuations in weekly job performance: A week-level study examining intra-individual relationships. *Journal of Occupational and Organizational Psychology*, 83, 419–441.
- Bolger, N., & Zuckerman, A. (1995). A framework for studying personality in the stress process. *Journal of Personality and Social Psychology*, 69, 890–902.
- Bonnet, M. H., & Arand, D. L. (2003). Clinical effects of sleep fragmentation versus sleep deprivation. Clinical review. *Sleep Medicine Reviews*, 7, 297–310.
- Boswell, W. R., & Olson-Buchanan, J. B. (2007). The use of communications technologies after hours: The role of work attitudes and work-life conflict. *Journal of Management*, 33, 592–610.
- Boucsein, W., & Thum, M. (1997). Design of work/rest schedules for computer work based on psychophysiological recovery measures. *International Journal of Industrial Ergonomics*, 20, 51–57.
- Brown, D. R. (1990). Exercise, fitness, and mental health. In C. Bouchard, R. J. Shephard, T. Stephens, J. S. Sutton, & B. D. McPherson (Eds.), *Exercise, fitness, and health: A consensus of current knowledge* (pp. 607–626). Champaign, IL: Human Kinetics.
- Bulger, C. A., Matthews, R. A., & Hoffman, M. E. (2007). Work and personal life boundary management: Boundary strength, work/personal life balance, and the

- segmentation-integration continuum. *Journal of Occupational Health Psychology*, 12, 365–375.
- Carskadon, M. A., & Dement, W. C. (2005). Normal human sleep overview. In A. P. Smith & D. M. Jones (Eds.), *Handbook of human performance: Vol 3. State and trait* (pp. 195–235). London: Academic Press.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155–159.
- Cox, R. C. (2002). Exercise psychology. In R. C. Cox (Ed.), *Sports psychology, concepts and applications* (5 th ed, pp. 366–389). Boston: McGraw Hill.
- Cox, T., & Ferguson, E. (1994). Measurement of the subjective work environment. *Work & Stress*, 8, 98–109.
- Craig, A., & Cooper, R. E. (1992). Symptoms of acute and chronic fatigue. In A. P. Smith & D. M. Jones (Eds.), *Handbook of human performance* (Vol. 3, pp. 289–339). London: Academic Press.
- Cropley, M., Dijk, D.-J., & Stanley, P. (2006). Job strain, work rumination, and sleep in school teachers. *European Journal of Work & Organizational Psychology*, 15, 181–196.
- Cropley, M. & Millward, L. J. (2009). How do individuals’ ‘switch-off’ from work during leisure? A qualitative description of the unwinding process in high and low ruminators. *Leisure Studies*, 28, 333–347.
- Cropley, M., & Purvis, L. J. M. (2003). Job strain and rumination about work issues during leisure time: A diary study. *European Journal of Work and Organizational Psychology*, 12, 195–207.
- Dababneh, A. J., Swanson, N., & Shell, R. L. (2001). Impact of added rest breaks on the productivity and well being of workers. *Ergonomics*, 44, 164–174.
- de Croon, E. M., Sluiter, J. K., Blonk, R. W. B., Broersen, J. P. J., & Frings-Dresen, M. H. W. (2004). Stressful work, psychological job strain, and turnover: A 2-year prospective cohort study of truck drivers. *Journal of Applied Psychology*, 89, 442–454.
- de Croon, E. M., Sluiter, J. K., Frings-Dresen, M. H. W. (2003). Need for recovery after work predicts sickness absence. A 2-year prospective cohort study in truck drivers. *Journal of Psychosomatic Research*, 55, 331–339.

- de Croon, E. M., Sluiter, J. K., Frings-Dresen, M. H. W. (2006). Psychometric properties of the need for recovery after work scale: test-retest reliability and sensitivity to detect change. *Journal of Occupational Environmental Medicine*, 63, 202–206.
- De Raeve, L., Kant, I., Jansen, N. W. H., Vasse, R. M., & van den Brandt, P. A. (2009). Changes in mental health as a predictor of changes in working time arrangements and occupational mobility: Results from a prospective cohort study. *Journal of Psychosomatic Research*, 66, 137–145.
- De Raeve, L., Vasse, R. M., Jansen, N. W. H., van der Brandt, P. A., & Kant, I. (2007). Mental health effects of changes in psychosocial work characteristics: A prospective cohort study. *Journal of Occupational Environmental Medicine*, 49, 890–899.
- Demerouti, E., Bakker, A. B., Geurts, S. A., & Taris, T. W. (2009). Daily recovery from work-related effort during non-work time. In S. Sonnentag, P. Perrewé, & D. Ganster (Eds.), *Currents perspectives on job-stress recovery* (pp. 85–123). Bingley, UK: Emerald.
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, 86, 499–512.
- Demerouti, E., Taris, T. W., & Bakker, A. B. (2007). Need for recovery, home-work interference and performance: Is lack of concentration the link? *Journal of Vocational Behavior*, 71, 204–220.
- Eden, D. (2001). Vacations and other respites: Studying stress on and off the job. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology* (Vol. 16, pp. 121–146). New York: Wiley.
- Elovainio, M., Kivimäki, M., Vahtera, J., Virtanen, M., & Keltikangas-Järvinen, L. (2003). Personality as a moderator in the relations between perceptions of organizational justice and sickness absence. *Journal of Vocational Behavior*, 63, 379–395.
- Etzion, D., Eden, D., & Lapidot, Y. (1998). Relief from job stressors and burnout: Reserve service as a respite. *Journal of Applied Psychology*, 83, 577–585.

- Eurostat. (2010). *Employment statistics*. European Commission eurostat. http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Employment_statistics (15.10.2011).
- Evans, M. G. (1985). A Monte Carlo study of the effects of correlated method variance in moderated multiple regression analysis. *Organizational Behavior and Human Decision Processes*, 36, 305–323.
- Feldt, T., Kinnunen, U., Rönkä, T., Kinnunen, M.-L., & Rusko, H. (2007). Työkuormituksesta palautuminen ja sen mittaaminen: Psykologinen ja fysiologinen näkökulma. [Recovery from work strain and its measurement: psychological and physiological point of view.] In A. Aro, T. Feldt, & V. Ruohomäki (Eds.), *TOP 1: Puheenvuoroja työ- ja organisaatiopsykologiasta* [Addresses from work and organizational psychology] (pp. 60–82). Helsinki: Edita.
- Fritz, C., & Sonnentag, S. (2005). Recovery, health, and job performance: Effects of weekend experiences. *Journal of Occupational Health Psychology*, 10, 187–199.
- Fritz, C., & Sonnentag, S. (2006). Recovery, well-being, and performance-related outcomes: The role of workload and vacation experiences. *Journal of Applied Psychology*, 91, 936–945.
- Furnham, A. (1990). *The protestant work ethic: The psychology of work-related beliefs and behaviors*. London: Routledge.
- Geurts, S. A. E., & Sonnentag, S. (2006). Recovery as an explanatory mechanism in the relation between acute stress reactions and chronic health impairment. *Scandinavian Journal of Work, Environment and Health*, 32, 482–492.
- Gilboa, S., Shirom, A., Fried, Y., & Cooper, C. (2008). A meta-analysis of work demand stressors and job performance: Examining main and moderating effects. *Personnel Psychology*, 61, 227–271.
- González-Romá, V., Schaufeli, W. B., Bakker, A. B., & Lloret, S. (2006). Burnout and work engagement: Independent factors or opposite poles? *Journal of Vocational Behavior*, 68, 165–174.
- Grandey, A. A., & Cropanzano, R. (1999). The conservation of resources model applied to work-family conflict and strain. *Journal of Vocational Behavior*, 54, 350–370.

- Grossman, A., Bouloux, P., Price, P., Drury, P. L., Lam, K. S., Turner, T., ... Sutton, J. (1984). The role of opioid peptides in the hormonal responses to acute exercise in man. *Clinical Science*, 67, 483–491.
- Hahn, V., Binnewies, C., Sonnentag, S., & Mojza, E. (2011). Learning how to recover from job stress: Effects of recovery training program on recovery, recovery-related self-efficacy, and well-being. *Journal of Occupational Health Psychology*, 16, 201–216.
- Hakanen, J., Bakker, A., & Schaufeli, W. B. (2006). Burnout and engagement among teachers. *Journal of School Psychology*, 43, 495–513.
- Hakanen, J., Schaufeli, W. B., & Ahola, K. (2008). The Job Demands-Resources Model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement. *Work & Stress*, 22, 224–241.
- Halbesleben, J. R. B. (2010). A meta-analysis of work engagement: Relationships with burnout, demands, resources, and consequences. In A. B. Bakker & M. P. Leiter (Eds.), *Work engagement: Recent developments in theory and research* (pp. 102–117). New York: Psychology Press.
- Halbesleben, J. R., & Buckley, M. R. (2004). Burnout in organizational life. *Journal of Management*, 30, 859–879.
- Harrison, Y., & Horne, J. A. (1999). One night of sleep loss impairs innovative thinking and flexible decision making. *Organizational Behavior and Human Decision Processes*, 78, 128–145.
- Hobfoll, S. E. (1998). *Stress, culture, and community: The psychology and physiology of stress*. New York: Plenum Press.
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology*, 6, 307–324.
- Härmä, M. (2006). Workhours in relation to work stress, recovery and health. *Scandinavian Journal of Work, Environment and Health*, 32, 502–514.
- Hätinen, M., Kinnunen, U., Mäkikangas, A., Kalimo, R., Tolvanen, A., & Pekkonen, M. (2009). Burnout during a long-term rehabilitation: comparing low burnout, high burnout – benefited, and high burnout – not benefited trajectories. *Anxiety, Stress and Coping*, 22, 341–360.
- Iso-Ahola, S. (1997). A psychological analysis of leisure and health. In J. Haworth (Ed.), *Work, leisure and well-being* (pp. 131–144). London, UK: Routledge.

- Jansen, N. W. H., Kant, I., Van Amelsvoort, L. G. P. M., Nijhuis, F. J. N., & van den Brandt, A. (2003). Need for recovery from work: evaluating short-term effects of working hours, patterns and schedules. *Ergonomics*, 46, 664–680.
- Jansen, N. W. H., Kant, I., & van den Brandt, P. A. (2002). Need for recovery in the working population: description and associations with fatigue and psychological distress. *International Journal of Behavioral Medicine*, 9, 322–340.
- Jansen, N. W. H., Van Amelsvoort, L. G. P. M., Kristensen, T. S., van den Brandt, P. A., & Kant, I. J. (2003). Work schedules and fatigue: a prospective cohort study. *Occupational and Environmental Medicine*, 60, i47–i53.
- Johns, M. W., & Doré, C. (1978). Sleep at home and in the sleep laboratory: Disturbance by recording procedures. *Ergonomics*, 21, 325–330.
- Kalimo, R., Hakanen, J., & Toppinen-Tanner, S. (2006). *Maslachin yleinen työuupumuksen arviointimenetelmä MBI-GS*. [The Finnish version of the Maslach Burnout Inventory - General Survey]. Finnish Institute of Occupational Health, Helsinki.
- Kalimo, R., Pahkin, K., Mutanen, P., & Toppinen-Tanner, S. (2003). Staying well or burning out at work: work characteristics and personal resources as long-term predictors. *Work & Stress*, 17, 109–122.
- Kammeyer-Mueller, J. D., Judge, T. A., & Scott, B. A. (2009). The role of core self-evaluations in the coping process. *Journal of Applied Psychology*, 94, 177–195.
- Kinnunen, U., Feldt, T., & Mäkikangas, A. (2008). Testing the effort-reward imbalance model among Finnish managers: the role of perceived organizational support. *Journal of Occupational Health Psychology*, 13, 114–127.
- Kinnunen, U., & Mauno, S. (Eds.) (2009). *Irtiottoja työstä: työkuormituksesta palautumisen psykologia*. [Breaks from work: A psychological approach to recovery from work strain.] Tampere: Tampereen yliopistopaino oy.
- Kinnunen, U., Mauno, S., & Siltaloppi, M. (2010). Job insecurity, recovery and well-being at work: Recovery experiences as moderators. *Economic and Industrial Democracy*, 31, 179–194.

- Kiss, P., & De Meester, M. (2005). Need for recovery in ageing workers. *International Congress Series*, 1280, 202–207.
- Kivimäki, M., Elovainio, M., Vahtera, J., & Ferrie, J. E. (2003). Organisational justice and health of employees: Prospective cohort study. *Occupational & Environmental Medicine*, 60, 27–33.
- Kivimäki, M., Virtanen, M., Elovainio, M., Kouvonen, A., Väänänen, A. & Vahtera, J. (2006). Work stress in the etiology of coronary heart disease – a meta-analysis. *Scandinavian Journal of Work, Environment and Health*, 32, 431–442.
- Kossek, E. E, Lautsch, B. A., & Eaton, S. C. (2006). Telecommuting, control, and boundary management: Correlates of policy use and practice, job control, and work-family effectiveness. *Journal of Vocational Behavior*, 68, 347–367.
- Lavidor, M., Weller, A., & Babkoff, H. (2003). How sleep is related to fatigue. *British Journal of Health Psychology*, 8, 95–105.
- Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of the three dimensions of job burnout. *Journal of Applied Psychology*, 81, 123–133.
- Lehto, A.-M., & Sutela, H. (2008). *Työolojen kolme vuosikymmentä. Työolotutkimusten tuloksia 1977–2008*. [Three decades of working conditions. Results of working condition surveys 1977–2008.] Helsinki: Tilastokeskus.
- Lindström, K., Elo, A.-L., Skogstad, A., Dallner, M., Gamberale, F., Hottinen, V., ... Ørthede, E. (2000). *User's Guide for the QPSNordic. General Nordic Questionnaire for Psychological and Social Factors at Work*. TemaNord 603. Copenhagen: Nordic Council of Ministers.
- Lisper, H., & Eriksson, B. (1980). Effects of the length of a rest break and food intake on subsidiary reaction-time performance in an 8-hour driving task. *Journal of Applied Psychology*, 65, 117–122.
- Lundberg, U. (2005). Stress hormones in health and illness: The roles of work and gender. *Psychoneuroendocrinology*, 30, 1017–1021.
- Lundberg, U., & Cooper, C. L. (2011). *The science of occupational health: Stress, psychobiology, and the new world of work*. Oxford: Wiley-Blackwell.

- Machin, M. A., & Hoare, P. N. (2008). The role of workload and driver coping styles in predicting bus drivers' need for recovery, positive and negative affect, and physical symptoms. *Anxiety, Stress and Coping*, 21, 359–375.
- MacKinnon, D. P. (2008). *Introduction to Statistical Mediation Analysis*. New York: Taylor & Francis Group.
- Maslach, C., Jackson, S. E., & Leiter, M. P. (1996). *Maslach Burnout Inventory Manual*. 3rd Ed. Palo Alto, Ca.: Consulting Psychologists Press.
- Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology*, 52, 397–422.
- Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior*, 70, 149–171.
- Mauno, S., Rantanen, J., & Kinnunen, U. (2009). Palautuminen työn ja perheen yhdistämisen palapelissä. [Work, family and recovery from work.] In U. Kinnunen & S. Mauno (Eds.), *Irtiottoja työstä: työkuormituksesta palautumisen psykologia* [Breaks from work: A psychological approach to recovery from work strain] (pp. 67–84). Tampere: Tampereen yliopistopaino oy.
- Mayer-Pirttijärvi, H. (2009). Työaikakatsaus. Työajat ja poissaolot EK:n jäsenyrityksissä vuonna 2008. [Review of working times. Working hours and absences in member companies of Confederation of Finnish Industries EK in 2008.] Helsinki: Confederation of Finnish Industries EK.
- McAuley, E., Kramer, A. F., & Colcombe, S. J. (2004). Cardiovascular fitness and neurocognitive function in older adults: A brief review. *Brain, Behavior, & Immunity*, 18, 214–220.
- McEwen, B. S. (1998). Stress, adaptation, and disease: Allostasis and allostatic load. *Annals of the New York Academy of Sciences*, 840, 33–44.
- Meijman, T. F., & Mulder, G. (1998). Psychological aspects of workload. In P. J. D. Drenth & H. Thierry (Eds.), *Handbook of work and organizational psychology: Vol. 2. Work psychology* (pp. 5–33). Hove, UK: Psychology Press.
- Mignot, E. (2008). Why we sleep: The temporal organization of recovery. *PLoS Biology*, 6, e106.

- Mohren, D. C. L., Jansen, N. W. H., & Kant, I. (2010). Need for recovery from work in relation to age: a prospective cohort study. *International Archives of Occupational and Environmental Health*, 83, 553–561.
- Moreno-Jimenez, B., Mayo, M., Sanz-Vergel, A., Geurts, S., Rodriguez-Munoz A., & Garrosa, E. (2009). Effect of work-family conflict on employee's well-being: The moderating role of recovery experiences. *Journal of Occupational Health Psychology*, 14, 427–440.
- Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, 126, 247–259.
- Muthén, B. O. (2001). Latent variable mixture modeling. In G. A. Marcoulides & R. E. Schumacker (Eds.), *New Developments and Techniques in Structural Equation Modeling* (pp. 1–33). Lawrence Erlbaum Associates.
- Muthén, L. K., & Muthén, B. O. (1998–2007). *Mplus User's Guide*. 5th Ed. Los Angeles: Muthén & Muthén.
- Mäkikangas, A., Hyvönen, K., Leskinen, E., Kinnunen, U., & Feldt, T. (2011). A person-centered approach to investigate the development trajectories of job-related affective well-being: A 10-year follow-up study. *Journal of Occupational and Organizational Psychology*, 84, 327–346.
- Oerlemans, W. G. M., Bakker, A. B., & Demerouti, E. (2011.) *How feeling happy helps to successfully recover from work: a day reconstruction study*. Conference presentation in the 15th Conference of the European Association of Work and Organizational Psychology. Maastricht, The Netherlands.
- Oerlemans, W. G. M., Bakker, A. B., & Veenhoven, R. (2011). Finding the key to happy aging: a day reconstruction study of happiness. *Journal of Gerontology: Psychological Sciences*, 10.1093/geronb/gbr040.
- Partinen, M., & Gislason, T. (1995). Basic Nordic Sleep Questionnaire (BNSQ): A quantitated measure of subjective sleep complaints. *Journal of Sleep Research*, 4, 150–155.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879–903.

- Pulkkinen, L., Nurmi, J., & Kokko, K. (2002). Individual differences in personal goals in mid-thirties. In L. Pulkkinen & A. Caspi (Eds.), *Paths to successful development: Personality in the life course* (pp. 331–352). New York: Cambridge University Press.
- Raglin, J. S., & Morgan, W. P. (1985). Influence of vigorous exercise on mood state. *Behavior Therapy*, 8, 179–183.
- Rau, R. (2006). Learning opportunities at work as predictor for recovery and health. *European Journal of Work and Organizational Psychology*, 15, 158–180.
- Rook, J. W., & Zijlstra, F. R. H. (2006). The contribution of various types of activities to recovery. *European Journal of Work and Organizational Psychology*, 15, 218–240.
- Ryckman, R. M., Thornton, B., & Gold, J. A. (2009). Assessing competition avoidance as a basic personality dimension. *Journal of Psychology*, 143, 175–192.
- Rydstedt, L. W., Cropley, M., Devereux, J. J., & Michalianou, G. (2009). The effects of gender, long-term need for recovery and trait inhibition-rumination on morning and evening saliva cortisol secretion. *Anxiety, Stress and Coping*, 22, 465–474.
- Sallinen, M., Holm, A., Hiltunen, J., Hirvonen, K., Härmä, M., Koskelo, J., ... Müller, K. (2008). Recovery of cognitive performance from sleep debt: Do a short rest pause and single recovery night help? *Chronobiology International*, 25, 279–296.
- Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement. *Journal of Organizational Behavior*, 25, 293–315.
- Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire. *Educational and Psychological Measurement*, 66, 701–716.
- Schaufeli, W. B., & Enzmann, D. (1998). *The burnout companion to study and practice: A critical analysis*. Washington, DC: Taylor & Francis.

- Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies*, 3, 71–92.
- Schaufeli, W. B., Taris, T. W., & Van Rhenen, W. (2008). Workaholism, Burnout, and Work Engagement: Three of a Kind or Three Different Kinds of Employee Well-Being? *Applied Psychology*, 57, 173–203.
- Seppälä, P., Mauno, S., Feldt, T., Hakanen, J., Kinnunen, U., Tolvanen, A., & Schaufeli, W. (2009). The construct validity of the Utrecht Work Engagement Scale: Multi-sample and longitudinal evidence. *Journal of Happiness Studies*, 10, 459–481.
- Siltaloppi, M., & Kinnunen, U. (2007). Työkuormituksesta palautuminen: psykologinen näkökulma palautumiseen. [Recovery from work strain: a psychological point of view.] *Työ ja ihminen*, 21, 30–41.
- Siltaloppi, M., & Kinnunen, U. (2009). Vapaa-ajan merkitys työkuormituksesta palautumisessa. [The role of leisure time in recovery from the work strain.] In U. Kinnunen & S. Mauno (Eds.), *Irtiottoja työstä: työkuormituksesta palautumisen psykologia* [Breaks from work: A psychological approach to recovery from work strain.] (pp. 99–113). Tampere: Tampereen yliopistopaino oy.
- Sluiter, J. K., de Croon, E. M., Meijman, T. F., & Frings-Dresen, M. H. W. (2003). Need for recovery from work related fatigue and its role in the development and prediction of subjective health complaints. *Occupational and Environmental Medicine*, 60, 62–70.
- Sluiter, J. K., Frings-Dresen, M. H. W., van der Beek, A. J., & Meijman, T. F. (2001). The relation between work-induced neuroendocrine reactivity and recovery, subjective need for recovery, and health status. *Journal of Psychosomatic Research*, 50, 29–37.
- Sluiter, J. K., van der Beek, A. J., & Frings-Dresen, M. H. W. (1999). The influence of work characteristics on the need for recovery and experienced health: A study on coach drivers. *Ergonomics*, 42, 573–583.
- Sonnentag, S. (2001). Work, recovery activities, and individual well-being: A diary study. *Journal of Occupational Health Psychology*, 6, 196–210.

- Sonnentag, S. (2003). Recovery, work engagement, and proactive behavior: A new look at the interface between nonwork and work. *Journal of Applied Psychology, 88*, 518–528.
- Sonnentag, S., & Bayer, U.-V. (2005). Switching off mentally: Predictors and consequences of psychological detachment from work during off-job time. *Journal of Occupational Health Psychology, 10*, 393–414.
- Sonnentag, S., Binnewies, C., & Mojza, E. (2008). Did you have a nice evening? A day-level study of recovery experiences, sleep, and affect. *Journal of Applied Psychology, 93*, 674–684.
- Sonnentag, S., Binnewies, C., & Mojza, E. (2010). Staying well and engaged when demands are high: The role of psychological detachment. *Journal of Applied Psychology, 95*, 965–976.
- Sonnentag, S., & Fritz, C. (2007). The Recovery Experience Questionnaire: Development and validation of a measure for assessing recuperation and unwinding from work. *Journal of Occupational Health Psychology, 12*, 204–221.
- Sonnentag, S., & Geurts, S. A. E. (2009). Methodological issues in recovery research. In S. Sonnentag, P. Perrewé, & D. Ganster (Eds.), *Currents perspectives on job-stress recovery* (pp. 1–36). Bingley, UK: Emerald.
- Sonnentag, S., & Jelden, S. (2009). Job stressors and the pursuit of sport activities: A day-level perspective. *Journal of Occupational Health Psychology, 14*, 165–181.
- Sonnentag, S., & Krueger, U. (2006). Psychological detachment from work during off-job time: The role of job stressors, job involvement, and recovery-related self-efficacy. *European Journal of Work and Organizational Psychology, 15*, 197–217.
- Sonnentag, S., Kuttler, I., & Fritz, C. (2010). Job stressors, emotional exhaustion, and need for recovery: A multi-source study on the benefits of psychological detachment. *Journal of Vocational Behavior, 76*, 355–365.
- Sonnentag, S., & Natter, E. (2004). Flight attendants' daily recovery from work: Is there no place like home? *International Journal of Stress Management, 11*, 366–391.

- Sonnentag, S., & Zijlstra, F. R. H. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *Journal of Applied Psychology, 91*, 330–350.
- Spector, P. E. (2006). Method variance in organizational research: truth or urban legend. *Organizational Research Methods, 9*, 221–232.
- Sverke, M., & Hellgren, J. (2002). The nature of job insecurity: Understanding employment uncertainty on the brink of a new millennium. *International Association for Applied Psychology, 51*, 23–42.
- Trougakos, J. P., Beal, D. J., Green, S. G., & Weiss, H. M. (2008). Making the break count: An episodic examination of recovery activities, emotional experiences, and positive affective displays. *Academy of Management Journal, 51*, 131–146.
- Trougakos, J. P., & Hideg, I. (2009). Momentary work recovery: The role of within-day work breaks. In S. Sonnentag, P. L. Perrewé, & D. C. Ganster (Eds.), *Current perspectives on job-stress recovery* (pp. 37–84). Emerald, Bingley, UK.
- Tucker, P., Dahlgren, A., Akerstedt, T., & Waterhouse, J. (2008). The impact of free-time activities on sleep, recovery, and well-being. *Applied Ergonomics, 39*, 653–662.
- Van Amelsvoort, L. G. P. M., Kant, I. J., Bültmann, U., & Swaen, G. M. H. (2003). Need for recovery after work and the subsequent risk of cardiovascular disease in a working population. *Occupational and Environmental Medicine, 60*, i83–i87.
- van der Hulst, M., van Veldhoven, M., & Beckers, D. (2006). Overtime and need for recovery in relation to job demands and job control. *Journal of Occupational Health, 48*, 11–19.
- Van Hooff, M. L. M., Geurts, S. A. E., Taris, T. W., Kompier, M. A. J., Dijkers, J. S. E., Houtman, I. L. D., & van den Heuvel, F. M. M. (2005). Disentangling the causal relationships between work-home interference and employee health. *Scandinavian Journal of Work and Environmental Health, 31*, 15–29.
- van Veldhoven, M. (2008). Need for recovery after work: An overview of construct, measurement and research. In J. Houdmont & S. Leka (Eds.), *Occupational*

- health psychology: European perspectives on research, education and practice* (pp. 1–25). Nottingham: Nottingham University Press.
- van Veldhoven, M., & Broersen, S. (2003). Measurement quality and validity of the "need for recovery scale". *Journal of Occupational and Environmental Medicine*, 60, 3–9.
- Viswesvaran, C., Sanchez, J. I., & Fisher, J. (1999). The role of social support in the process of work stress: A meta-analysis. *Journal of Vocational Behavior*, 54, 314–334.
- Westman, M., & Etzion, D. (2001). The impact of vacation and job stress on burnout and absenteeism. *Psychology & Health*, 16, 595–606.
- Winwood, P. C., Bakker, A. B., & Winefield, A. H. (2007). An investigation of the role of non-work-time behavior in buffering the effects of work-strain. *Journal of Occupational and Environmental Medicine*, 49, 862–871.
- Winwood, P. C., Winefield, A. H., & Lushington, K. (2006). The contribution of age, domestic responsibilities and shiftwork to work-related fatigue and recovery within a sample of full-time Australian nurses. *Journal of Advanced Nursing*, 56, 438–449.
- Yeung, R. R. (1996). The acute effects of exercise on mood state. *Journal of Psychosomatic Research*, 40, 123–141.
- Ylöstalo, P., & Jukka, P. (2008). *Työolobarometri. Lokakuu 2008. Ennakkotietoja*. [Barometer of working conditions. October 2008. Foreknowledges.] Helsinki: Työ- ja elinkeinoministeriö.
- Ylöstalo, P., & Jukka, P. (2010). *Työolobarometri. Lokakuu 2009. Työ ja yrittäjyys*. [Barometer of working conditions. October 2009. Work and enterprise.] Helsinki: Työ- ja elinkeinoministeriö, 34/2010.
- Zapf, D. (2002). Emotion work and psychological well-being. A review of the literature and some conceptual considerations. *Human Resource Management Review*, 12, 237–268.
- Zijlstra, F. R. H., & Sonnentag, S. (2006). After work is done: Psychological perspectives on recovery from work. *European Journal of Work and Organizational Psychology*, 15, 129–138.
- Åkerstedt, T. (2006). Psychosocial stress and impaired sleep. *Scandinavian Journal of Work, Environmental & Health*, 32, 493–501.

- Åkerstedt, T., Kecklund, G., Gillberg, M., Lowden, A., & Axelsson, J. (2000). Sleepiness and days of recovery. *Transportation Research Part F: Traffic Psychology and Behavior*, 3, 251–261.
- Åkerstedt, T., Knutsson, A., Westerholm, P., Theorell, T., Alfredsson, L., & Kecklund, G. (2002). Sleep disturbances, work stress and work hours: A cross-sectional study. *Journal of Psychosomatic Research*, 53, 741–748.
- Åkerstedt, T., Nilsson, P. M., & Kecklund, G. (2009). Sleep and recovery. In S. Sonnentag, P. L. Perrewé, & D. C. Ganster (Eds.), *Current perspectives on job-stress recovery* (pp. 205–247). Emerald, Bingley, UK.