Recovery from work

the role of emotions in the recovery process

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Award date:
2012

Eindhoven, August 2012

Recovery from work: The role of emotions in the recovery process

by

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in partial fulfilment of the requirements for the degree of

Master of Science
in Innovation Management

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TUE. School of Industrial Engineering
Series Master Theses Innovation Management

Subject headings: Recovery from work, detachment, adverse health, emotions, daily diary study

Abstract

The aim of this study is to contribute to organizational behavior and work psychology literature providing a better understanding of recovery from work during leisure time by analyzing the moderating role of emotions (specifically after work). A new conceptual model was designed i.e. 'Emotions-Detachment-Recovery Model', which conceptualizes recovery process by means of detachment from work as predictor of recovery state. Furthermore, it suggests adverse health as predictor of detachment from work. The main objective of this study was to test the moderating effect of emotions between adverse health and detachment from work. In addition, three hypotheses were also tested in order to validate the model suggested. A daily diary study conducted in a general hospital in The Netherlands provided the data to analyze. Eighty participants were given an electronic device (iPod Touch®) in order to answer a maximum of three questionnaires per day during ten days. In addition to descriptive analysis and psychometric statistics, hierarchical regression analyses were performed to test the hypotheses. Results showed a negative relation between adverse health (cognitive and physical complaints) and detachment from work (cognitive, emotional and physical), contrary to what was hypothesized (Hypothesis 1). Moreover, positive relations were found between physical detachment and recovery state (Hypothesis 2) and between cognitive detachment and sleep quality (Hypothesis 3), supporting both hypotheses. No moderating effects of (positive or negative) were found in the relation between adverse health and detachment. However negative emotions were negatively related to cognitive and emotional detachment. It can be concluded that in addition to the frequently assumed role played by emotions as recovery outcome, it is likely that emotions also fulfill a more active role, though not as a moderator between adverse health and detachment.

Preface

This thesis represents the conclusion of a journey that began two years ago with the goal of completing my Master studies in Innovation Management at the Eindhoven University of Technology.

This being my first approach to research has been a challenging, rewarding and enriching experience. Sometimes a long and tiring process specially when there was no specific direction, sometimes an easy way to go but always a satisfying process when it was realized that this piece of work will contribute to the society and to the research field. Having had the opportunity to carry out this study within the Human Performance Management Group has allowed me to realize how valuable it is to understand how individuals' performance is affected and influenced by different factors within the work and non work context.

First of all I would like to thank Professor J. de Jonge for trusting me and accepting to be my first supervisor, his guidance, advice, critical feedback and support helped me to put all the things together for this research. I would also like to thank MSc. Irene Niks for letting me contributing to her research by conducting my thesis. Finally, I would like to thank Dr. J. Gevers for her guidance through the whole journey.

On a personal level, I cannot forget all those helped me through this process. Thanks for your company, your words of support, calls, dinners, friendship either near me in Eindhoven or thousands of kilometers away. Last but not least, I would like to thank my mother for all the lovely words that cheered me up when I most needed, thank you for being the first to believe in this dream and to help me to achieve it, this is for you.

Thank you all for being part of this chapter in my life, this chapter that allowed me to live an international experience in a wonderful country, a lighting city and a magnificent university.

Barbara García Miravete Quintana

Eindhoven, August, 2012

Executive Summary

The objective of this research was to investigate how emotions affect the recovery process from work. Specifically, it was investigated whether or not emotions (positive or negative) moderate the relation between adverse health and detachment from work. A new conceptual model ('Emotions-Detachment-Recovery Model') was designed, which conceptualizes recovery process by means of detachment from work as predictor of recovery state and that suggests adverse health as predictor of detachment from work (Figure 1).

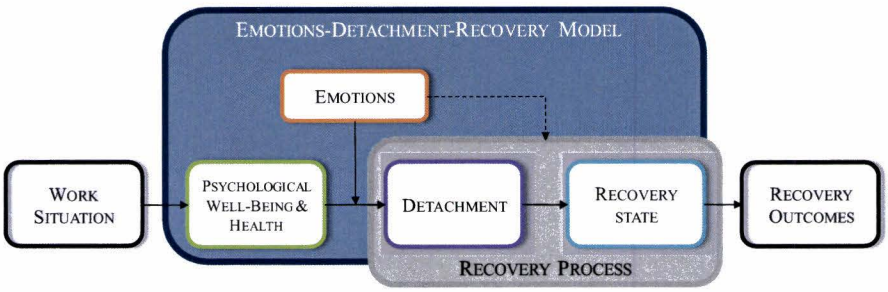

Figure 1 'Emotions-Detachment-Recovery Model'

To test this model, three hypothesis and one research question were posed:

Hypothesis 1: Health complaints (cognitive, emotional and physical) at the end of the working day are positively related to detachment from work (cognitive, emotional, and physical) before going to sleep. Suggesting that the more health complaints, the more detached the individual will be since more recovery activities are followed. The relation will be stronger if the type of detachment from work matches particular health complaints

Hypothesis 2: Detachment from work before going to sleep is positively related to recovery state at the beginning of the next working day.

Hypothesis 3: Detachment from work before going to sleep is positively related to sleep quality assessed at the beginning of the next working day.

Research question: what is the role of emotions as moderator variable in the relation of adverse health and detachment from work?

Method

A daily diary study conducted in a general hospital in The Netherlands provided the data to analyze. Eighty employees working in four different departments and fourteen sub-departments were given an electronic device (iPod Touch®) in order to answer a maximum of three questionnaires per day during ten consecutive days. 82.5 percent of the participants were women and the mean age was 40.78 years.

The process to analyze the data focused on three analyses: (a) understanding how participants behaved (responses pattern) during the daily diary study, (b) assessment of reliability of the main constructs of the conceptual model, and (c) a single level analysis where the hypotheses were tested through a cross-sectional perspective (hierarchical regression analyses).

Findings

Results showed that cognitive complaints impede detachment in the three dimensions, while physical complaints hamper emotional and physical detachment. Furthermore, being emotionally exhausted did not affect detachment. Hypothesis 1 was not supported since the direction found was opposite to the one expected.

With regard to the relation between detachment from work and recovery state (Hypothesis 2), results supported that detachment is important for recovery. It was found that physical detachment was positively related to recovery state. Moreover, a significant positive relation was found between cognitive detachment and sleep quality, supporting Hypothesis 3. These results provided extra information regarding which specific dimensions of detachment contribute to recovery state (conceptualized as recovery state and sleep quality).

Regarding the research question which is the role of emotions in the relation between adverse health and detachment, it was concluded that positive emotions did not contribute to detachment from work, and that negative emotions impeded cognitive and emotional detachment. However no moderating effect, as initially suggested, was found.

Limitations

It is important to interpret the results of this study in light of its own limitations. Probably the mayor limitation of this research is the fact that a cross-sectional analysis was conducted although the study was initially design to be analyzed as a daily diary study through multilevel analysis. Aggregating the data across daily measurement might hinder some daily effects. Furthermore, because of the cross-sectional analysis, no causal relations could be tested and therefore the interpretability of the model might be questioned. A second limitation regarding the single level analysis is the lack of power due to the small sample size (N=80, but for some analysis N=68), this might be responsible to a certain extent of not being able to find moderating effects of emotions in the relation between adverse health and detachment from work. A third limitation has to do with the reliance on self-report measures which can raise concerns about common-method variance. However, it has been recently argued not to be a matter of major concern. The fourth limitation is that recovery state and sleep quality were each assessed with one item only, which might caused that no more significant relations were found when testing Hypotheses 2 and 3. It is recommended for future research to use multi-items which are more powerful than single-item measures (Hair et al., 2010).

Theoretical implications

One of the most important contributions of this research has to do with the statistical analysis conducted in order to better understand how participants behaved during the daily diary study. Displaying the general pattern of responses (days of measurement, specific questionnaires, completion time, work shift and uncommon responses) in a visual chart provided an easy and complete overview of all the cases gathered for further analysis. The second contribution of this thesis to the recovery theory is the analysis of emotions assuming a more active role in the recovery process. Although results were not as originally expected, studying emotions with exploratory purposes provided some guidance for future research.

Practical implications

Three general recommendations were suggested to contribute to recovery based on the results and on the conceptual model. The first implication is to influence detachment by means of adverse health at the end of the working day i.e. to design job procedures that reduce specially cognitive and physical complaints. The second suggestion is to try to avoid that employees have negative emotions at the end of the working day since these emotions impede detachment (i.e. to give a constructive feedback instead of a destructive criticism). However the events that trigger negative emotions are often out of control of supervisors and co-workers. Thus, the third recommendation is that recovery training programs on detachment for work (emphasizing cognitive and physical) and emotion regulations (highlighting negative emotions) will increase the possibilities of successful recovery since has been found that recovery training is effective in improving employee's recovery and well-being (Hahn et al., 2011).

Future research

The first recommendation for future research is to examine the new conceptual model through a multilevel analysis where the hierarchical structure of the data (measures nested within persons) is taken into account, and daily changing effects can be analyzed. Furthermore, to confirm the preliminary findings regarding the possible causal relation suggested by the conceptual model, longitudinal studies are needed. Regarding daily diary studies, it is recommended to pay attention to statistical analysis that allows the researcher to determine whether or not new electronic devices affect the measurement procedure and results.

Furthermore it is suggested to include specific leisure activities to explore how they are related to detachment and recovery state. Besides, analyzing sleep quality as part of the recovery process and sleep quantity in an exploratory basis will help to understand better the recovery process.

Finally, it was suggested to analyze emotions in the non work context and in the relation between detachment from work and recovery state to have a complete overview of the effect of emotions on the recovery process

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1. Introduction

The world of work has changed. Several years ago the idea of being available 24/7 for work issues would have been surprising. However, nowadays being 100 percent available for work may be seen as a positive value which indicates commitment to a job, career and organization (Landy & Conte, 2010). Moreover, meeting job and home demands has become a daily challenge. Employees face increasing job demands (Trougakos & Hideg, 2009). Dealing with these demands draws upon an individual's internal resources (Sonnentag, 2003), which in turn may cause fatigue at the end of a working day (Zijlstra & Sonnentag, 2006). Additionally, working under stressful conditions may lead to physical and mental strain reactions (Hahn, Binnewies, Sonnentag, & Mojza, 2011).

The increasing job demands have forced people to work at home during non working hours too, consuming valuable time that was originally planned for other, non work, activities. The technological advances such as portable computers, smart-phones and availability of wireless internet access have forced the individuals to deal with work issues during non work life, which in turn has "blurred the boundaries between job and home life" (Peeters, Montgomery, Bakker, & Schaufeli, 2005, p. 43).

Boundary theory suggests that people create and maintain psychological, physical, or behavioral distance in order to delimitate their social domains such as home and work (Park, Fritz, & Jex, 2011; Ashfort, Kreiner, & Fugate, 2000). Being able to create a psychological distance between work and private life is necessary to recovery from work demands (Zijlstra & Sonnentag, 2006) and to bring the strain process to an end which may prevent an ongoing deterioration in health (Hahn et al., 2011; Sonnentag, 2003; Zijlstra & Sonnentag, 2006).

During the past decades, the awareness of the importance of the role played by recovery in the relation between stressful work characteristics on the one hand, and health, well-being and performance on the other hand has risen (Sonnentag & Geurts, 2009). Recovery from work, which refers to the process that replenishes depleted resources (Sonnentag & Zijlstra, 2006) and considered as opposite to the strain process (Sonnentag & Fritz, 2007), is important for both individuals and organizations. Individuals attempt to accomplish their working demands successfully and in order to do so they need to start the working day with energy and with replenished resources. On the other hand, having healthy employees that are ready to face the challenges of a new day is imperative for companies that are involved in a competitive and demanding environment.

Understanding the process of recovery and what factors help or impede this process is critical since it is a process in which we engage every day. It has been suggested that some specific activities such as social, relaxation or physical activities may lead to recovery (Sonnentag, 2001). Moreover, it has been argued that recovery experiences (i.e. psychological detachment, relaxation, mastery and control) are the underlying strategies of the off-job activities that contribute to recovery. Research has also

highlighted that psychological detachment defined as the "individual sense of being away from the work situation" (Etzion, Eden, and Lapidot, 1998, p.579), is the most relevant recovery experience that contributes to recovery from work (Sonnentag & Fritz, 2007).

In addition to psychological detachment, work conditions (e.g. job resources, work hours, or time pressure), personal characteristics, and other variables have been studied within the recovery context. Emotions (particularly within the work setting) which are conceptualized as "multi-component response tendencies that unfold over relatively short time spans" (Fredrickson, 2004, p.1368), have emerged as an area of opportunity to study within recovery. There are no studies that have analyzed a more active role of emotions in the recovery process other than as recovery outcome.

Research has suggested that individual's performance during leisure time is related to his or her work experience during the day (Sonnentag, 2001). Thus it may be assumed that the way the individual feels after work (i.e. as a result of the work experience) influences some aspects of recovery during leisure time. For instance, it may influence the effectiveness of the leisure activities, the selection procedure of the activities to perform during free time, or the level of fatigue when arriving home. Therefore it seems reasonable to study the role of emotions in the recovery process.

The main research question of this study is:

Which role do emotions fulfill in the recovery process?

To answer this question, the objective of this research is twofold. At the academic level, it aims to contribute to organizational behavior and work psychology literature providing a better understanding of recovery from work by analyzing the role of emotions. The second objective is to discuss practical implications at both personal and organizational level and to make recommendations for improving and facilitating the daily recovery process. In order to do so , the first part of this research was devoted to study the literature regarding recovery from work to understand the basic concepts, underlying theories, empirical evidence that have expanded the existing knowledge as well as to identify relevant gaps in the literature that might answer the research question. The second part of the project had two main objectives: (a) to design a new conceptual model that integrates the principal components of the recovery process and that includes the necessary to answer the initial research question, and (b) to test this model in the health care sector to make recommendations about how to improve the recovery process and how the organization itself can evaluate their own recovery processes through the conceptual model developed earlier.

This research is performed as part of a larger resreach (dialy diary study) conducetd within the Human Performance Management Group at the faculty of Industrial Engineering and Innovation Sciences at Eindhoven University of Technology. The research was conducted in the health care sector in a

general hospital in The Netherlands, where 80 participants answered during ten consecutive days daily questionnaires in an electronic device (iPad Touch®). The analysis of the data and the testing of the hypotheses were performed through single level analysis (cross-sectional analysis).

1.1 Outline

The outline of this thesis is as follows. Chapter 2 ('Literature Review') discusses recovery from work and the role of emotions in the recovery process as central topics of this research. Chapter 3 ('Conceptual Model and Hypotheses') explains the new conceptual model that aims to integrate existing gaps in the literature regarding the role of emotions in the recovery process. Moreover, hypotheses derived from the model which relate their key constructs are addressed. Subsequently, Chapter 4 ('Research methodology') focuses on the analytic strategy that was followed in this research. It explains the procedure followed to gather the data, sample, measures, and the statistical analyses. Chapter 5 ('Results') presents the results of the data analysis in three parts. First, the procedure to understand the diary data is explained including an overview of how the participants answered the questionnaires. Second, psychometric properties, mainly reliability, were assessed for the central concepts. Finally, the third analysis corresponds to the single levels analysis where the hypotheses were tested. Last but not least, Chapter 6 ('Discussion') highlights the relevant results, limitations, theoretical and practical implications and concludes with recommendations for future research.

2. Literature Review

The aim of this chapter is to provide an overview of the literature review on recovery from work and on the role of emotions in this process. Specifically, it starts with a discussion about the theories underlying the recovery process, the different facets of the process and the role of sleep. Detachment from work is also explored as a recovery experience contributing to the recovery process. Afterwards special attention is paid to the role of emotions, as an affective state, in the recovery process. Finally, it concludes by pointing to central issues to be further addressed.

2.1 Recovery from Work

In order to define recovery, most studies draw on two theoretical models that provide the background and concepts for its understanding: the Effort-Recovery Model introduced by Meijman and Mulder in 1998 and the Conservation of Resources Theory by Hobfoll in 1998 (Sonnentag, 2001).

The Effort-Recovery Model implies that the effort spent at work arouse load reactions including physiological and behavioral responses such as fatigue (Sonnentag, 2001; Sonnentag & Fritz, 2007). Then, under normal conditions, these effects are reversible. This means that when the individual is no

longer in contact with the work strains and demands, the systems that were previously affected return to their baseline level (i.e. pre-demand level) and recovery takes place (Sonnentag, 2001).

On the other hand, the Conservation of Resources Theory holds that individuals attempt to obtain, retain, and protect their resources (Sonnentag, 2001; Sonnentag & Fritz, 2007; Binnewies, Sonnentag, & Mojza., 2009a). Resources are defined as "objects, personal characteristics, and energies that either themselves valued for survival, directly or indirectly, or that serve as a means of achieving these resources" (Hobfoll, 1998 p.45 in Sonnentag, 2001). Adapted to the work context, this theory infers that stressful work situations threaten individual's resources (e.g. health and well-being). As a consequence, the individuals attempt to restore their resources investing additional ones (Sonnentag, 2001).

Hence, recovery might be defined as the process opposite to the strain process that has been caused by exposure to stressors (Sonnentag, Binnewies, & Mojza, 2008), where indicators of the organism's functioning return to their pre-stressor level (Sonnentag & Geurts, 2009; Binnewies et al., 2009a). Recovery is necesarry to prevent continuous deterioration in mood and performance (Sonnentag, 2003) and occurs during time periods when the demands similar to the ones that were required during work are not longer needed, or when new resources are built up (Sonnentag et al., 2008a)

The aforementioned theories propose that recovery and unwinding processes play an important role in predicting individual health and well-being (Sonnentag, 2001). These models suggest two main processes by which recovery occurs: (a) to abstain from work issues, and to avoid that the systems that were called or used during work are no longer required; and, (b) gaining new internal resources which will help restore the threaten ones (Sonnentag & Fritz, 2007).

Recovery might happen within two main contexts: (a) during work, known as internal recovery, and (b) in a non work context, referred to as external recovery (Geurts & Sonnentag, 2006). Internal recovery takes place during short breaks from work such as coffee or lunch breaks. In the other hand, external recovery is possible during off-job hours, weekends, or vacations (Geurts & Sonnentag, 2006; Demerouti, Bakker, Geurts, & Taris, 2009). The current research intends to focus on external recovery, principally daily off-job recovery. The main reason lies in the fact that everyday experience has suggested that job performance, some affective states and recovery from work fluctuate from day to day (Ohly, Sonnentag, Niessen, & Zapf, 2010). Furthermore, reserach has suggests that the effect of recovery process during long time periods such as vacations vanishes rapidly, implying that individuals benefit from shorter rest periods during the work week evenings (Sonnentag, 2003).

Different approaches to recovery have been studied. According to Sonnentag and Geurts (2009) studies on recovery may assess several perspectives or facets of recovery. They discussed basically

three: (a) recovery settings, (b) recovery as a process and (c) recovery as an outcome which will be explained below.

- Recovery settings refer to the context where recovery is analyzed or in which recovery is assumed to happen. These settings consider recovery from work during lunch breaks (Trougakos & Hideg, 2009), during leisure time evenings after finishing the workday (Sonnentag, 2003; Sonnentag & Bayer, 2005; Sonnentag et al., 2008a), weekends (Fritz & Sonnentag, 2005), vacations (Fritz & Sonnentag, 2006) and sabbaticals. Usually, these studies compare individual's state or situation before and after the recovery process in order to evaluate the impact of the recovery experiences.

- Recovery as a process involves the research which attempts to assess the mechanisms that trigger the recovery experience (Sonnentag & Geurts, 2009). These mechanisms have significant contribution to maintain individuals' well-being, occupational indicators and affective states. Three main categories (adapted from the classification suggested by Demerouti, Bakker, Geurts, and Taris, 2009) can be identified: (a) 'Activities with a potential for recovery' comprise low-effort activities (passive activities), physical activities (active activities) and social activities; (b) 'Experiences with a potential for recovery' include psychological detachment, mastery, relaxation and control experiences (Sonnentag & Fritz, 2007); and (c) 'Activities potentially inhibiting recovery' consist of work-related activities and probably household and child-care activities which may impede a successful recovery process.

- Recovery as an outcome centers on recovery as a consequence of a successful or less successful recovery process. Sonnentag and Geurts (2009) describe a general classification of the outcome variables that have been studies as recovery outcomes where three main groups can be identified: psychological, physiological and behavioral outcomes.

'Psychological recovery outcomes'. The level of recovery is frequently assessed by asking people how they feel after a certain work period and/or after a recovery process (Sonnentag & Geurts, 2009). Within the possibilities for assessing the recovery level, it has been found that recovery state (conceptualized also as need for recovery), well-being (situational well-being, psychological well-being, level of fatigue, health complaints), affective states (positive and negative emotions and moods) and sleep quality are the most frequently used.

'Physiological recovery outcomes' refers to neuroendocrine and cardiovascular measures. The former refers to measures of catecholamine and cortisol levels which are frequently assessed in experimental settings. The latter includes the heart rate (HR), blood pressure (BP) and heart rate variability (HRV), which help to determine the level of recovery of the individual.

'Behavioral recovery outcomes' refers primarily to job performance which is considered a multidimensional concept (Sonnentag & Frese, 2002; Landy & Conte, 2010) that refers to the behavior at work that supports organizational goals in a direct or indirect manner (Binnewies et al., 2009a). Some studies have focused on task performance outcomes since they are closely related to the required daily work activities. However, contextual performance indicators such as organizational citizenship behavior, prosocial organizational behavior, personal initiative, voice and taking charge (Sonnentag & Frese, 2002) have also been included in recovery studies since they facilitate task performance and thus contributes to the organization's performance (Binnewies et al., 2009a).

The role of sleep in several studies within the work, health and recovery domain has been constantly overlooked (Demerouti et al., 2009; Rook & Zijlstra, 2006; Zijlstra & Sonnentag, 2006). Nevertheless, research has highlighted that sleep is important for recovery (Rook & Zijlstra, 2006) although the exact mechanisms that are related to sleep quality, sleep disturbances and their possible consequences are not yet fully understood (Zijlstra & Sonnentag, 2006). Research has suggested that sleep can be studied from two perspectives: (a) sleep as a predictor of recovery, and (b) sleep as an outcome of recovery. Furthermore, sleep quality has been noted as more relevant to recovery than sleep quantity. However it has been suggested that sleep quantity contributes indirectly to recovery by maintaining sleep quality (Rook & Zijlstra, 2006).

Finally, recovery studies have followed different study designs depending on the objective of the research. Recovery studies have followed quasi-experimental, cross-sectional, longitudinal, and diary studies designs, in order to understand better the recovery process. Overall, it is recommended to combine various design approaches to get a complete picture of the recovery process ('design triangulation').

2.2 Emotions and Recovery

As introduced before, research has suggested that the way individuals feel after work might influence some aspects of recovery during leisure time. For instance, emotions may influence the effectiveness of the leisure time, the level of fatigue when arriving home, or the selection procedure of the activities to perform during free time. Thus, it seems reasonable and important to study the role of emotions in the recovery process.

Defining emotions has been difficult since it involves physiological, subjective, and behavioral responses that converge on one construct (Weiss, 2002). However, consensus has risen that emotions are best conceptualized as "multi-component response tendencies that unfold over relatively short time spans" (Fredrickson, 2004, p.1368). Moreover, after reviewing relevant research, it was observed that comparing emotions with moods through common features facilitates their understanding.

Moods are usually described as positive or negative, whereas emotions are expressed more specifically (e.g. fear, anger, or joy) (Landy & Conte, 2010). Moods are commonly considered as less intense and of relatively longer duration (i.e. moods can also be quite brief and intense) than emotions (Morris & Reilly, 1987). Emotions have often specific objects (Gross, 1998) and are considered to be response systems that are activated by these objects (Gray & Watson, 2001).
On the contrary, moods are more diffuse (Gross, 1998) and lack an object, defining event or specific behavioral impulse associated with them (Morris & Reilly, 1987). Nonetheless that does not mean that are not cause by something in particular; it means that "the cause is not part of the experience itself. Thus, diffuseness of mood, its disconnection from particular objects or circumstances, is often central to its broad cognitive and behavioral effects" (Weiss, 2002, p.24).

Recovery from work has been related to research on mood and emotions regulation. It has been discussed that mood regulation provides specific knowledge relevant for recovery since mood repair is one of the main functions of recovery after stressful situations at work (i.e. which frequently tend to impaired mood) (Sonnentag & Fritz, 2007). Additionally, some recovery experiences (e.g. detachment, relaxation, and mastery experiences) are similar to affect-regulation strategies (i.e. mood and emotions regulation) (Sonnentag et al., 2008a).

Emotion regulation is defined as "the process by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998, p.275). Activities such as avoiding particular places, distraction, exercise and relaxation are some examples of activities that are described as emotion regulation activities and that might be related to some recovery experiences which in turn contribute to a successful recovery process. Furthermore the Broaden-and-Build Theory of positive emotions described by Fredrickson (2004) has been highlighted as underlying theory for recovery because it suggest that positive emotions build personal resources (which is one of the main purposes of recovery).

Regarding self-regulation of mood, distraction (which was found as an activity to self-regulate moods by Morris and Reilly, 1987) might be the most relevant activity since it can be related to detachment whose role has been emphasized for mood improvement (Sonnentag & Bayer, 2005). Other activities such as social interaction and exercise constitute the most common methods of self-regulation and the most effective behavior at changing a bad mood respectively (Thayer, Newman, & McClain, 1994).

The role of affective states in the recovery process is not yet well understood. Some studies have shown the role of the affective states (e.g. positive moods, positive emotions, etc) as indicators of recovery outcomes. However, it is also possible to consider the affective states as a predictor or a facilitator of the recovery process (Sonnentag & Geurts, 2009).

Four important aspects arose as a result of the initial literature review that are worth highlighting.

- *Activities related to recovery.* It still remains important to know the specific activities that contribute to recovery and how these activities are related to recovery experiences and to a successful recovery process.
- *Facets of recovery.* It is suggested that in order to get a better understanding of the recovery process, an integration of the three recovery perspectives is needed: Defining a setting to study recovery and considering both recovery process and its possible outcomes. (Sonnentag & Geurts, 2009).
- *Sleep.* Sleep is still a subject under discussion because there is insufficient empirical evidence to clarify its role in the recovery process (i.e. whether sleep belongs to the recovery process, or if it is considered as recovery outcome). Furthermore, the relation between sleep quantity and sleep quality is not clear enough. While sleep quality has been the most related to recovery, sleep quantity might be a potential predictor of sleep quality and recovery.
- *Emotions (Affective states).* The limited research relating emotions and recovery process in addition to the close relation of affect regulation theories with the underlying theories of recovery, suggest a more detail study of these constructs. While it is true that affective states have been considered as a recovery outcome, the literature also suggests that they might play a more active role within the recovery process.

The aforementioned raises some questions such as which specific activities contribute to the recovery process? How the work experiences influence the recovery process? And which is the role of sleep in the recovery process? The main purpose of this research is to develop a model that integrates the issues discussed before and that allows to study the role of emotions in the recovery process.

3. Conceptual Model and Hypotheses

This chapter aims to present the process undertaken to develop the conceptual model that will be further analyzed. It starts by introducing the initial model that was developed to address the main issues discussed in the literature review. Subsequently, a more detailed and adequate models as well as the hypotheses that will be tested in the subsequent stage of this research are explained.

3.1 Conceptual Model Development

Before introducing the model, it is important to mention that most of the recovery from work studies center or develop their research models based on the general representation of the recovery process presented on Figure 3.1. In this illustration, predictors such as recovery activities have an influence on the recovery process which in turn leads to specific recovery outcomes. The model that will be developed is based on this process.

Figure 3.1 Recovery process (sequence)

Driven by the research question of *"Which role do emotions fulfill in the recovery process?"* and considering the highlighted issues discussed in the previous chapter ('Literature Review'), the initial model depicted in Figure 3.2 attempts (a) to include the three facets of recovery (i.e. recovery setting, process and outcomes: Examine the daily recovery process that leads to a successful recovery state as recovery outcome), (b) to identify the activities that facilitate or impede recovery, (c) to assess emotions as moderating variable, and (d) to explore the role of sleep (sleep quantity and quality) in a deeper way that allows to determine if it is part of the recovery process or recovery outcome.

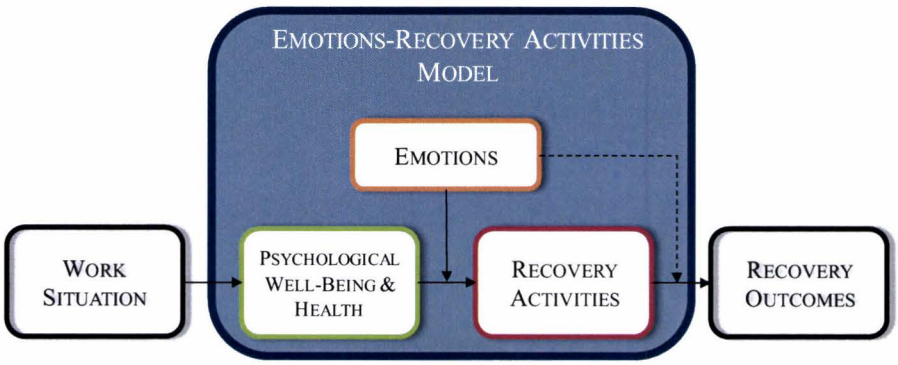


Figure 3.2 'Emotions-Recovery Activities Model'

In order to explain the main purpose of this model, imagine an individual that had a stressful and tiring work day, where several personal resources were demanded. Nevertheless, the outcome of the working day was successful (e.g. the individual made great progress in a project, s/he received good news, a raising of the salary was announced, etcetera.). These moments are reflected in the emotional status of the employee (i.e. how they feel at the end of the day, relaxed, angry, sad, inspired, etcetera.) which in turn may influence the predictors of the recovery process (e.g. activities during leisure time).

In general terms, the central model ('Emotions-Recovery Activities Model') represents a situation where the individual's psychological well-being or health after work influences the choice of recovery activities during leisure time. This relation might be moderated by emotions (at the end of the working day). The activities that an individual normally uses for recovery may change according to what happened during the working day. For instance, if the individual was required to perform several physical activities during work, the recovery activities likely to restore his/her resources should be classified as low-effort activities, social activities, relaxation or cognitive activities (according to the underlying theories of recovery). However, because of the satisfactory moments experienced at work, the situation where the individual chooses recovery activities that involve physical effort (i.e. practicing a sport, or mastery experiences involving psychical resources) may happen.

Regarding the additional concepts, it is assumed that work situation (which can be interpreted as work experience including job demands, the nature of the work activities or special job characteristics) influences individual's psychological well-being and health at the end of the working day. Moreover,

the recovery activities contribute to recovery outcomes (e.g. psychological, physiological or behavioral). Once more, emotions may also influence this relation increasing or decreasing the possibilities of a successful recovery process. For instance thinking positively about aspects of work (that might be triggered by positive emotions at the end of the working day) influences recovery outcomes (Binnewies, Sonnentag, & Mojza, 2009b). Finally, sleep may be interpreted as part of the recovery process or as an indicator of a successful recovery process.

In order to constrain the model, two conditions were determined: (a) the recovery setting (facet of recovery) and (b) the role of sleep. Concerning the inclusion of the three facets of recovery, recovery process and outcomes are easily identified in the model; however, the recovery setting is not so obvious. It is suggested to analyze recovery during leisure time evenings (after finishing the workday) as recovery setting (context where recovery is assumed to happen). The main reason is because the work experiences are not the same every day, thus emotions may vary according to these experiences. Additionally, from now on, sleep will be considered as recovery outcome assuming that a successful recovery in the evening should improve sleep quality (Sonnentag & Geurts, 2009).

Subsequently, a detail model was also proposed (Figure 3.3). This model suggests that the recovery process might be divided in three main components that will influence recovery outcomes. First of all, the recovery activities during leisure time influence recovery experiences (i.e. psychological detachment, relaxation, mastery experience, and control) which have been suggested to be the underlying strategies influencing recovery (Sonnentag & Fritz, 2007). The recovery state is introduced as a possible indicator of successful recovery (i.e. how recovered does the individual feel after the recovery activities/experiences). This recovery state affects the 'recovery outcomes' which may refer to behavioral recovery outcomes (e.g. task and contextual performance indicators).

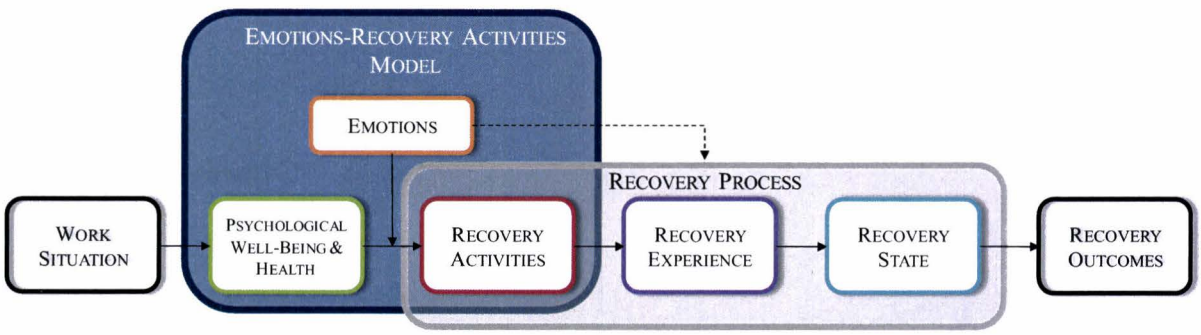


Figure 3.3 'Emotions-Recovery Activities Model' including extended recovery process

Once the recovery process has been extended, it can be assume that emotions affect some extra relations. For instance, emotions may influence the relation between recovery experience and real recovery intensifying it or weakening it. The "feeling" of been recovered ('recovery state') might depend on the emotional status of the individual. This version of the model would be ideal to

analyzed, however the model needed to be adapted according to the research available time and resources.

Figure 3.4 presents the adapted model that was further studied in detail. It has been suggested that are not the specific activities that the individual chooses to perform during leisure time the ones that contribute to recover from work, but their underlying strategies such as relaxation or psychological distance from work-related issues (Sonnentag & Fritz, 2007). Moreover, it may be considered that psychological detachment from work is the most relevant recovery experience that influences the recovery process (Sonnentag & Fritz, 2007). Consequently, the 'recovery activities' component was removed from the previous model and the 'recovery experience' concept was substituted by 'detachment' from work. Studying one experience at a time may help to understand better their behavior within the recovery process.

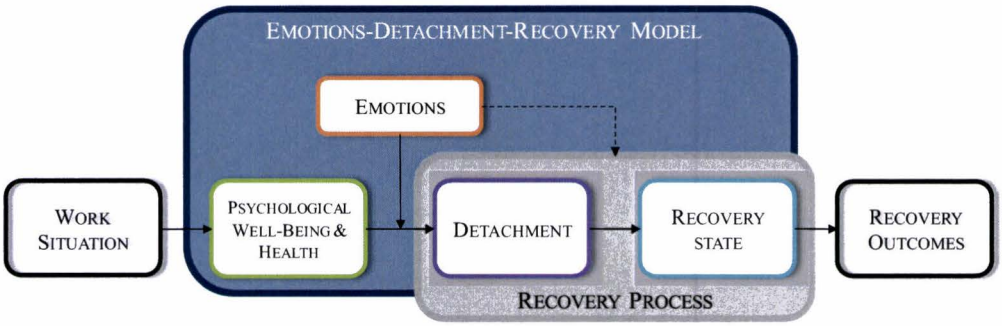


Figure 3.4 'Emotions-Detachment-Recovery Model'

The 'Emotions-Detachment-Recovery Model' (Figure 3.4) illustrates the recovery process (represented by detachment and recovery state), the influence of psychological well-being and health (as possible predictors) and emotions as moderator variable. It also depicts two extra concepts (i.e. work situation and recovery outcomes), that were left out of the analysis due to the scope of the project.

This model can be analyzed under different study designs (e.g. cross-sectional, longitudinal or diary studies). In this research, a cross-sectional analysis was conducted in order to test the following hypotheses. However, it is important to note that the data that was used as input was gathered trough a daily diary study.

3.2 Hypotheses

A brief description of the conceptualization of the main constructs that are going to be used in this research is presented below. At the same time, some hypotheses that are expected to be tested are discussed.

Psychological well-being and health. This component of the model can refer to two concepts: psychological well-being or health. In regard to well-being, it has been characterized because of its many possible forms of conceptualization and measurement which vary between one form and another depending on the purpose of the research (Warr, in press). Similarly, health has been viewed from different perspectives (e.g. medical, social, economic, spiritual) and therefore conceptualizations range from the absence of disease or disability to the state of complete physical, mental and social well-being (Larson, 1999).

In this research, adverse health will be assessed. It will be represented by health complaints (e.g. concentration problems, emotional exhaustion and physical complaints). It is suggested that a distinction within health complaints is needed. Based on one of the principles of the Demand-Induced Strain Compensation (DISC) model (De Jonge & Dormann, 2003) which emphasizes the need to recognize the multidimensionality of concepts (e.g. job demands, job resources, and job related strains), cognitive, emotional, and physical health complaints are distinguished. The main reason may lie in the assumption that if job related strains and job demands vary according to the previous dimensions, and at the same time influence individual's well-being; it is reasonable to think of health complaints through these same dimensions.

In contrast to the relation analyzed by Sonnentag & Fritz (2007) were the effects of psychological detachment were related to adverse health (health complaints), it may be argued that adverse health is negatively related to detachment from work. Because the more physical, cognitive and emotional complaints the individual has, the longer will take to recover, thus less detachment will have. However, other possibility exists. If the individual repots a high score in health complaints, it can also be assumed that the individual will engage in activities that allow him/her to reduce those feelings; therefore a positive relation might be expected. For instance the more physical complaints the individual has, the higher the score of detachment the individual will report because during leisure time s/he got involved in detachment activities related to the same dimension of the health complaints.

Detachment from work. Detachment from work which refers to the sense of being away from work related issues, will follow the same line of reasoning about the recognition of multidimensionality of the concepts introduced before (De Jonge & Dormann, 2003). This conceptualization, suggested by De Jonge, Spoor, Sonnentag, Dormann, and Van den Tooren (2012), encompass cognitive, emotional, and physical absence from work.

Since one of the conditions for recovery to happen is that resources that were called during stressful situations are no longer required during leisure time, it seems reasonable to adapt this condition to the relation between adverse health and detachment. For instance it would be expected that if the individual suffers from physical complaints, s/he will tend to detach more in that particular dimension (not involving in physical activities that demand too much effort or preferring relaxing activities that

allow restore those internal resources). In the same vein, someone that is constantly dealing with emotional job demands (that might be reflected in emotional complaints) would be better if during his/her leisure time avoids social activities or something related to emotional demands (emotional detachment). In order to study the relation between adverse health and detachment, the concept of matching enters into play. In this research, it is hypothesize that people will benefit more from detachment from work if this detachment matches the health complaints.

> *Hypothesis 1:* Health complaints at the end of the working day are positively related to detachment from work before going to sleep. Suggesting that the more health complaints, the more detached the individual will be since more recovery activities are followed. The relation will be stronger if the type of detachment from work matches particular health complaints.

Recovery state. The state of being recovered (i.e. measured in the morning before work) has been used in previous research as an indicator of successful recovery (Binnewies et al., 2009a).

The recovery state will be conceptualized with two indicators of a successful recovery process: (a) recovery state and (b) sleep quality. Recovery state refers to how recovered does the individual feel after the recovery process. It is expected a positive relation between detachment from work and recovery state. Regarding sleep quality, it has been suggested that positive recovery experiences should reduce the strain level increased by the working day and should in turn enhance sleep quality (Sonnentag & Fritz, 2007).

> *Hypothesis 2:* Detachment from work before going to sleep is positively related to recovery state at the beginning of the next working day.

> *Hypothesis 3:* Detachment from work before going to sleep is positively related to sleep quality assessed at the beginning of the next working day.

The particular effects of the different dimensions of detachment are not specified because it might depend on the sample of the study since every job involves different level of physical, cognitive and emotional demands.

Emotions. As emphasized in the initial literature review, although some studies have analyzed the role of affective states as recovery outcomes, research suggest that they can play an active role as an antecedent or facilitator of the recovery process (Sonnentag & Geurts, 2009). In this research it is suggested to analyze the moderating role of emotions in the relation of adverse health (health complaints) and detachment from work before going to sleep. It has been suggested that experiencing positive emotions is related to certain processes that may quickly down-regulate the stress response,

which in turn will promote recovery (Van Hooff, Geurts, Beckers, & Kompier, 2011). Moreover, the Broaden-and-Build Theory of positive emotions suggests that positive emotions share the feature of increaseing an individual's personal resources (Fredrickson, 2004). This increasing in personal resources may contribute to the underlying theory of recovery (Conservation of Resources Theory).

Since the role of emotions in the relation between adverse health and detachment is not clear and since there are no other studies that have addressed this particular relation, instead of formulating a definite hypothesis, this research will attempt to answer the question *"what is the role of emotions as moderator variable in the relation between adverse health and detachment from work?"*

Although emotions will be analyzed with explorative purposes, it is expected that emotions will threat the matching relation between adverse health (health complaints) and detachment, especially when positive emotions are present. In other words, it is assumed that when the individual experiences positive emotions at the end of the working day, the "feeling" attached to the possible health complaints may be reduce or altered an therefore affect the relation with detachment from work. For instance an individual who repots high physical complaints but who experienced positive emotions during the working day might pursue challenging and physical activities during leisure time, contrary to what it is usually advised (follow activities that facilitates physical detachment if you have physical complaints). On the contrary, if the individual experienced negative emotions, it might increase the feeling of adverse health and thus strength the matching hypothesis.

It is important to note that for this research the role of emotions will be analyzed in the relation between adverse health (after work) and detachment from work (before going to sleep) as the principal objective.

To conclude with the development of the model, one question remains: "In which industry sector or group in particular is better to test this model?" The first choice would be a sector where the employees are in constant contact with the three dimensions of job demands, therefore three dimensions in health complaints could be easy to identify. Besides, the matching effect could be studied. For instance work in service job is particularly challenging, it is characterized by a high degree of emotion work demands (Sonnentag & Natter, 2004) which is vulnerable to burnout (Singh, 2000). Typical jobs that are characterized by these demands include those of flight attendants, kinder garden teachers, call-center employees, or front-line employees whose customer service roles are noted.

Probably one of the sectors which can involve the three dimensions of adverse health is the health care sector. This sector is one of the most demanding service sectors which are constantly facing new challenges and changes. One of the important changes is an "increasingly knowledgeable consumer with intensifying demands to have information available for helping them to make appropriate health

care decisions" (Purbey, Mukherjee, & Chandan, 2007, p. 242). Different jobs within this sector face the three types of job demands (physical, emotional and cognitive). Nurses, for instance, are in constant contact with patients and families (cognitive) and their job tasks require physical and cognitive resources as weel. Therefore it would be interesting to test this model in the health care sector in order to evaluate the multidimensionality of the concepts and the interaction of emotions in the recovery process.

4. Research Methodology

This section presents the research methodology as the second stage of the master thesis. It explains the general aspects of the study that were undertaken in order to analyze the conceptual model developed in the previous section.

Since one of the main differences between science and common sense beliefs is that "science is characterized not by assumption but by data collection" (Landy & Conte, 2010, p.423), the present research aims to combine explanatory and design sciene. The principal objective of explanatory science according to Van Aken (2005) is to "develop valid knowledge to understand the natural or social world, or to describe, explain and possibly predict". On the other hand, the central objective of the design science is to "develop knowledge that can be used by professionals in the field of question to design solutions to their field problems" (Van Aken, 2005, p. 22).

Therefore, the objective of this research is twofold. The first part of this research was devoted to study the literature regarding recovery from work to understand the basic concepts, underlying theories, empirical evidence that have expanded the existing knowledge as well as to identify relevant gaps in the literature that might answer the question of 'which role do emotions fulfill in the recovery process?'. The second part of the project has two main objectives: (a) to design a conceptual model that integrates the principal components of the recovery process and that includes the necessary to answer the initial research question (described in Chapter 3), and (b) to test this model in the health care sector in order to make recommendations about how to improve the recovery process and how the organization itself can evaluate their own recovery processes through the conceptual model developed earlier.

The following diagram (Figure 4.1) depicts the general procedure that was followed in the current research.

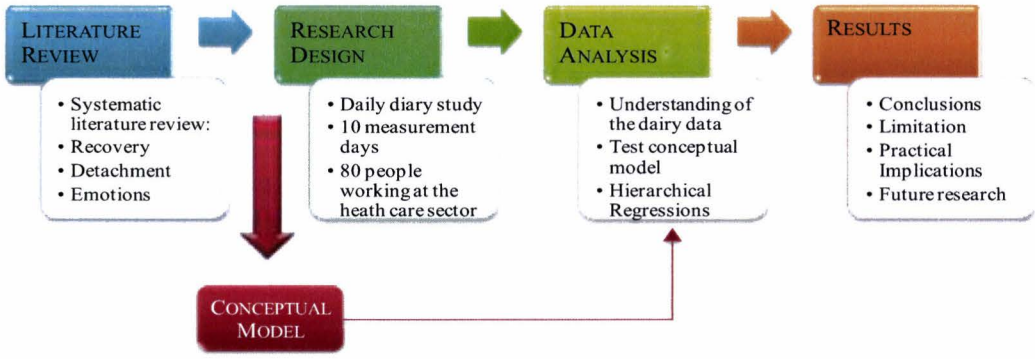


Figure 4.1 Research overview

As explained before, this research started with a systematic literature review focused on the recovery process and the role of emotions in recovery as a general construct. Consequently, a new conceptual model was designed where different hypotheses were suggested regarding the relations of the components and the role of emotions in the off-job recovery process. Afterwards, in order to explore and test these propositions, a daily diary study contributed to the collection of the relevant data for further study. The subsequent stage was focused on the analysis of the data. In this stage, preliminary analyses were conducted to understand the sample and the relations suggested by the model, and then the hypotheses that were developed as a result of the literature review were tested. The research finished with the interpretations of the results, discussion of conclusions, limitations, practical and theoretical implications and future research.

4.1 Procedure

This research is part of a bigger research conducted within the Human Performance Management Group at the faculty of Industrial Engineering and Innovation Sciences at Eindhoven University of Technology. Data from a daily diary study conducted from December 5th, 2011 to December 20th, 2011 within the health care sector were analyzed.

Employees from a general hospital in The Netherlands working in four different departments and fourteen sub-departments were invited to participate in the study offering them a monetary compensation as an incentive at the end of the daily diary study. It was expected to get the participants to complete the different daily questionnaires for a period of 10 days including working and non-working days.

The individuals participating in the study received an iPod Touch ® for ten consecutive days at least (i.e. some participants kept the device for a few more days). Each day, the participants were asked to answer a survey on the electronic device two or three times per day depending on whether they were in a working or in a non-working day. During a working day (WD), the participants filled out three questionnaires: (a) before work (w_1), which was usually answered in the morning, after waking up, (b) after work (w_2) when the participants had returned home from work during the early evening, and (c)

before going to sleep (w_3), preferably during the late evening. However, it is important to mention that the response time for these questionnaires depended also on the shift the participant was starting (i.e. day, evening, night or broken shift).

On the other hand, if the measurement day was a non-working day (FD) (i.e. also called free day), the participants filled out two questionnaires: (a) after waking up (f_1) (i.e. or when the free day started), and (b) before going to sleep (f_2). The corresponding response times also were influenced by the type of shift the participant had the day before the free day.

4.2 Sample

In total, 80 participants joined the experiment. The mean age of participants was 40.78 years with standard deviation of 11.62, 82.5 percent (66) of participants in the sample were women, whereas 17.50 percent (14) were men. Participants work in different departments and sub departments. 22.50% work in a nursing department, 23.75% work in a laboratory, 40% work in the operating room department, and 11% work in the emergency room department. Regarding the sub departments, the surgery sub department of the operating room has 15% of the participants representing it. The rest of the sub departments have between 13.75% and 2.50% of participants.

Assuming that in the ideal situation every participant would complete a period of 10 days during working days, the maximum number of entries (i.e. responses) would be 2400 (80people*10 days*3 measures per day). However, since the participants do not follow the same working schedule, the final number of cases varied and after the daily survey period, 1940 cases where obtained. This represents 80.83% of response. Since the previous assumption is not realistic, a different response rate which took into account the total working and non-working days was estimated. Based on the participants' responses, a total of 2043 cases (i.e. entries or questionnaires) were expected, therefore, the response rate was 94.96%. Additionally, there is also an individual response rate which show if people completed all the questionnaires that were required according to their schedule. For example a participant that report to have 5 working days (WD) and 5 free days (FD) was expected to have 25 measures or completed questionnaires (i.e. 5WD*3 questionnaires + 5FD*2 questionnaires). In average, the individual response rate represents 93.64% (i.e. this percentage did not take into account some uncommon measures).

The majority of the participants (92.5%) started the measurement period on December 7th, 63 participants (78.75%) completed the questionnaires during 10 days, 7 participants (8.75%) completed 11 days, while the remaining 10 (12.5%), completed six (1), eight (4), nine (4) or fourteen days (1).

4.3 Measures

The measures that were used in the daily diary survey are described below. Almost all items are scored on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Recovery state (before work, w_1)

Recovery state was assessed with one item "I am sufficiently recovered from my last service". The possible responses ranged from 1 (strongly disagree) to 5 (strongly agree).

Sleep quality was measured with one item "How do you rate the quality of your sleep?" The possible responses are 1 (very bad). 2 (fairly poor), 3 (reasonably well), and 4 (very good).

Emotions (after work, w_2)

Emotions at the end of the working day were measured by using eight items of the Job Related Affective Well-Being Scale (Van Katwyk et al., 2000). "Today during work, I felt (a) enthusiastic, (b) relaxed, (c) angry, (d) disgust, (e) discouraged, (f) sad, (g) inspired, and (h) satisfied".

Adverse health (after work, w_2)

Cognitive complaints (originally conceptualized as concentration problems) were measured with three items derived from a semantic differential scale developed by Meijman (1991). For instance, "I have difficulty to concentrate at the moment".

Emotional complaints (originally conceptualized as emotional exhaustion) were measured with the well-validated Dutch version (Schaufeli & Van Dierendonck, 2000) of the Maslach Burnout Inventory. Three items were used. An example is: "At this moment I feel drained from my work".

Physical complaints refer to neck, shoulder, back and limb problems. Three items derived from a scale developed by Hildebrandt and Douwes (1991) were used (e.g. "At this moment I have pain in my neck or shoulders")

Detachment from work (before going to sleep, w_3) (originally conceptualized as recovery from work). Refers to an individual's sense of being detached from the work situation. It is assessed by the scale develop by De Jonge et al. (2012) which includes cognitive, emotional and physical components of detachment. Two items per dimension were assessed. For instance, "After my service, I put all thoughts of work aside" (cognitive), "After my service, I emotionally distanced myself from my work" (emotional), and "After my service, I shook off the physical exertion from my work" (Physical).

Besides the aforementioned variables, some control variables were measured. In addition to the socio-demographic characteristics (i.e. age and gender).

4.4 Data Analysis Procedure

The procedure that was followed in order to test the conceptual model is the following. Figure 4.2 illustrates the general stages that were addressed.

In the first place, it is of utmost importance to familiarized with the data, to get to know the participants that joined the research (sample) (i.e. through general variables), and to get a general picture of what kind of responses were gathered in the daily surveys. Therefore, once the data was collected through the daily questionnaires, a chart displaying all the responses (i.e. 1940 cases) and basic information (i.e. age, gender, measured days, type of survey answered which refers to the moment of the day (i.e. w_1, w_2, w_3, f_1, etc.), days of measurement, and type of work shift) for all the participants was created.

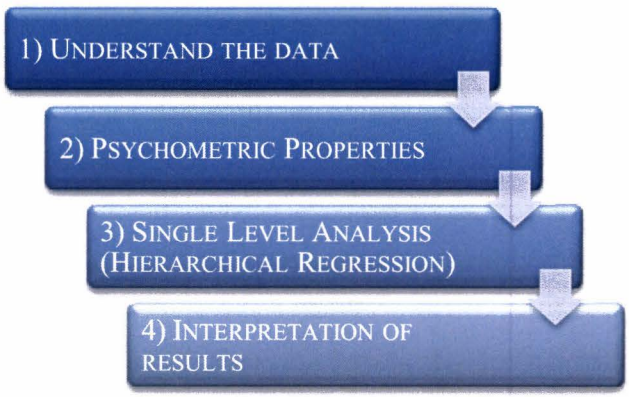


Figure 4.2 Data analysis procedure

This initial analysis helped to determine which cases might be discarded because of several reasons. For instance if there was a problem with the time response (e.g. if the participant filled out the corresponding questionnaire in a different day), or if the questionnaire selected did not match with the previous questionnaires (i.e. if the participant filled out other questionnaire instead of the following depending on the suggested sequence $w_1 \rightarrow w_2 \rightarrow w_3$ or $f_1 \rightarrow f_2$).

The second step in this general process referred to the assessment of three psychometric properties: (a) (uni) dimensionality, (b) reliability, and (c) construct validity. Because most of the measures constitute well-known and tested tools, reliability is the only psychometric property that was evaluated. Reliability, which refers to whether an instrument can be interpreted consistently across different situations (Field, 2009) was assessed by computing the Cronbach's alpha (reliability coefficient, internal consistency) of the variables in the conceptual model (e.g. cognitive complaints, emotional complaints, physical complaints, detachment, positive and negative emotions) for the principal ten days of measurement.

Once the psychometric properties were assessed, the single level analysis was conducted in SPSS for Windows. The values of the variables of interest were aggregated (averaged) across daily measurements. As a result, a single value for each variable was recorded per participant. A Person correlation matrix was initially assessed to verify that there were no high levels of multicollinearity (strong correlation between two or more predictors in a regression model, Field (2009)). Additionally

a quick examination of the correlation matrix provided an idea of how the variables of the conceptual model are related.

In order to test the three main hypotheses and the research question regarding emotions, a series of hierarchical regressions was conducted. The first analysis (Hypothesis 1) included three models (one for each detachment dimension as dependent variable) where the gender and age (control variables) were the first predictors for the model and then the adverse health variables were entered. Although it is recommended as a general rule that the predictors should be added according to their level of importance (Field, 2009), the order followed helped to better interpret the results. The second analysis (research question) was conducted based on the first analysis. Here, the interaction terms of positive and negative emotions with the adverse health variables were added to the model. The last analysis (Hypothesis 2 and 3) involved detachment from work (three dimensions) and recovery state (recovery state and sleep quality), and followed the same hierarchical order as the first analysis.

The last stage concerning the interpretation of results has as main objective to draw conclusions regarding the hypotheses that were tested; particularly, if the relations between the main variables resulted as initially suggested. This interpretation of the results is address mainly in the last chapter (Chapter 6 'Discussion'). Especial attention was given on the results regarding the exploration of the role of emotions in the relation between adverse health and detachment. Furthermore, an evaluation of the conceptual model regarding the initial objectives and its performance in this research is included.

5. Results

This chapter presents the results that helped to conclude if emotions play a role in the daily recovery process. Results provided feedback regarding the functionality of the model and about the hypotheses as suggested earlier. The outline of the chapter follows the data analytic procedure explained in Chapter 4. First, the analysis conducted in order to understand the data is presented, followed by the assessment of some psychometric properties of the main constructs. The last section presents the results of the hypothesized relations examined at a single level (aggregating the data based on average values across daily measurements) for which hierarchical regression analyses in SPSS for Windows were conducted.

5.1 Understanding the Data

To understand the data, three issues were analyzed: (a) the general overview of the data gathered, (b) the behavior of the participants during the daily diary study, and (c) adjustment of special cases (uncommon responses).

5.1.1 Overview of the Data

As mentioned before, the first approach to get acquainted with the collected data was a visualization of all the answers gathered with the daily surveys. This visualization was accomplished by capturing the data from SPSS into an Excel file where the 80 people was identified by its electronic device (iPod Touch ®) number (i.e. from 2 to 81), then the days of measurement where depicted in columns and every answer was placed according to the participant's number, the day of measurement and the moment of the day (i.e. w_1 (before work), w_2 (after work), w_3 (before going to sleep), f_1 (after waking up in a free day), f_3 (before going to sleep in a free day), and the special cases w4 and f_3 which mean different moment of the day).

Colors helped to identify whether the survey was answered within the correct time slot or if the individual answered in a different day (i.e. two situations were remarked: (a) late response (next day), and (b) late response two days after the expectation. As can be seen in Figure 5.1 (the complete table is presented in Appendix 1.), there is variation in the number of measured days, types of surveys that people answered (i.e. the survey depended on the working schedule of the individual), and in the number of questionnaires completed (i.e. every questionnaire is treated as a measure or case).

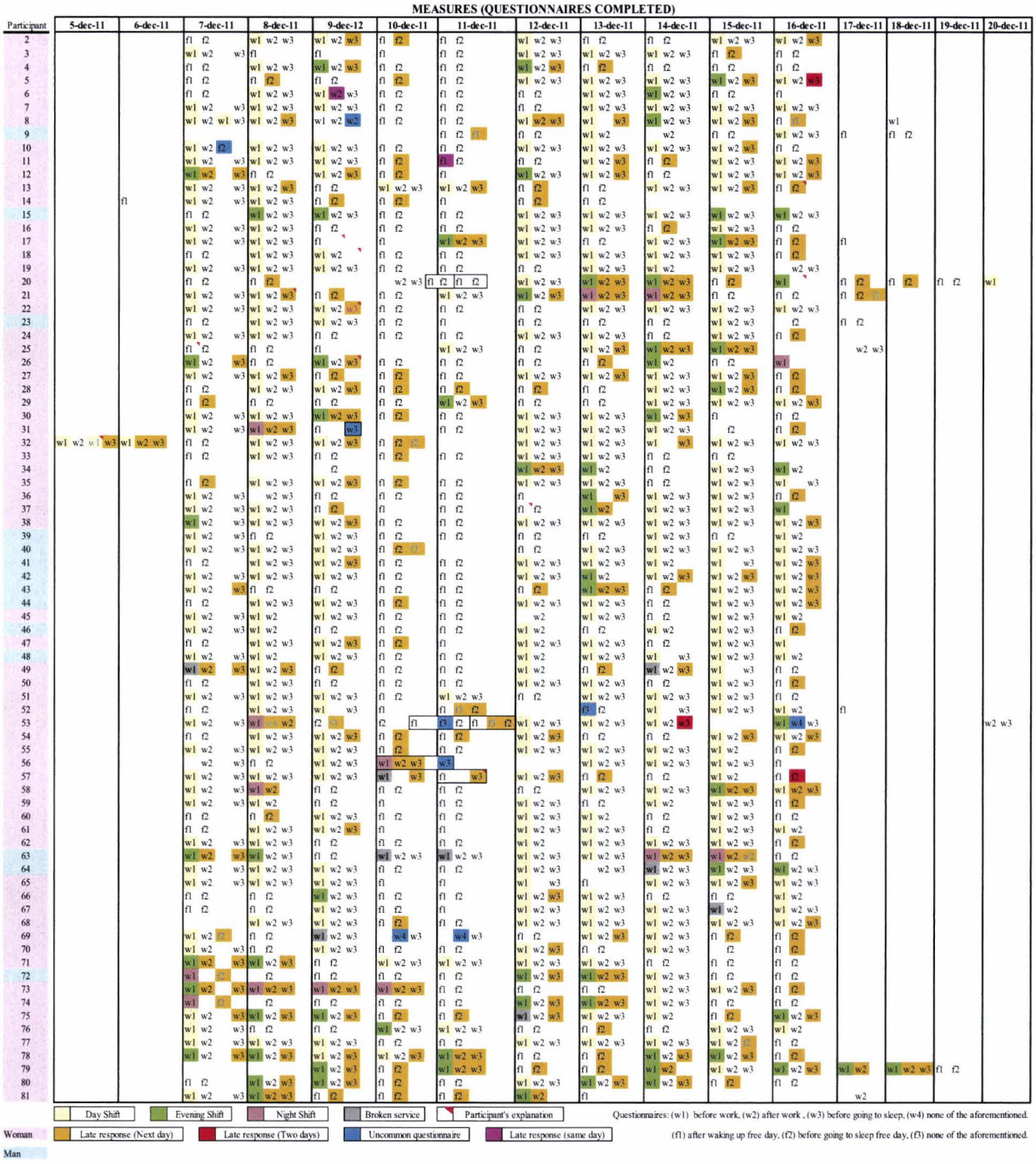


Figure 5.1 Overview of the participants' responses (1940 cases)

Considering all participants' measures, 795 days where registered. From those days, 57% (453) corresponded to working days and the rest 43% (342) were specified as free days. In average, ten days (i.e. 9.94) were completed by every participant, six days (i.e. 5.7) were working days and four days (i.e. 4.3) were free days.

Regarding the recovery periods, it is important to note that four general scenarios might be analyzed (Figure 5.2): (a) the relation between detachment from work during a free day and the recovery state

on the next working day, (b) the relation between adverse health, detachment and recovery state during working days, (c) the relation between adverse health and detachment during a working day, and recovery state during a free day, and (d) the relation between detachment and recovery state during free days.

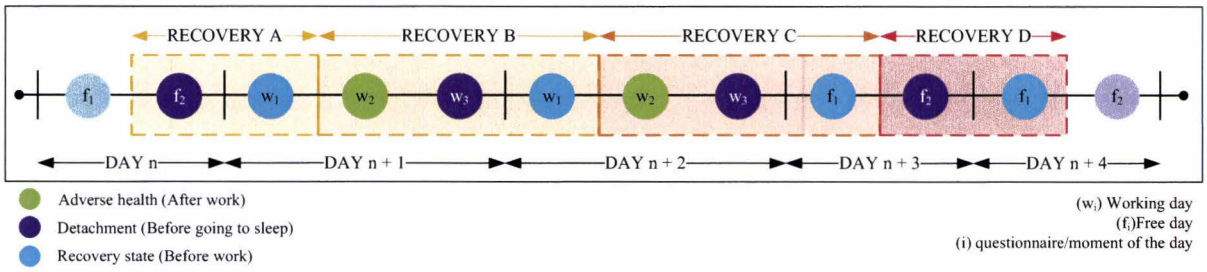


Figure 5.2 Possible recovery scenarios to analyze

Understanding the data also included checking the frequency of the scenarios described before. It would be expected that every participant has completed at least 9 recovery periods (i.e. taking into account the ten days of measurement and that every recovery period covers measurement moments of two days because the recovery state is measured the next morning). The scenario consisting of the relations between adverse health, detachment and recovery state during working days (i.e. scenario b), which will be analyzed in this study (corresponds to the conceptual model), was found 226 times in the participants' responses (i.e. the final number might be affected by some uncommon responses that will be analyzed in the further sections). The other scenarios were present in 127 (a), 127 (c), and 135 (d) times. Based on the ideal ten measurement days of every participant, 720 recovery periods were expected (9 recovery periods * 80 participants) (The complete table regarding, working days, free days and recovery periods is presented in Appendix 3). However, since several questionnaires were missing or forgotten to complete, the actual recovery periods (615) represents the 85.42% of response.

The following figure (Figure 5.3) gives a summary of the sample, the measured days and the type of questionnaires that were answered as a general picture of the participants' responses.

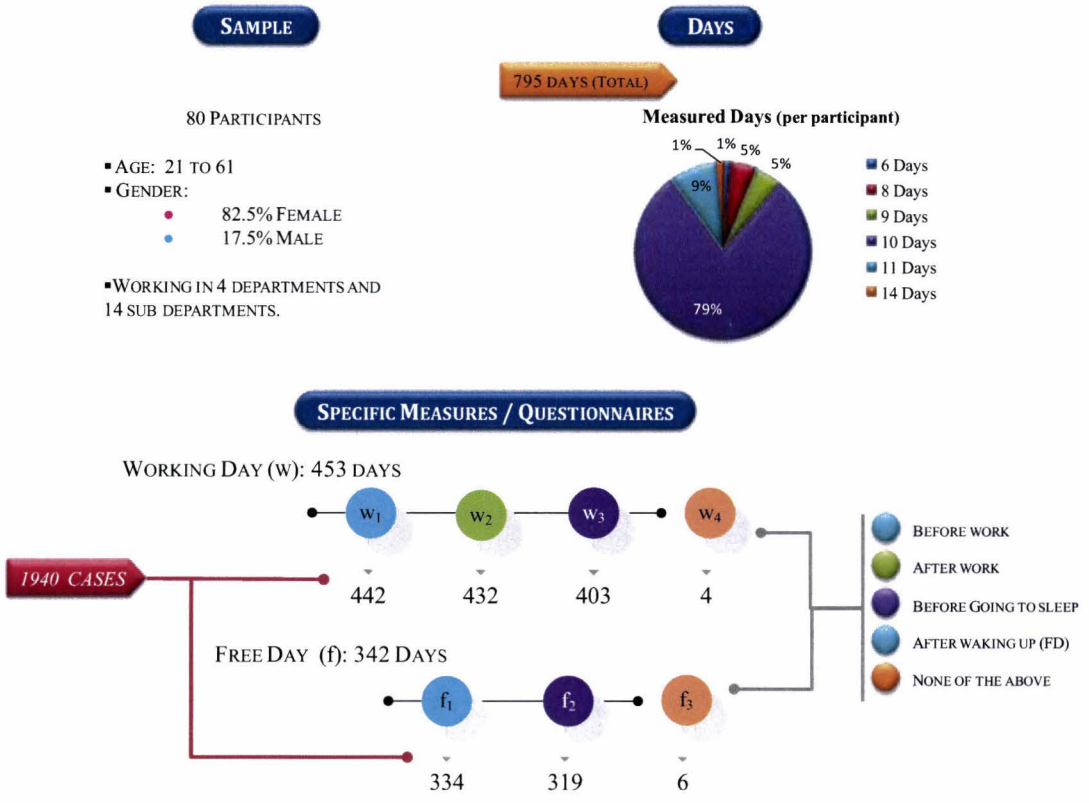


Figure 5.3 Summary sample, days and specific measures

5.1.2 Behavior of the Participants During the Daily Diary Study

Besides understanding the way participants responded to the daily diary study through statistical measures such as number of working days, or cases corresponding to the different day moments (type of questionnaires); it is also important to understand how participants behaved under the circumstances that this study involved (interpreting the pattern of responses, Figure 5.1)

Previous daily diary studies (e.g. paper-based studies) have relied on the participants' compliance with the instructions regarding completing the questionnaires at the specified times (Sonnentag & Bayer, 2005). However, a frequently mentioned limitation is that one cannot verify the exact time of response. It might be that the responses that were not gathered within the desired time slot influence or alter the relations studied. For instance, if one questionnaire is designed to explore the emotions at the end of the working day and it is answered during the late evening, it is likely that the experiences or activities performed after work influence the responses.

To overcome lack of tracking responses, it has been suggested that technology (e.g. web-based surveys) and electronic devices (e.g. handheld computers) may help (Sonnentag & Bayer, 2005). Consequently, some daily studies have used electronic devices such as pocket computers to record the time of filling in the surveys (Binnewies et al., 2009a; Van den Tooren & De Jonge, 2011). Knowing the exact time of response has helped researchers to include in the analysis only the cases that followed the study instructions.

Nevertheless, once electronic devices are used, do these devices ensure the correct use of them? Or do they guarantee the appropriate moment of response? One of the drawbacks of handheld computers is that it requires some computer knowledge (Ohly et al., 2010) or at least being familiarized with technology. In this study 80 iPod Touch® were used, and even if nowadays most of the people are familiarized with these devices, it might be that some participants had problems getting used to the device.

Being acquainted with the responses of the participants, may help to make inferences regarding the way one expects them to behave. For instance it might be inferred that for young participants would be easier to follow the study protocol since they are assumed to be more familiarized with the technology and iPod® applications than older participants. However, it might also be inferred that young people will be more interested in taking advantage of the benefits of the device which may hinder them to follow the correct instructions (e.g. forget to answer a questionnaires because the participant was playing with the device or listening to music). Just to mention one example, one of the participants who presented more irregular measures is 24 years old - this might support the second case. However, nothing can be finally concluded - there are more aspects influencing the participant's behavior.

Although exploring how people behaved during the daily diary study is not the main research question, and it is also beyond the scope of this research, there are some advantages of exploring this matter in future research. Knowing more about the sample (participants), their interaction with the electronic device, and their experience with new technology might help to interpret the responses, to understand some uncommon cases and to better design daily diary studies.

5.1.3 Adjustment of Special Cases

Some of the cases that were initially considered not valid for the study were kept after a deeply analysis (i.e. reviewing comments from the participants). Some atypical cases do not affect the variables under study or got a logical explanation that allowed them to remain part of the sample (e.g. the participant slept few minutes after midnight therefore the last questionnaire of the day (w_3 or f_2) was recorded the next day, some missing questionnaires were because the participant forgot the electronic device at home)

However, not all the irregular cases had an explanation; therefore the following actions were taken.

- *Incorrect questionnaire*.

Incorrect questionnaire was considered when the participant completed a questionnaire that was not expected according to the previous one. For instance if s/he answered the morning questionnaire (w_1) after the early evening questionnaire (w_2), or when the time of the day when the participant was

intended to answer did not correspond to any of the principal options (work moment w_4 or free day moment f_3 specified as "none of the above").

Since the answers specified with the work moment w_4 and free day moment f_3 do not contribute to any of the variables in this research, it was decided to delete them from the sample, this means that the actual response rate is 94.46% (1930/2043 cases expected based on the inferred work schedule of the participants).

Although at the beginning some cases seemed to disturb the validity of the measurement days, some of them do not affect the analysis of the main variables in a direct way. Specifically, the uncommon responses during free days do not affect the recovery scenario of interest, therefore it is not necessary to decide whether to delete them or not. Table 5.1 includes all the cases that were considered as incorrect questionnaires.

Table 5.1Incorrect questionnaires, explanation and action taken

PERSON	DAY	MEASURE / ISSUE	EXPLANATION AND ACTION
Incorrect moment of the day (w_4 and f_3)			
9	11.12.11	f_3 as an additional measure during a free day	Since these measures do not contribute to the variables, the cases were deleted
52	11.12.11	f_3 in between the normal questionnaires for a free day	
	13.12.11	f_3 instead of f_1	
53	08.12.11	w_4 in between w_1 and w_2	
	09.12.11	f_3 after f_2 and completed next day	
	10.12.11	f_3 in between f_1-f_2	
	11.12.11	f_3 in between f_1-f_2 (no logical response behavior, 5 free day measures in two days)	
	16.12.11	w_4 instead of w_2	
69	10.12.11	w_4 before w_3	
	11.12.11	w_4 before w_3	
Incorrect questionnaire during free day			
8	16.12.11	f_1 instead of f_2 (+ answered 1 day after)	The majority of these cases do not affect the recovery scenario of interest. However, some of them (the working day questionnaires) might influence on the reliability assessment (since during the reliability assessment no restriction of recovery scenarios was made)
21	17.12.11	f_2 third questionnaire during a free day (+ answered 1 day after)	
31	09.12.11	w_3 answered instead of f_2	
32	10.12.11	f_2 extra at the end of the day (+ answered 1 day after)	
40	10.12.11	f_2 repeated after f_2. This measure might correspond to the next day. (+ answered 1 day after)	
57	11.12.11	w_3 instead of f_2. The participant explained that the day started as a free day but then she was called to work. (+ answered 1 day after)	
Incorrect questionnaire during working day			
8	09.12.11	w_2 repeated instead of w_3	This case do not affect the recovery scenario that includes two working days, however it might affect the reliability assessment.
10	07.12.11	f_2 instead of w_3	This case only impedes to

			analyze the recovery process (w_2-w_3-w_1)
32	05.12.11	w_1 was repeated after w_2 because the participant thought that she did not save the previous w_1 questionnaire	Since this case impedes the correct analysis of the recovery scenario, the second w_1 might be ignored. However for reliability analyses it will be included.
63	15.12.11	w_2 instead of w_3 (+ answered 1 day after)	Since the next day is a free day, this issue does not affect the study, but it might influence reliability of some variables.
69	07.12.11	f_2 instead of w_3 (+ answered 1 day after)	Since the following day is a free day, these cases do not affect the current study.
72	07.12.11	f_2 after w_1 (+ answered 1 day after)	
74	07.12.11	f_2 after w_1 (+ answered 1 day after)	
77	15.12.11	f_2 instead of w_3 (+ answered 1 day after)	

The only cases that might affect the analysis of some psychometric properties are the incorrect questionnaires belonging to working days (i.e. w_1, w_2) that were identified during working days (in total 3 cases). However, it might be assumed that the possible effect is very small compared to the total number of cases.

Table 5.2 Late responses (one day after)

Questionnaire / Service	Working Day	
	w_2	w_3
Day shift	3	56
Evening shift	24	46
Night shift	11	8
Broken service	1	4
Uncommon measure	1*	1*
Total (156)	40	115
Questionnaire / Status	**Free Day**	
	f_1	f_2
Late response	-	78
Uncommon measure	1*	7*
Total (90)	1	85

*The details were explained before ('Incorrect questionnaire').

- *Late responses (Questionnaires answered one day after the day expected).*

As mentioned before, the most reasonable explanation is that the participant completed the last questionnaire of the day (i.e. w_3, f_2) a couple of hours after midnight. Therefore it was assumed that the answers were not too late and were not at the same time as the following questionnaire (w_1 before work). The exact hour of every case (or questionnaire) was recorded on the electronic device; however, due to the time required to check all the cases, this analysis was omitted. Thus the initial assumption remained valid to keep all these cases.

Table 5.2 depicts the summary of the responses presenting this issue.

First of all, it is important to mention that there are some logical explanations additionally to the ones provided by the participants. For instance, it was expected that the questionnaires filled out after work (w_2) and before going to sleep (w_3) during a work day belonging to the evening and night shift presented a late response due to the schedule. (This expectation includes 89 out of 156 cases in a working day).

Secondly, the measures completed before going to sleep (w_3) in a working day (i.e. and belonging to a day shift) in addition to the late responses during a free day may be explained by the assumption explained before that the participant answered after midnight. (This assumption involves 134 cases). Thirdly, the responses that belong to a broken service might also involve evening or night shift. It was not specified; therefore one of the two last explanations may suit these cases (5 cases). Furthermore, the three cases that are recorded as day shift and late response (i.e. these cases did not have an exact explanation from the participants) might be examples of cases considered to delete because they were not expected. Nevertheless, there is no enough evidence to discard them yet.

- *Questionnaires answered two days after the day expected.*

(In Figure 5.1 are represented in red). Three questionnaires were completed two days after they were supposed to be answered. There were no explicit reasons or explanations given by the participants regarding these measures. Strictly speaking the cases that correspond to working days (2 cases) might affect the variables of interest since the answers might be influenced by additional variables and events. However since these cases only represent a relative small percentage of all the measures, no specific action is needed. It is recommended that for future studies it is important to be aware that late responses might affect the variables under study.

In total, considering late responses of one and two days, 249 questionnaires were completed late; this represents 12.83% from the total number of cases.

The last adjustment in the data relates to how to deal with the measurement days without emphasis in the specific date. In other words, it does not matter if one participant started the questionnaire on December 5, and other participant started two days later. For analysis purposes, for both participants these dates correspond to the measurement day 1. Therefore some changes in the initial Excel Figure 5.1 were made in order to represent the previous statement.

This change also applies to the measurements that did not have a continuous track. For instance, if a participant skipped one day of completing the questionnaire, the immediate next entry corresponded to the next measurement day.

Fifteen participants' measurement records were modified (shifted from their actual date to their measurement day) because they presented some of the issues mentioned before. Appendix 2 depicts the figure with these adjustments. Further analyses were performed under the statement that the focus was on the measurement day instead of on the exact date.

5.2 Psychometric Properties

From now on, all data analyses will be conducted only considering working days as this is the scenario that the conceptual model suggests.

As specified before, the only psychometric property that was analyzed is reliability. Reliability, which is defined as the "assessment of the degree of consistency between multiple measurements of a variable" (Hair, Black, Babin, & Anderson, 2010, p.125) was assessed by means of the internal consistency. Two diagnostic measures were used for the current research: (a) Cronbach's alpha and (b) the Corrected Item-Total Correlation (correlation between each item and the summated scale score). Both analysis where conducted using SPSS for Windows and the results were easily interpreted creating an excel table. Additionally, the column labeled Cronbach's Alpha if Item Deleted which reflects the change in the Cronbach's α that would happen if the particular item is deleted, was also consulted (in order to check if deleting a specific item improves reliability).

Cronbach's alpha coefficients were computed separately for the 10 principal measurement days, Table 5.3 shows the values of the mean and range of the values of the coefficientα (The complete table of Cronbach's α is presented in Appendix 4). There are some important issues to discuss regarding the reliability assessment.

First, from the variables that will be studied in this research, the ones measuring recovery state (recovery state and sleep quality) were not included in the reliability analysis because they were measured only with one item. In order to interpret these results, one must be aware that the daily fluctuations of the Cronbach's alpha coefficient and the Item-Total Correlation may be due to the sample size (working day cases) that was assessed every day. Because the working schedule was different for all the participants, the number of cases (working days) varied between ten (most of the participants had a free day) and 60.

Table 5.3 Reliabilities (Cronbach's Alpha coefficient)

	Between-Person α	
	Mean	Range
Recovery state w_1 (before work)		
〉 Recovery state	n/a	n/a
〉 Sleep quality	n/a	n/a
Adverse health w_2 (after work)		
〉 Cognitive Complaints	.92	.83–.96
〉 Emotional Complaints	.83	.76–.91
〉 Physical Complaints	.73	.59–.85
Emotions w_2 (after work)		
〉 Positive emotions	.81	.66–.90
〉 Negative emotions	.88	.82–.95
Detachment w_3 (before going to sleep)		
〉 Cognitive detachment	.90	.74–.97
〉 Emotional detachment	.90	.82–.96
〉 Physical detachment	.76	.61–.92

Notes. α = Cronbach's alpha; n/a = not applicable

Whit regard to the variables assessing adverse health (cognitive, emotional and physical complaints), in average all had a high reliability, Cronbach's alpha (mean) was .92, .83, .73 respectively. Similarly,

Cronbach's alpha computed for positive and negative emotions had a high reliability on average (α = .81 and α = .88 respectively) since the values are above the lower limit of acceptability according to Hair et al. (2010).

Concerning the reliability assessment of detachment, it can be noticed that the three dimensions had a high reliability on average, ranging from .76 to .90. However since these variables assessed only two items per dimension, the Inter-Item Correlation was also examined separately for the ten days of measurement. Both items from cognitive detachment were highly correlated (average from the ten days), r = .82, (p (2-tailed) < .01). The two items of emotional detachment were also highly correlated, r = .83 (p (2-tailed) < .01). Finally, the physical dimension of detachment had in average a relatively high correlation, r = .63, however not all the daily analysis were significant (day four, r = .47, p = n.s.). Once more the varied values might be attributed to the sample size.

Furthermore, most of the values of the Corrected Item-Total Correlation were above 0.3, which is preferable according to Field (2009). The analysis of the column labeled Cronbach's Alpha if Item Deleted on SPSS indicated that there was no need to revise or delete any item in specific. The change of Cronbach's Alpha if a specific item were deleted was not substantially greater than the current values.

5.3 Single Level Analysis

The complete analysis of the conceptual model was done in three general stages. The first stage included an inspection of the correlation matrix to get an overview of the relation between the variables. Then, the model was studied separately in two parts: (a) the first analysis examined the relation between adverse health and detachment from work (Hypothesis 1) and the moderating role of emotions in this relation (Research question), and (b) the second analysis focused on the relation between detachment from work and the two indicators of recovery state (Hypotheses 2 and 3).

5.3.1 Correlation Analysis Between the Key Constructs

Table 5.4 shows the number of items that were aggregated for each variable, means, standard deviations, and Person correlations (two-tailed). The first inspection of the correlation matrix was to verify that multicollinearity does not exist between two or more predictors because further problems in the regression analysis might arise (e.g. it might result in untrustworthy *b*s (coefficients), limits the size of R (multiple correlation between the predictors and the outcome), and makes it difficult to assess the individual importance of a predictor (Field, 2009)). This initial scan revealed that perfect collinearity does not exist (i.e. when one predictor is a perfect linear combination of the others (r=1)). However, collinearity might be present between emotional and cognitive detachment (r =.84, p (two-tailed) < .01) when analyzed as possible predictors of recovery state or sleep quality. At this moment

of the analysis is soon to take action regarding a possible multicollinearity. The rest of the correlation values range between (r = -0.64 and r = .76).

The second objective of the correlation matrix analysis is to examine the correlation coefficients, which indicate the strength and direction of the relation between two metric variables (Hair et al., 2010), between the variables that are included in the hypotheses. This inspection provided the strength and significance of the relations between adverse health (cognitive, emotional and physical complaints) and detachment from work (cognitive, emotional and physical), and between detachment and recovery state. It also gave a general idea of how positive and negative emotions are related to the other variables.

First of all, results regarding how the variables are related belonging to the same construct, showed a positive and significant relation between recovery state and sleep quality (representing recovery state), also between cognitive, emotional and physical complaints (adverse health), and finally between cognitive, emotional and physical detachment (detachment from work). On the contrary, a significant negative relation was found between positive and negative emotions, which support the fact that are measuring something opposite.

Furthermore, a positive significant relation was found between the three dimensions of detachment from work and recovery state (Hypothesis 2) which suggests that participants who experienced high levels of detachment reported higher levels of recovery state. Physical detachment had the highest correlation with recovery state (r = .66, p < .01). Moreover, positive significant relations were found between detachment (three dimensions also) and sleep quality (Hypothesis 3) indicating that participants who reported high levels of detachment also indicated high levels of sleep quality. This relation might help to the decision of defining sleep quality as recovery outcome in this research.

However, regarding the relation between adverse health and detachment from work, the direction of the relations was contrary to what was hypothesized (Hypothesis 1). Negative rather than positive significant associations were found between cognitive and emotional complaints and cognitive detachment. Additionally, the three dimensions of adverse health (i.e. cognitive, emotional and physical complaints) were negatively correlated with emotional and physical detachment. These results might support the relation mentioned earlier when explaining the conceptual model, that suggested that the more cognitive, emotional and physical complaints the individual has, the longer will take to recover, thus less detachment will have (detachment will be more difficult).

When the correlations of positive and negative emotions were analyzed, it was found that positive emotions were negatively related to cognitive complaints (r = -.25, p < .05), and to emotional complaints (r = -.45, p < .01), suggesting that participants who reported positive emotions after work, also reported lower levels of cognitive and emotional complaints (might suggest a buffering effect).

On the other hand, negative emotions were significantly correlated with cognitive ($r = .45$, $p < .01$), emotional ($r = .76$, $p < .01$) and physical ($r = .41$, $p < .01$) complaints. These results suggest that when participants reported negative emotions at the end of the working day, they also reported high health complaints.

Additionally, positive emotions were significantly related only to physical detachment ($r = .23$, $p < .05$), whereas negative emotions where negatively correlated to cognitive ($r = -.44$, $p < .01$), emotional ($r = -.42$, $p < .01$) and physical ($r = -.42$, $p < .01$) detachment. These results suggest that participants who reported high positive emotions after work, experienced higher levels of physical detachment. On the other hand, participants who experienced high negative emotions at the end of the working day, reported less cognitive, emotional and physical detachment.

Besides analyzing only the relations that are part of the hypotheses, it can be seen that almost all predictors are related to recovery state. For instance, the three dimensions of health complaints were negatively correlated with recovery state ($r = -.49$, $r = -.58$, $r = -.41$, all $p < .01$) implying that when participants experienced a high recovery state at the beginning of the day, they also reported lower health complaints after work. Moreover it was found that cognitive complaints and emotional complaints are negatively correlated to sleep quality ($r = -.28$, $p < .05$, and $r = -.36$, $p < .01$, respectively) suggesting that the high cognitive and emotional complaints after work resulted in less sleep quality (hampering recovery).

Emotions were also related to the recovery state indicators. Positive emotions were significantly correlated with recovery state ($r = .36$, $p < .01$) indicating that when high levels of positive emotions were recorded at the end of the working day, high levels of recovery were reported at the beginning of the next one. Negative emotions were negatively associated with recovery state ($r = -.39$, $p < .01$), which based on the order suggested by the conceptual model, suggests that high levels of negative emotions could imply lower recovery state the next day.

Finally, only negative emotions were significantly correlated with sleep quality ($r = -.28$, $p < .05$).This might imply that when high levels of negative emotions at the end of the working day were experienced, lower sleep quality was indicated.

Table 5.4 Number of items, descriptive statistics, and Pearson correlations (N=80)

		Items	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	Age[1]	1	40.78	11.62	-											
2	Gender	1	.83	.38	-.21	-										
3	Recovery state	1	3.86	.61	.19	.26*	-									
4	Sleep quality	1	2.91	.45	.02	.23*	.51**	-								
5	Cognitive complaints	3	2.25	.74	-.28*	-.08	-.49**	-.28*	-							
6	Emotional complaints	3	2.03	.71	-.25*	-.18	-.58**	-.36**	.57**	-						
7	Physical complaints	3	2.31	.83	-.12	.08	-.41**	-.21	.46**	.52**	-					
8	Positive Emotions	4	3.69	.51	-.005	.21	.36**	.21	-.25*	-.45**	-.18	-				
9	Negative Emotions	4	1.87	.59	-.18	-.25*	-.39**	-.28*	.45**	.76**	.41**	-.57**	-			
10	Cognitive detachment	2	3.96	.58	-.03	.29**	.36**	.41**	-.34**	-.31**	-.18	.19	-.44**	-		
11	Emotional detachment	2	3.95	.61	.03	.22	.45**	.41**	-.42**	-.41**	-.32**	.09	-.42**	.84**	-	
12	Physical detachment	2	3.66	.64	.19	.12	.66**	.40**	-.60**	-.57**	-.64**	.23*	-.42**	.55**	.66**	-

Notes. The Pearson correlations (r) are based on average values across daily measurements. *$p < .05$ (two-tailed); **$p < .01$ (two-tailed).

[1]. This analysis was conducted for N=68 (since not all participants provided their age)

5.3.2 Findings of Hierarchical Regressions Analyses

5.3.2.1 Hypothesis 1: Health complaints at the end of the working day are positively related to detachment from work before going to sleep.

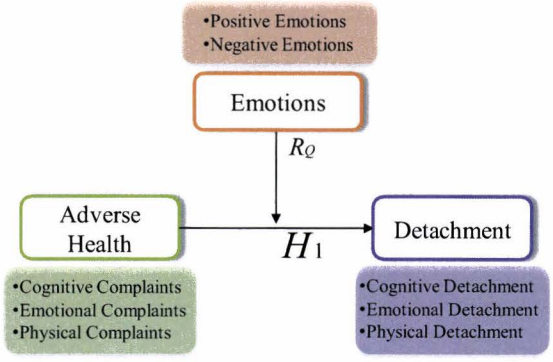


Figure 5.4 Model representing Hypothesis 1 and research question regarding emotions

Figure 5.4 shows that, in order to test Hypothesis 1, the new conceptual model was examined in two parts. The segment specified in this illustration corresponds to the relation between adverse health (specifically cognitive, emotional and physical complaints) and detachment (cognitive, emotional and physical). The research question regarding how emotions affect the initial relation is also included.

In the previous section ('Correlation analysis') was found that, contrary to expectations, adverse health was negatively related to detachment from work.

Table 5.5 shows the results of the hierarchical regression analyses with the three dimensions of detachment as dependent variables. As can be seen, cognitive, emotional and physical complaints accounted for an additional 13.6% (ΔR^2=0.136) of the variation in cognitive detachment. The table indicates that the second model fitted the data best (Model 2, $F(5,62) = 4.22$, $p < .01$). A significant negative relation between cognitive complaints and cognitive detachment was found. Contrary to was hypothesized originally. However, as expected, the relation was stronger between the variables of the same dimension (cognitive). Moreover, a significant positive relation was found between gender and cognitive detachment, suggesting that women reported higher levels of cognitive detachment than men.

With regard to emotional detachment, including adverse health dimensions added substantially to the prediction of emotional detachment (ΔR^2=0.259), indicating that the second model fitted the data best (Model 2, $F(5,62) = 5.61$, $p < .001$). It was found that cognitive and physical complaints had a significant negative relation with emotional detachment (different from the one expected since matching dimensions were not found).

The third analysis regarding physical detachment showed that adding cognitive, emotional and physical complaints accounted for an additional 46% (ΔR^2=0.457) of the variance in physical detachment in comparison to the initial model. In this analysis, two relations were significant. More specifically, cognitive complaints and physical complaints were negatively related to physical detachment, suggesting that the more physical and cognitive complaints an employee has, the more

difficult it is to detach from work. Here, it can be seen that the effect was more significant between physical complaints and physical detachment, supporting the matching effect to some extent.

Overall, it can be concluded that Hypothesis 1 was not supported because of the direction found (negative instead of positive) between adverse health indicators and detachment from work (three dimensions). However, the second part of Hypothesis 1 might be partially supported. It appears that match is better than non-match, based on significance level (cognitive and physical).

Table 5.5 Hierarchical regression of detachment from work and adverse health (N=68)

	Cognitive Detachment			Emotional Detachment			Physical Detachment		
Variable	B	SE B	β	B	SE B	β	B	SE B	β
Model 1: Control variables									
Constant	3.37	0.33		3.43	0.36		2.82	0.37	
Age	0.00	0.01	0.04	0.00	0.01	0.08	0.01	0.01	0.24#
Gender	0.57	0.20	.35**	0.41	0.21	0.23#	0.39	0.22	0.21#
Model 2: Adverse health									
Constant	4.53	0.47		5.09	0.48		4.97	0.41	
Age	0.00	0.01	-0.09	0.00	0.01	-0.08	0.00	0.01	0.06
Gender	0.43	0.19	.26*	0.22	0.20	0.13	0.18	0.17	0.10
Cognitive complaints	-0.26	0.13	-0.32*	-0.28	0.13	-0.33*	-0.29	0.11	-0.32*
Emotional complaints	-0.01	0.15	-0.01	-0.05	0.15	-0.06	-0.06	0.13	-0.07
Physical complaints	-0.08	0.10	-0.10	-0.18	0.11	-0.23#	-0.35	0.09	-0.43***
R^2 (Model 1)	0.118			0.053			0.081		
ΔR^2	0.136			0.259			0.457		
Best Fitting Model	R^2 =.25 F (5, 62) = 4.22 p = .002 Adj. R^2 = .19		(Model 2)	R^2 =.31 F (5, 62) = 5.61 p = .000 Adj. R^2 = .26		(Model 2)	R^2 =.53 F (5, 62) = 14.47 p = .000 Adj. R^2 = .50		(Model 2)

Note. B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; # $p < .10$ (two-tailed); * $p < .05$ (two-tailed) ; ** $p < .01$ (two-tailed); *** $p < .001$ (two-tailed)

5.3.2.2 *Research question: What is the role of emotions as moderator variable in the relation of adverse health and detachment from work?*

As depicted in Figure 5.4, positive and negative emotions were analyzed as well. An initial insight into the relations of emotions and the other variables was given in the correlation analysis, where positive emotions were found to be positively related to physical detachment and negatively related to cognitive and emotional complaints. While negative emotions were positively related to cognitive, emotional and physical complaints and negatively related to cognitive, emotional and physical detachment.

As specified in the methodology section, the role of emotions as moderator was tested in the relation between adverse health and detachment from work. This analysis was performed in two parts, analyzing the effect of positive and negative emotions separately for a better understanding of the effects (i.e. a more clear picture of the results).

The Role of Positive Emotions

Table 5.6 shows the results of the hierarchical regression analyses for the three dimensions of detachment and the moderating effect of *positive* emotions and health complaints. As can be seen, the model including only the single effects of cognitive complaints, emotional complaints, physical complaints and positive emotions predicted better cognitive, emotional and physical detachment than the alternative models.

With regard to cognitive detachment, adding the interaction effects of adverse health and positive emotions did not contributed significantly to the explained variance in cognitive detachment. The second model fitted the data best (Model 2, $F(5,61) = 3.51$, $p < .01$). A significant positive relation between gender and cognitive detachment as detected, implying that women reported higher levels of cognitive detachment than men. Moreover, a negative relation between cognitive complaints and cognitive detachment was found.

Regarding emotional detachment, similar results were found. The second model fitted the data best (Model 2, $F(6,61) = 4.79$, $p < .001$). Cognitive and physical complaints were negatively related to emotional detachment. Finally, the analysis considering physical detachment showed that the second model predicted the data best (Model 2, $F(6,61) = 11.89$, $p < .001$) explaining an additional 46% of the variance in physical detachment when adding cognitive, emotional and physical detachment as well as positive emotions in comparison to the initial model.

Effects of positive emotions on the relation between adverse health and psychological detachment were not found.

Table 5.6 Hierarchical regression of detachment from work and adverse health and positive emotions (N=68)

	Cognitive Detachment			Emotional Detachment			Physical Detachment		
Variable	B	SE B	β	B	SE B	β	B	SE B	β
Model 1: Control variables									
Constant	3.37	0.33		3.43	0.36		2.82	0.37	
Age	0.00	0.01	0.04	0.00	0.01	0.08	0.01	0.01	0.24#
Gender	0.57	0.20	0.35**	0.41	0.21	0.23#	0.39	0.22	0.21#
Model 2: Adverse health									
Constant	4.28	0.75		5.60	0.75		5.11	0.65	
Age	0.00	0.01	-0.08	0.00	0.01	-0.09	0.00	0.01	0.06
Gender	0.42	0.20	0.25*	0.25	0.20	0.14	0.19	0.17	0.10
Cognitive complaints	-0.26	0.13	-0.32*	-0.28	0.13	-0.33*	-0.28	0.11	-0.32*
Emotional complaints	0.01	0.15	0.01	-0.09	0.15	-0.10	-0.07	0.13	-0.08
Physical complaints	-0.08	0.10	-0.11	-0.18	0.11	-0.23#	-0.35	0.09	-0.43***
Positive emotions	0.06	0.14	0.05	-0.12	0.14	-0.10	-0.03	0.12	-0.03
Model 3: Positve emotions(moderator)									
Constant									
Age									
Gender									
Cognitive complaints									
Emotional complaints									
Physical complaints									
Positive emotions									
CC X PE									
EC X PE									
PC X PE									
R^2 (Model 1)	0.118			0.053			0.081		
ΔR^2 (Model 1 - Model 2)	0.138			0.268			0.458		
ΔR^2 (Model 2 - Model 3)	0.02			0.013			0.035		
Best Fitting Model	R^2 =.26		(Model 2)	R^2 =.32		(Model 2)	R^2 =.54		(Model 2)
	F (6, 61) = 3.51			F (6, 61) = 4.79			F (6, 61) = 11.89		
	p = .005			p = .000			p = .000		
	Adj. R^2 = .18			Adj. R^2 = .25			Adj. R^2 = .49		

Note. CC = cognitive complaints; EC = emotional complaints; PC = physical complaints; PE = positive emotions; NE = negative emotions; B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; # $p < .10$; * $p < .05$ (two-tailed); ** $p < .01$ (two-tailed); *** $p < .001$ (two-tailed)

The Role of Negative Emotions

Table 5.7 shows that including interaction effects between cognitive, emotional and physical complaints and *negative* emotions did not contribute to a better prediction of cognitive, emotional or physical detachment. However, negative emotions that have been added in the second model contributed to a better prediction of cognitive and emotional detachment.

With regard to cognitive detachment, the second model fitted the data best (Model 2, $F(6,61) = 5.36$, $p < .001$). When including negative emotions, additional significant relations were found compared to the initial model (without emotions). More specifically, a significant negative relation between negative emotions and cognitive detachment was found. This result suggests that the participants who reported less negative emotions were able to cognitively detach from work.

Moreover, when looking at lower levels of significance ($p < .10$), other relation was highlighted. Emotional complaints were positively related to detachment from work. This finding suggests that when participants reported high levels of emotional complaints they also indicated high levels of cognitive detachment.

Concerning emotional detachment, adding adverse health indicators and negative emotions accounted for an additional 29% ($\Delta R^2=0.291$) of the variation in emotional detachment. Table 5.7 indicates that once more the second model fitted the data best (Model 2, $F(6,61) = 5.33$, $p < .001$). A significant negative relation between cognitive ($p < .05$) and physical complaints ($p < .10$), and emotional detachment was detected (same result as when emotions were not included). Additionally, results showed a significant negative relation between negative emotions and emotional detachment ($p < .10$) suggesting that employees who indicated lower levels of negative emotions also experienced higher levels of emotional detachment.

Finally, the analysis regarding physical detachment showed the second model as the best fitting model (Model 2, $F(6,61) = 11.88$, $p < .001$) since adding adverse health indicators and negative emotions added substantially to the prediction of physical detachment 46% ($\Delta R^2=0.458$). No single effect of negative emotions was found. Cognitive and physical complaints were negatively related to physical detachment (as shown in the initial analysis, Hypothesis 1).

Table 5.7 Hierarchical regression of detachment from work and adverse health and negative emotions (N=68)

	Cognitive Detachment			Emotional Detachment			Physical Detachment		
Variable	B	SE B	β	B	SE B	β	B	SE B	β
Model 1: Control variables									
Constant	3.37	0.33		3.43	0.36		2.82	0.37	
Age	0.00	0.01	0.04	0.00	0.01	0.08	0.01	0.01	0.24#
Gender	0.57	0.20	0.35**	0.41	0.21	0.23#	0.39	0.22	0.21#
Model 2: Adverse health									
Constant	5.00	0.47		5.39	0.50		4.94	0.44	
Age	-0.01	0.01	-0.11	0.00	0.01	-0.09	0.00	0.01	0.06
Gender	0.26	0.19	0.16	0.11	0.20	0.07	0.19	0.18	0.11
Cognitive complaints	-0.26	0.12	-0.32*	-0.28	0.13	-0.33*	-0.29	0.11	-0.32*
Emotional complaints	0.29	0.17	0.34#	0.14	0.18	0.15	-0.08	0.16	-0.08
Physical complaints	-0.07	0.10	-0.09	-0.18	0.10	-0.23#	-0.35	0.09	-0.43***
Negative emotions	-0.48	0.16	-0.49**	-0.30	0.17	-0.29#	0.03	0.15	0.03
Model 3: Negative emotions (moderator)									
Constant									
Age									
Gender									
Cognitive complaints									
Emotional complaints									
Physical complaints									
Negative emotions									
CC X NE									
EC X NE									
PC X NE									
R^2 (Model 1)	0.118			0.053			0.081		
ΔR^2 (Model 1 - Model 2)	0.227			0.291			0.458		
ΔR^2 (Model 2 - Model 3)	0.033			0.003			0.01		
Best Fitting Model	R^2 =.34 F (6, 61) = 5.36 p = .000 Adj. R^2 = .28		(Model 2)	R^2 =.34 F (6, 61) = 5.33 p = .000 Adj. R^2 = .28		(Model 2)	R^2 =.54 F (6, 61) = 11.88 p = .000 Adj. R^2 = .49		(Model 2)

Note. CC = cognitive complaints; EC = emotional complaints; PC = physical complaints; PE = positive emotions; NE = negative emotions; B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; # $p < .10$; * $p < .05$ (two-tailed) ; ** $p < .01$ (two-tailed); *** $p < .001$ (two-tailed)

Overall, results showed that positive emotions after work did not influence the relation between adverse health indicators (cognitive, emotional and physical complaints) and detachment from work (cognitive, emotional and physical). However, negative emotions influenced directly cognitive and emotional detachment. This suggests that negative emotions after work might hinder cognitive and emotional detachment. No moderating effects were found between positive or negative emotions and cognitive, emotional and physical complaints in the relation between adverse health and detachment.

5.3.2.3 *Hypotheses 2 and 3: Detachment from before going to sleep is positively related to recovery state and sleep quality at the beginning of the next working day*

With regard to Hypothesis 2 and Hypothesis 3, Figure 5.4 shows the variables that were involved in the analysis. In the same manner as in the previous cases, the correlation analysis provided a rough

idea about the behavior of the variables and their correlations. The three dimensions of detachment from work were positively related to recovery state and to sleep quality.

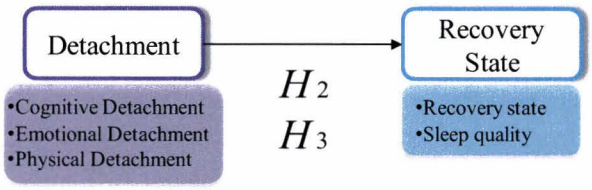


Figure 5.5 Model representing Hypothesis 2 and Hypothesis 3

Table 5.8 shows the results of the hierarchical regression analyses. With regard to recovery state, inclusion of the three dimensions of detachment added substantially to the prediction of recovery state controlling for age and gender (ΔR^2=0.38). The second model was the best fitting model (Model 2, $F(5,62) = 11.13$, $p < .001$). Specifically, only physical detachment was a significant predictor. High levels of physical detachment were related to high levels of recovery state (how recovered the participant was). Since it was not specified that one particular dimension of detachment should be related to recovery state, this result provides interesting empirical evidence regarding which kind of detachment contribute to the state of recovery.

Concerning Hypothesis 3, hierarchical regression analysis did not show any significant relation between cognitive, emotional and physical detachment and sleep quality. Although the best fitting model was the one including the three dimensions of detachment (Model 2, $F(5,62) = 3.16$, $p < .05$), no significant effects were found. These results may be due to the relatively high correlation between cognitive and emotional detachment ($r = .84$, $p < 0.01$). Since multicollinearity between predictors makes it difficult to evaluate the individual importance of a predictor (Field, 2009), it might be that significant relations between detachment and sleep quality were hindered. To check this assumption, stepwise regression analysis (for Model 2) was conducted to analyze what exactly happened with cognitive and emotional detachment as predictors of recovery state and sleep quality.

Table 5.9 shows the results of the stepwise regression analyses for both recovery state and sleep quality. As can be seen, regarding recovery state, the results did not change: Model 2 is still the model that best fitted the data (Model 2, $F(3,64) = 18.93$, $p < .001$). Besides, physical detachment remained the most significant relation between detachment and recovery state. However, with regard to sleep quality, the relatively high correlation between cognitive and emotional detachment impeded a more comprehensive analysis. As can be seen now, after controlling for age and gender, a significant positive relation was found between cognitive detachment and sleep quality. This result suggests that employees who reported high levels of cognitive detachment also experienced high levels of sleep quality.

The original Hypothesis 2 and Hypothesis 3 did not specify which dimensions of detachment were related to recovery state outcomes. Positive relations between physical detachment and recovery state,

and between cognitive detachment and sleep quality were found. These results support these hypotheses and provide additional and useful information regarding which dimensions of detachment contribute to recovery state.

Table 5.8 Hierarchical regression of recovery state and sleep quality and detachment from work (N=68)

	Recovery State			Sleep Quality		
Variable	B	SE B	β	B	SE B	β
Model 1: Control variables						
Constant	3.09	0.34		2.70	0.27	
Age	0.01	0.01	0.24#	0.00	0.00	0.05
Gender	0.39	0.20	0.24#	0.20	0.16	0.16
Model 2: Detachment						
Constant	1.34	0.43		1.54	0.41	
Age	0.00	0.00	0.09	0.00	0.00	-0.01
Gender	0.16	0.17	0.10	0.01	0.16	0.01
Cognitive detachment	-0.01	0.17	-0.01	0.22	0.16	0.29
Emotional detachment	0.08	0.18	0.09	0.00	0.17	0.00
Physical detachment	0.54	0.13	0.59***	0.14	0.12	0.20
R^2 (Model 1)	0.09			0.023		
ΔR^2	0.38			0.18		
Best Fitting Model	R^2 =.47 F (5, 62) = 11.13 p = .000 Adj. R^2 = .43		(Model 2)	R^2 =.20 F (5, 62) = 3.16 p = .013 Adj. R^2 = .14		(Model 2)

Note. B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; # $p < .10$ (two-tailed); * $p < .05$ (two-tailed) ; ** $p < .01$ (two-tailed); *** $p < .001$ (two-tailed)

Table 5.9 Hierarchical regression of recovery state and sleep quality and detachment from work (stepwise model 2) (N=68)

	Recovery State			Sleep Quality		
Variable	B	SE B	β	B	SE B	β
Model 1: Control variables						
Constant	3.09	0.34		2.70	0.27	
Age	0.01	0.01	0.24#	0.00	0.00	0.05
Gender	0.39	0.20	0.24#	0.20	0.16	0.16
Model 2: Detachment						
Constant	1.44	0.36		1.61	0.40	
Age	0.00	0.00	0.08	0.00	0.00	0.03
Gender	0.17	0.16	0.10	0.01	0.16	0.01
Cognitive detachment				0.32	0.09	0.42***
Emotional detachment						
Physical detachment	0.59	0.09	0.64***			
R^2 (Model 1)	0.09			0.023		
ΔR^2	0.38			0.156		
Best Fitting Model	R^2 =.47 F (3, 64) = 18.93 p = .000 Adj. R^2 = .44		(Model 2)	R^2 =.18 F (3, 64) = 4.65 p = .005 Adj. R^2 = .14		(Model 2)

Note. B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; # $p < .10$ (two-tailed); * $p < .05$ (two-tailed) ; ** $p < .01$ (two-tailed); *** $p < .001$ (two-tailed)

6. Discussion

The purpose of this research was to study how emotions play a role in the recovery from work processes. Specifically, it was investigated whether or not emotions (either positive or negative) moderate the relation between adverse health and detachment through a newly designed conceptual model that included recovery state as outcome of detachment from work. The hypotheses derived from this model were tested by means of hierarchical regression analyses of a daily diary study. Eighty employees from a general hospital in The Netherlands completed up to three questionnaires during ten consecutive days. This thesis contributes to organizational behavior and work psychology literature by considering emotions in a more active role, and not as a recovery outcome. Besides, analyzing in more detail how the participants behaved (answered) during the daily diary study provided a better understanding of how electronic devices (in this case iPod Touch®) might help or impede the measurement procedure.

The following sections address the conclusions regarding the three hypotheses and the research question about emotions as well as several theoretical implications. Afterwards, limitations, practical implications and recommendations for future research are discussed.

6.1 Conclusions and Theoretical Implications

Similarly like the results were discussed, the conclusions are addressed by the corresponding hypotheses and research question.

6.1.1 Adverse Health – Detachment (Hypothesis 1)

Regarding the relation between adverse health (cognitive, emotional and physical complaints) and detachment from work (cognitive, emotional and physical detachment), a positive relation was expected assuming that the more complaints an employee has, the more detachment s/he will experience (since this feeling will lead them to pursue more recovery activities). Furthermore, this relation was expected to be stronger for associations in the same dimension (i.e. matching complaints and detachment). Figure 6.1 presents a summary of the results regarding this hypothesis. As depicted in the previous chapter, a negative relation between cognitive and physical complaints on one hand and cognitive, emotional and physical detachment on the other was found (opposite to the first hypothesis). However, this relation supports the more basic proposition which suggests that the more health complaints an employee experiences, the more difficulties to detach well.

These results further support the suggestion by Sonnentag and Fritz (2007) who stated that, though finding a negative relation between psychological detachment and health complaints (health complaints considered as recovery outcome), "it might also be that individuals suffering from impaired well-being are less likely to enjoy positive recovery experiences" (Sonnentag & Fritz, 2007,

p.217). One way to explain this result is understanding (or examining) the reasons (or predictors) of adverse health, specifically what are the causes of cognitive, emotional and physical complaints. For instance if these complaints were due to high workload, this result would be in line with earlier research (Sonnentag & Bayer, 2005; Sonnentag & Kruel, 2006) that suggests that when workload is high, high levels of need for recovery are difficult to satisfy. Moreover, it has been assumed that workload implies to feel the necessity to take work home (Sonnentag & Kruel, 2006). So, besides the possible effect of work load on health complaints, it might impede detachment in a more direct way since the individual is likely to perform work activities during leisure time (workload might also impede detachment because the individual is thinking about the work that needs to be done during the next day).

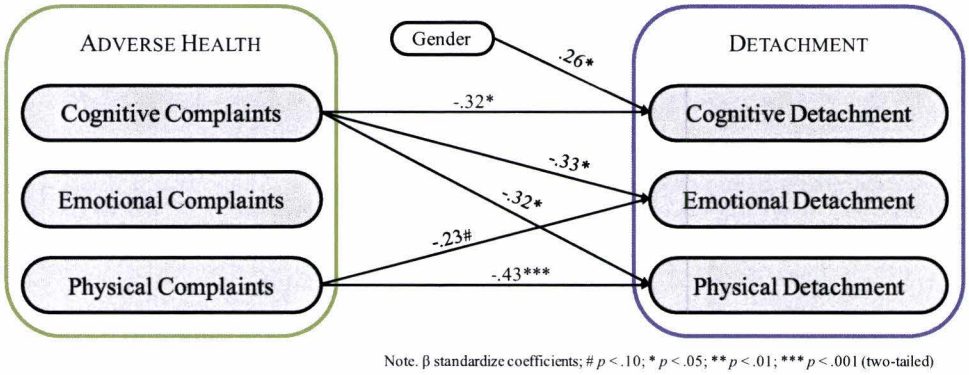


Figure 6.1 Summary of results of adverse health - detachment (Hypothesis 1)

Regarding cognitive detachment, gender was significant related, suggesting that women reported higher levels of cognitive detachment than men.

On the other hand, the second part of the hypothesis might be partially supported. For cognitive and physical detachment it appeared that the stronger effect was related to the same adverse health dimension (i.e. based on significance level). This finding suggests that reporting high physical complaints at the end of the working day will require more time to physically detach and that presenting high levels of cognitive complaints will hamper cognitive detachment. In order to better understand why adverse health impedes detachment would be important to examine the causes of these complaints.

Overall, results showed that cognitive complaints impede detachment in the three dimensions, while physical complaints hamper emotional and physical detachment. Furthermore, being emotionally exhausted did not affect detachment. It might be argued that emotional complaints could be better labeled as recovery outcomes than as possible predictor of detachment. Moreover, it might be argued that emotional complaints are not constantly present. A significant event must happen to feel emotionally drained. Even in the health care sector it could happen that emotionally demands are not permanent. Therefore, the single level analysis could not be able to identify significant relations.

Finally, it seems that something is missing in this relation that contributes to detachment. It might be that health complaints influence specific recovery activities which in turn will contribute to detachment. For instance, it is possible that the participants followed activities that helped them to detach in the same dimension of their health complaints, but because complaints were high, leisure time was not enough to detach. Here, more research is clearly needed

6.1.2 Emotions, Adverse Health and Detachment (Research question)

After analyzing the moderating role of successively positive and negative emotions on the relation between adverse health and detachment, no significant effects were found (Figure 6.2). However, when including negative emotions, three significant 'main-effect' relations emerged in comparison with the initial results.

Regarding positive emotions, one possible explanation of why no significant effect was found is based on the Broaden-and-Build Theory of positive emotions (Fredrickson, 2004). This theory suggests that positive emotions might contribute to recovery by building personal resources which is one of the main purposes of recovery. Therefore, since detachment from work is focused on reducing the strain levels and on avoiding the use of resources that were called during work, and not particularly in gaining new internal resources, no significant relations were found. It is likely that if the recovery experience analyzed had been a mastery experience instead of detachment, a significant direct relation and even a moderating relation may be present.

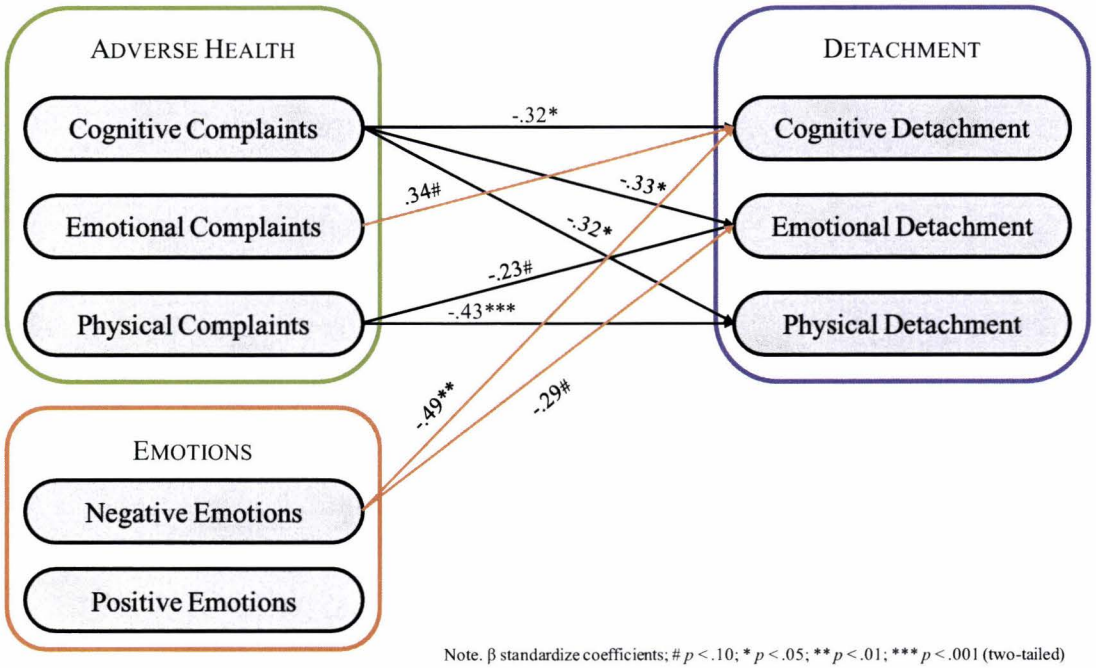


Figure 6.2 Summary of results of adverse health - detachment and emotions (Research question)

With regard to the negative emotions analysis, no moderating effects were found. However, negative emotions were negatively related to cognitive and emotional detachment. These results indicate that

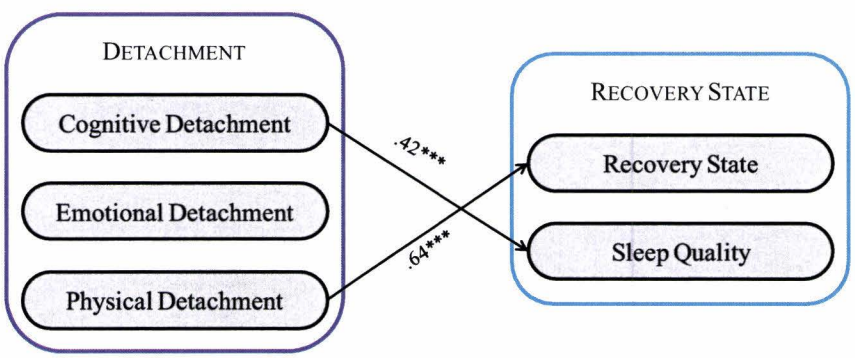
negative emotions might impede cognitive and emotional detachment. Probably, negative emotions after work have a strong effect that spills over the non work context, impeding cognitive and emotional detachment. For instance, an individual who had a dispute with a co-worker continues to think about the event even during leisure time, at the same time s/he is to a certain extent connected with work issues which impede detachment from work.

Surprisingly, when including negative emotions into the analysis, a significant trend between emotional complaints and cognitive detachment emerged. Contrary to the initial findings, this result suggests that when high emotional complaints are present (and negative emotions), higher levels of detachment are reported. This might support the original Hypothesis 1 to a certain extent. The employee who had emotional complaints followed leisure activities that contributed to a better cognitive detachment, though no matching effects were found.

It can be tentatively concluded that positive emotions do not contribute to detachment from work, and that negative emotions impede cognitive and emotional detachment.

6.1.3 Detachment – Recovery State (Hypotheses 2 and 3)

With regard to the analyses between detachment from work and recovery state, Hypotheses 2 and 3 were supported (Figure 6.3). With regard to the relation between detachment and recovery state (Hypothesis 2), results supported that detachment is important for recovery (sufficient recovery indicator). The original hypothesis did not specify which dimension was expected to be related to recovery state. After the analysis, it is noted that physical detachment (which is more related to lower the physical complaints instead of just being away from work) was the only significant predictor of recovery state. Since recovery state was assessed by the statement of "I am sufficiently recovered from my last service", it is possible that participants related recovery to a physical state in a greater extent than to a complete recovery concept (cognitive, emotional and physical).



Note. β standardize coefficients; # $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed)

Figure 6.3 Summary of results of detachment - recovery state (Hypotheses 2 and 3)

Concerning the analysis between detachment from work and sleep quality, Hypothesis 3 was supported after taking into account that cognitive and emotional detachment were relatively high

correlated. Results showed that cognitive detachment is a significant predictor of sleep quality, although the variance in sleep quality explained by the cognitive detachment in addition to age and gender is relatively low (R^2=.18). This result in particular contradicts previous research. For example, Sonnentag et al. (2008a) found that recovery experiences (including detachment from work) did not predict sleep quality when analyzing the (daily) effect of recovery experiences during leisure time with sleep and affect in the next morning. They suggested that it might be that other factors such as food or alcohol intake during the evening have a greater impact on sleep quality. Notwithstanding, the current results showed that cognitive detachment has an impact on sleep quality. This result might support findings discussed by Demerouti et al. (2009) regarding the role of sleep in the recovery during non work time. They found evidence that cognitive arousal (which could be interpreted as lower levels of cognitive detachment) at bedtime is associated with increased sleep disturbance. This disturbance might affect sleep quality.

Emotional detachment was not related to recovery state or sleep quality, which might be due to the relatively high correlation with cognitive detachment. This high correlation might be attributed to the close relation between both concepts. It has been suggested that "cognition is a necessary precondition for emotion... emotions appear to be powerful influences on how we think and interpret events" (Lazarus, 1984, p.126).

In general, it can be concluded that both Hypothesis 2 and Hypothesis 3 were supported. Additional information was obtained about which specific dimensions of detachment contribute to recovery state.

6.1.4 Understanding of the Diary Data

One of the most important methodological contributions of this research has to do with the statistical analysis conducted in order to better understand how participants behaved during the daily diary study. Displaying the general pattern of responses (days of measurement, specific questionnaires, completion time, work shift and uncommon responses) in a visual chart provided an easy and complete overview of all the cases gathered for further analysis.

Most of the daily diary studies that have been conducted using paper based diaries/questionnaires have highlighted that not being able to track the participants' responses and relying on their compliance of the study instructions are important limitations. However, the studies that have attempted to overcome this limitations by using technological devices such as handheld computers or iPods, have frequently overlooked the detail analysis of how people are using those devises or how people are responding to the "new" instructions of the study. It might be that these new procedures lead to other limitations or challenges to overcome. For instance, researchers cannot assume that all participants are familiarized with new technologies, they must be aware that the use of electronic devices requires training to some extent. Furthermore if special cases are found, studies regarding whether or not these cases affect the final results should be performed. In the current research the

analysis of the effects of special cases could not be conducted because of a cross-sectional analysis was performed. Besides, most of the irregular cases did not affect the variables under study.

6.1.5 Recovery and Emotions Theory

This research has mainly addressed two streams of literature that are closely related. Firstly, literature regarding recovery from work as the overall construct, and secondly, emotions theory which might play diverse roles within the recover process. These theories were integrated into the new conceptual model, which met its objectives.

Therefore, a contribution of this thesis to the recovery theory is the analysis of emotions assuming a more active role in the recovery process. Although results were not as originally expected, studying emotions with exploratory purposes provided some guidance for future research. Previous research including emotions (affective states) in the recovery context considered them as recovery outcome measured in the morning (the next day after recovery happened) or as reflections during leisure time (Binnewies et al., 2009b). Following the same line of reasoning, Sonnentag, Mojza, Binnewies and Scholl (2008) findings suggest that psychological detachment from work during off-job time (throughout the week) is crucial for regulating one's affect (at the end of the working week).

This research might be one of the first studies that explicitly assess emotions experienced after work affecting the recovery process through the relation between adverse health and detachment. Because of how difficult it has been to define and separate emotions from other similar concepts, it is possible that other studies have included a conceptualization or a relation similar to the one studied here.

6.2 Limitations

It is important to interpret the results of this study in light of its own limitations. In this section several limitations are discussed.

6.2.1 Cross -Sectional Analysis

Probably a key limitation of this study is the fact that a cross-sectional analysis had been conducted. Studying the effects of emotions through a cross-sectional analysis rather than daily analysis could have prevented significant relations. Aggregating the data across daily measurements might imply that work experience (and the emotions that these experiences produce) is constant over time, which is not the case in reality. The daily effect that was intended by the study design was lost in the analysis.

Furthermore, the interpretability of the newly designed conceptual model might be questioned since causal relations could not be tested. The conceptual model suggested a causal order between the main concepts; however, it is important to keep in mind that these relations could be interpreted in the other direction as well, or even bi-directional (i.e. reciprocal relations, cf. De Jonge, Dormann, Janssen, Dollard, Landeweerd, & Nijhuis, 2001).

6.2.2 Lack of Power

Regarding the single level analysis, it might be argued that the small sample size could have resulted in lack of power. It must be reminded that for the hierarchical regressions, the sample size was reduce since not all the participants shared their age (i.e. N=68 instead of 80). This lack of power might be responsible to a certain extent of not being able to find moderating effects of emotions in the relation between adverse health and detachment from work.

It is also important to note that the original data set was designed as a daily diary study involving multilevel analysis, thus it is probably that in further research (daily diary study) lack of power will not be a problem. However, it has been recommend that based on the level of generalizability, statistical power, relations to study or the level of interest (at personal level or daily level), the researcher must decide how many days to measure and how many people is required. Sometimes the budget and the probability of compliance of study participants limit the sample size (Ohly et al., 2010).

6.2.3 Reliance on Self-Assessment

Another limitation of this study has to do with the use of self-report measures which can raise concerns about common-method variance. However, it has recently argued that self-reports does not guarantee finding significant results, and that may not limit internal consistency as much as has been often assumed (cf. Lance, Dawson, Birkelbach, & Hoffman, 2010)

Besides, several recovery studies have included co-worker or family ratings to assess whether or not self-report measures are overestimated and affect the analyses. For instance Sonnentag and Kruel (2006) additionally collected family ratings of psychological detachment in order to analyze possible predictors of psychological detachment. They found that most of their findings were rather stable for the two detachment measures - self-reported and family-reported.

6.2.4 Single-item Measures for Recovery State and Sleep Quality

The forth main limitation of this research is that recovery state and sleep quality were each assessed with one item only. An early indication that this may have affected the results was discussed when testing the relation between detachment and sleep quality. The main problem was attributed to the high correlation of cognitive and emotional detachment. However, the fact that sleep quality was only measured with one item may have also been related to the failure to find a significant predictor in the initial analysis. It has been recommended that multiple-items are more powerful than single-item measures (Hair et al., 2010). Therefore, it is recommended for further research to use multiple-items to represent recovery state and sleep quality. In fact this recommendation would be valid for all the constructs depicted in the new developed conceptual model.

In addition to the aforementioned limitations, it might be also argued that the results cannot be generalized to other sectors than health care. However, it would be possible that these results might

include broad job descriptions for the service sector as a whole because of their high emotional and cognitive job demands. However, not all service jobs involve the same level of physical job demands; therefore it is desirable to replicate this research in other sectors, such as services, bank, retail and industry.

6.3 Practical Implications

The health care sector, being characterized as one of the most dynamic and demanding service sectors, is facing new challenges. Escalating levels of competition, patient service alternatives, emphasis on continuous improvement and knowledgeable consumer with increasing demands (Purbey et al., 2007). Facing these challenges produces stressful work situations which in turn affects the individuals' well-being and performance. Recovery from work has been assumed to be a key player in the relation between stressful work characteristics in one hand, and health well-being and performance on the other hand (Sonnentag & Geurts, 2009). Being able to recovery from work allows the individual to face new work challenges with energy and replenished resources.

Some practical implications could be suggested based on the results of this reseach, though the causal relations proposed by the conceptual model are not definitive. First, assuming that (1) detachment from work contributes to recovery and (2) recovery and detachment are related to well-being and job performance outcomes, it should not be assumed that detachment (and recovery) are only the responsibility of the employees. Since the benefit of recovery are for both individuals and organizations, organizations should play an active role in the process of detachment from work. For instance, enable employees to detach from work by not demanding their services or attention during leisure time (i.e. not sending e-mails or not calling them during leisure time). However, we must bear in mind that health care sector does not stop, a general hospital is 24/7 available and it is likely that the employee (more if s/he is a doctor from the operating or emergency room department) will be reached if needed even in his/her leisure time. This statement might be supported by the results derived from the diary data analysis. A few employees reported that they performed work-related activities during a day-off.

Therefore, based on the newly designed conceptual model, three general options might be suggested to contribute to recovery. The first option is to influence detachment by means of adverse health at the end of the working day. More specifically, to design job procedures that reduce health complaints (based on the current results, focusing on reducing cognitive and physical complaints would have a higher influence in detachment). The second suggestion is to try to avoid that employees have negative emotions at the end of the working day since these emotions might impede detachment (specificaly cognitive and emotional, i.e. to give a constructive feedback instead of a destructive criticism). However, it might be assumed that events that trigger negative emotions are often out of control of supervisors and co-workers. Thus, the third option comes into play. It is suggested that

recovery training programs on detachment from work (emphasis on cognitive and physical) and emotion regulation (specificly negative emotions) will increase the possibilities of successful recovery since has been found that recovery training is effective in improving employee's recovery and well-being (Hahn et al., 2011).

Finally, related to the main research question, it was found that positive emotions after work do not influence detachment from work (contrary to was was expected). Therefore, no specific action in order to increase positive emotions during work is suggested based on the current findings. However, positive emotions might be significant when analyzing the data through multilevel analysis. Moreover, it is possible that positive emotions influence positive work reflection during leisure time which in turn has been considered as predictor of task performance in the long run (Binnewies et al., 2009b). For that reason, it would be also important to include advice in training sessions, how to increase positive emotions and positive reflection of the good sides of one's work.

6.4 Future Research

Everyday experience has suggested that job performance, some affective states and recovery from work fluctuate from day to day (Ohly et al., 2010); thus diary studies are being chosen more frequently because of its suitability for assessing recovery cycles in people's dialy life (Sonnentag & Geurts, 2009). Furthermore, reserach has suggests that the effect of recovery process during long time periods such as vacations vanish rapidly, implying that individuals benefit from shorter rest periods during the work week evenings (Sonnentag, 2003). Therefore, it is recommended that in order to examine the newly designed conceptual model, multilevel analysis is needed. Thus allowing to study behaviors and feelings within the work and non work context, which are useful to get the essence of experiences within and between individuals (Ohly et al., 2010). Furthermore, future research is needed in order to confirm the preliminary findings regarding the possible causal relations suggested by the conceptual model. Conducting the daily study might provide initial evidence of these causal relations on a daily basis. Moreover, it would be interesting to analyze if the initial hypotheses are supported for longer periods of study (longitudinal study).

Regarding future daily diary studies, it is suggested to pay attention to the meassures that do not comply with the instructions regarding the completion of the questionnaires on a certain time slot. The use of electronic devices help to record the exact completion time and therefore analyze whether or not cases out of the allowed range affect the results in order to support the use of these devices. Other recommendation within the daily diary study setting is the analysis of the whether on not work shift influence the results. Although it could not be added in this research (since each participant followed a different work schedule), it would be interesenting to draw conclusions regarding patterns corresponding to different work shifts. For instance, the measurement times suggested by the original study in this research were not explcitly followed when the participant reported an evening or night

shift. That is, the employee is working when it was generaly assumed that detachment might happen during late evening.

Before adapting the conceptual model for the current research, it was emphasized the need to analyze in more detail the different activities that that might foster recovery experiences, and at the same time contribute to recovery. It would be interesting to add some activities that are specific to the new way of working and interaction with society. For example, how social networks interfere or help the recovery process if the individual is 24/7 available.

After the analysis, it might be concluded that the new conceptual model served its purpose with respect to sleep quality suggested as recovery outcome. However, as highlighted earlier, sleep quality as part of the recovery process should be analyzed. It has been suggested that - in addition to direct effects - there might be interaction effects of sleep with leisure time activities on feelings of recovery (Sonnentag, 2003). Besides, the role of sleep quantity should be explored to conclude whether or not it is related to sleep quality, detachment and recovery.

Regarding the limitation about self-assessment, it is suggested that non-employee ratings (family, supervisor, colleagues) regarding detachment and recovery should be included. However, it is not guaranteed that these individuals are able to observe, and to objectively assess indicators of detachment, recovery and complaints (Binnewies et al., 2009a).

Regarding the central research question, "One can only really understand the emotional experience of work by considering it in the larger context of life and non-work roles" (Landy & Conte, 2010, p. 443). This may suggest that emotions should also be considered during leisure time (non work context) and also in the second part of the conceptual model (between detachment and sleep quality) since the correlation analysis suggested that positive emotions are positively related to recovery state (or the other way around) and that negative emotions are negatively related to recovery state and to sleep quality.

Although little attention was given to the boundary theory, it has been noted that few emphasis has been made on evaluating if detachment from home is beneficial or harmful for job performance or other variables in the working context. The transitions from work to non work role as well as from non work to work roles has been suggested for further study (Fritz, Yankelevich, Zarubin, & Barger, 2010)

6.5 Final Remarks

Still, there are many unanswered questions regarding recovery from work, the effect of detachment and its potential predictors, mediators, moderators, and outcomes. Nevertheless, this study shed some light on the role of emotions in the recovery process suggesting that only negative emotions are the ones that could be directly related to detachment. In general, adverse health (health complaints after

work) reduces the possibility of detachment and detachment is positively related to recovery state and sleep quality, being physical and cognitive the more significant dimensions. Therefore it seems reasonable that individuals, as well as organizations, direct their attention to reduce adverse health at the end of the working day in order to increase the possibilities of detachment, and of a successful recovery state.

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7. Appendices

7.1 Appendix 1. Overview of the participants' responses (1940 cases)

Figure 7.1 Overview of the participants' responses (1940 cases, complete)

7.2 Appendix 2. Participants' responses adjusted

This table shows the participants' responses adjusted. Measures that do not contribute to the variables under study (measures that do not correspond to the three measurement moments during a working day and the two moments during a free day, specifically w_4 and f_3) were deleted and the measured days were arrange based on the day of measurement (e.g. day 1, day 2, etc) and not on the date of measurement.

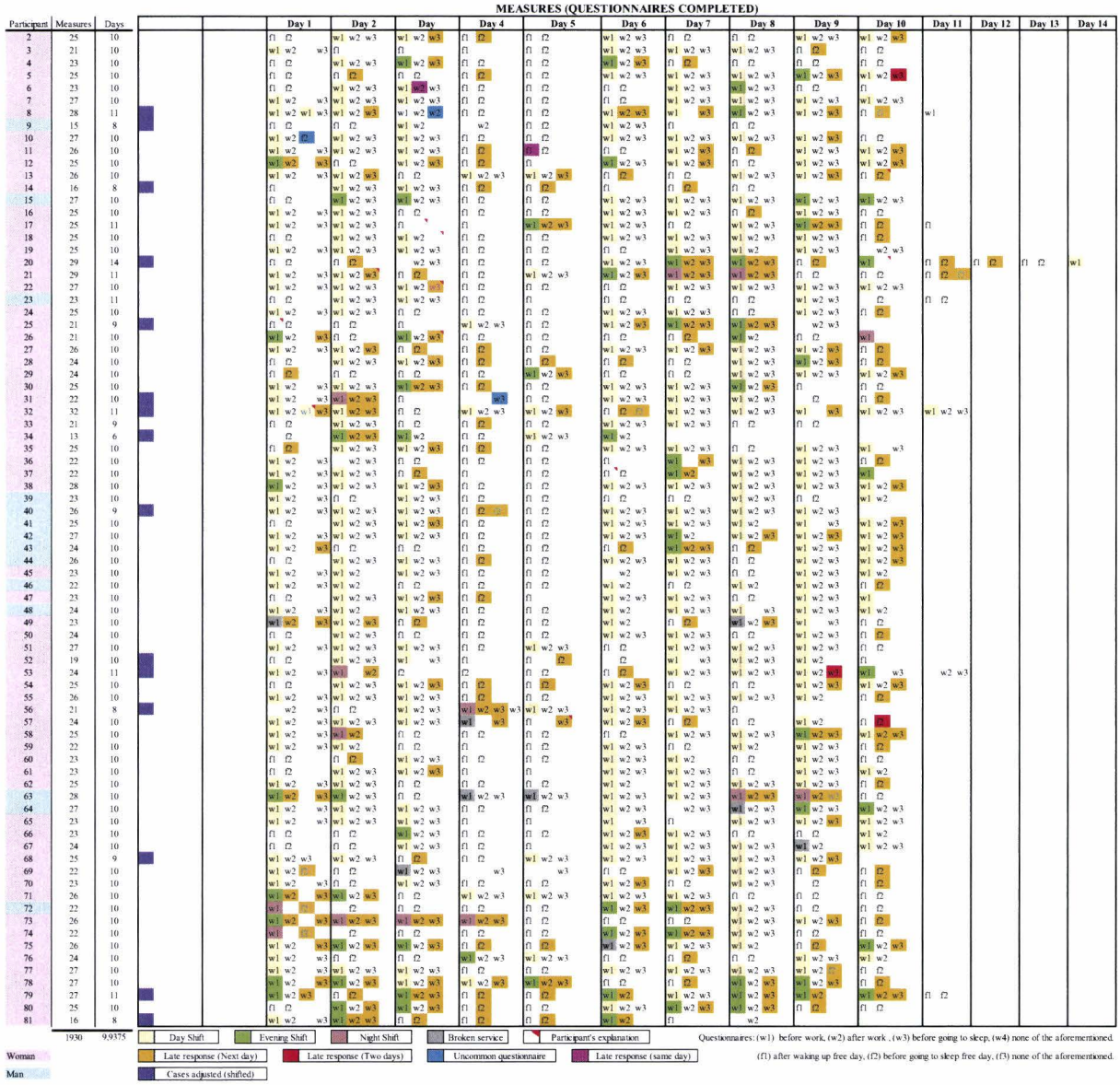

Figure 7.2 Overview of the participants' responses (Adjusted, 1930 cases)

7.3 Appendix 3. Diary data analysis

The diary data was statistically analyzed to know the responses pattern along the measurement days. Table 7.1 presents the general working day / day off patter of responses. On the other hand, Table 7.2 presents the scenarios that could have been analyzed and that were shown in Figure 5.2. This table considers only the recovery periods which contains all the questionnaires needed for their study. Therefore the spaces in between some recovery periods indicate that some questionnaires are missing.

Table 7.1 Working/ Free day General Pattern

WORKING DAY/ FREE DAY GENERAL PATTERN

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	WD	FD
2	f	w	w	f	f	w	f	f	w	w					5	5
3	w	f	f	f	f	w	w	w	f	f					4	6
4	f	w	w	f	f	w	f	f	f	f					3	7
5	f	f	f	f	f	w	w	w	w	w					5	5
6	f	w	w	f	f	f	w	w	f	f					4	6
7	w	w	w	f	f	f	w	w	w	w					7	3
8	w	w	w	f	f	w	w	w	w	f	w				8	3
9	f	f	w	w	f	w	f	f							3	5
10	w	w	w	f	f	w	w	w	w	f					7	3
11	w	w	w	f	f	f	w	f	w	w					6	4
12	w	f	w	f	f	w	w	f	w	w					6	4
13	w	w	f	w	w	f	f	w	w	f					6	4
14	f	w	w	f	f	f	f	f							2	6
15	f	w	w	f	f	w	w	w	w	w					7	3
16	w	w	f	f	f	w	w	f	w	f					5	5
17	w	w	f	f	w	w	f	w	w	f	f				6	5
18	f	w	w	f	f	w	w	w	w	f					6	4
19	w	w	w	f	f	f	w	w	w	w					7	3
20	f	f	w	f	f	w	w	w	f	w	f	f	f	w	6	8
21	w	w	f	f	w	w	w	w	f	f	f				6	5
22	w	w	w	f	f	f	w	w	w	w					7	3
23	f	w	w	f	f	f	f	f	w	f	f				3	8
24	w	w	f	f	f	w	w	f	w	f					5	5
25	f	f	f	w	f	w	w	w	w						5	4
26	w	f	w	f	f	f	f	w	f	w					4	6
27	w	w	f	f	f	w	w	w	w	f					6	4
28	f	w	w	f	f	f	f	w	w	f					4	6
29	f	f	f	f	w	f	f	w	w	w					4	6
30	w	w	w	f	f	w	w	w	f	f					6	4
31	w	w	f	w	f	w	w	w	f	f					6	4
32	w	w	f	w	w	f	w	w	w	w	w				9	2
33	f	w	f	f	f	w	w	f	f						3	6
34	f	w	w	f	w	w									4	2
35	f	w	w	f	f	w	w	f	w	w					6	4
36	w	w	f	f	f	f	w	w	w	f					5	5
37	w	w	f	f	f	f	w	w	w	w					6	4
38	w	w	w	f	f	w	w	w	w	w					8	2
39	w	f	w	f	f	f	f	w	f	w					4	6
40	w	w	w	f	f	w	w	w	w						7	2
41	f	w	w	f	f	w	w	w	w	w					7	3
42	w	w	w	f	f	w	w	w	w	w					8	2
43	w	f	f	f	f	f	w	f	w	w					4	6
44	f	w	w	f	f	w	w	f	w	w					6	4
45	w	w	w	f	f	w	w	f	w	w					7	3
46	w	w	f	f	f	w	f	w	w	f					5	5
47	f	w	w	f	f	w	w	f	w	w					6	4

48	w	w	w	f	f	w	w	w	w	w					8	2
49	w	w	f	f	f	w	f	w	w	f					5	5
50	f	w	f	f	f	w	w	f	w	f					4	6
51	w	w	w	f	w	f	w	w	w	f					7	3
52	f	w	w	f	f	f	w	w	w	f					5	5
53	w	w	f	f	f	f	w	w	w	w	w				7	4
54	f	w	w	f	f	w	f	f	w	w					5	5
55	w	w	w	f	f	w	w	w	w	f					7	3
56	w	f	w	w	w	w	w	f							6	2
57	w	w	w	w	f	w	f	f	w	f					6	4
58	w	w	f	f	f	f	w	w	w	w					6	4
59	w	w	f	f	f	w	f	w	w	f					5	5
60	f	f	w	f	f	w	w	f	w	f					4	6
61	f	w	w	f	f	w	w	f	w	w					6	4
62	w	w	f	f	f	w	w	w	w	f					6	4
63	w	w	f	w	w	w	w	w	w	f					8	2
64	w	w	w	f	f	w	w	w	w	w					8	2
65	w	w	w	f	f	w	f	w	w	w					7	3
66	f	f	w	f	f	w	w	f	f	w					4	6
67	f	f	w	f	f	w	w	w	w	w					6	4
68	w	w	f	f	w	w	w	w	w						7	2
69	w	f	w	w	w	f	w	w	f	f					6	4
70	w	f	w	f	f	w	f	w	f	f					4	6
71	w	w	f	w	w	w	w	f	f	f					6	4
72	w	f	f	f	f	w	w	w	f	f					4	6
73	w	w	w	w	f	f	f	w	w	f					6	4
74	w	f	f	f	f	w	w	w	f	f					4	6
75	w	w	w	f	f	w	w	w	f	w					7	3
76	w	f	f	w	w	f	f	f	w	w					5	5
77	w	w	w	f	f	w	w	w	w	f					7	3
78	w	w	w	w	w	f	f	w	w	f					7	3
79	w	f	w	f	f	w	w	w	w	w	f				7	4
80	f	w	w	f	f	w	w	w	f	f					5	5
81	w	w	f	f	f	w	f	w							4	4
													Total		453	342

Table 7.2Recovery Periods General Pattern

	RECOVERY PERIOD													Scnearios (Recovery Periods)				Recovery Periods	Expected RP	%
	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	RP11	RP12	RP13	ww	wf	fw	ff			RP/ERP
2	fw	ww	wf	ff	fw	wf	ff	fw	ww					2	2	3	2	9	9	100%
3	wf				fw	ww	ww	wf	ff					2	2	1	1	6	9	67%
4	fw	ww	wf	ff	fw	wf	ff	ff	ff					1	2	2	4	9	9	100%
5	ff	ff	ff	ff	fw	ww	ww	ww	ww					4	0	1	4	9	9	100%
6	fw	ww	wf	ff	ff	fw	ww	wf	ff					2	2	2	3	9	9	100%
7	ww	ww	wf	ff	ff	fw	ww	ww	ww					5	1	1	2	9	9	100%
8	ww*	ww		ff	fw	ww		ww	wf					4	1	1	1	7	10	70%
9	ff*	fw			fw	wf								0	1	2	1	4	7	57%
10		ww	wf	ff	fw	ww	ww	ww	wf					4	2	1	1	8	9	89%
11	ww	ww	wf	ff	ff	fw	wf	fw	ww					3	2	2	2	9	9	100%
12	wf	fw	wf	ff		ww	wf	fw	ww					2	3	2	1	8	9	89%
13	ww	wf	fw	ww	wf	ff	fw	ww	wf					3	3	2	1	9	9	100%
14		ww	wf	ff	ff		ff							1	1	0	3	5	7	71%
15	fw	ww	wf	ff	fw	ww	ww	ww	ww					5	1	2	1	9	9	100%
16	ww	wf	ff	ff	fw	ww	wf	fw	wf					2	3	2	2	9	9	100%
17	ww	wf			ww	wf	fw	ww	wf	ff				3	3	1	1	8	10	80%
18	fw	ww		ff	fw	ww	ww	ww	wf					4	1	2	1	8	9	89%
19	ww	ww	wf	ff	ff	fw	ww							3	1	1	2	7	9	78%
20	ff		wf	ff	fw	ww	ww	wf	fw		ff	ff	fw	2	2	3	4	11	13	85%
21	ww	wf	ff	fw	ww	ww	ww	wf	ff	ff				4	2	1	3	10	10	100%
22	ww	ww	wf	ff	ff	fw	ww	ww	ww					5	1	1	2	9	9	100%
23	fw	ww	wf	ff		ff	ff	fw						1	1	2	3	7	10	70%
24	ww	wf	ff	ff	fw	ww	wf	fw	wf					2	3	2	2	9	9	100%
25	ff	ff		wf	fw	ww	ww							2	1	1	2	6	8	75%
26	wf	fw	wf	ff	ff	ff	fw		fw					0	2	3	3	8	9	89%
27	ww	wf	ff	ff	fw	ww	ww	ww	wf					4	2	1	2	9	9	100%
28	fw	ww	wf	ff	ff	ff	fw	ww	wf					2	2	2	3	9	9	100%
29	ff	ff	ff	fw	wf	ff	fw	ww	ww					2	1	2	4	9	9	100%
30	ww	ww	wf	ff	fw	ww	ww	wf						4	2	1	1	8	9	89%
31	ww	wf			fw	ww	ww							3	1	1	0	5	9	56%
32	ww*	wf	fw	ww	wf	fw*	ww	ww		ww				5	2	2	0	9	10	90%
33	fw	wf	ff	ff	fw	ww	wf	ff						1	2	2	3	8	8	100%
34		ww		fw	ww									2	0	1	0	3	5	60%
35	fw	ww	wf	ff	fw	ww	wf	fw	ww					3	2	3	1	9	9	100%
36		wf	ff	ff	ff			ww	wf					1	2	0	3	6	9	67%
37	ww	wf	ff		ff	fw		ww	ww					3	1	1	2	7	9	78%
38	ww	ww	wf	ff	fw	ww	ww	ww	ww					6	1	1	1	9	9	100%
39	wf	fw	wf	ff	ff	ff	fw	wf	fw					0	3	3	3	9	9	100%
40	ww	ww	wf	ff*	fw	ww	ww	ww						5	1	1	1	8	8	100%
41	fw	ww	wf	ff	fw	ww	ww							3	1	2	1	7	9	78%
42	ww	ww	wf	ff	fw	ww		ww	ww					5	1	1	1	8	9	89%
43	wf	ff	ff	ff	ff	fw	wf	fw	ww					1	2	2	4	9	9	100%
44	fw	ww	wf	ff	fw	ww	wf	fw	ww					3	2	3	1	9	9	100%
45	ww		wf	ff			wf	fw	ww					2	2	1	1	6	9	67%
46	ww		ff	ff	fw		fw		wf					1	1	2	2	6	9	67%
47	fw	ww	wf	ff		ww	wf	fw	ww					3	2	2	1	8	9	89%
48	ww		wf	ff	fw		ww		ww					3	1	1	1	6	9	67%
49	ww	wf	ff	ff	fw		fw	ww						2	1	2	2	7	9	78%
50	fw	wf	ff	ff	fw	ww	wf	fw	wf					1	3	3	2	9	9	100%

51	ww	ww	wf	fw	wf	fw	ww	ww	wf					4	3	2	0	9	9	100%
52	fw	ww						ww						2	0	1	0	3	9	33%
53	ww				ff*	fw*	ww	ww	ww*					4	0	1	1	6	10	60%
54	fw	ww	wf	ff	fw	wf	ff	fw	ww					2	2	3	2	9	9	100%
55	ww	ww	wf	ff	fw	ww	ww	ww						5	1	1	1	8	9	89%
56	wf	fw	ww	ww*	ww	ww	wf							4	2	1	0	7	7	100%
57	ww	ww	ww			wf	ff	fw						3	1	1	1	6	9	67%
58	ww		ff	ff	ff	fw	ww	ww	ww					4	0	1	3	8	9	89%
59	ww		ff		fw	wf	fw		wf					1	2	2	1	6	9	67%
60	ff	fw	wf	ff	fw	ww		fw	wf					1	2	3	2	8	9	89%
61	fw	ww	wf			ww	wf	fw	ww					3	2	2	0	7	9	78%
62	ww	wf	ff	ff	fw		ww	ww	wf					3	2	1	2	8	9	89%
63	ww	wf	fw	ww	ww	ww	ww	ww						6	1	1	0	8	9	89%
64	ww	ww	wf	ff	fw		ww	ww	ww					5	1	1	1	8	9	89%
65	ww	ww	wf					ww	ww					4	1	0	0	5	9	56%
66	ff	fw	wf	ff	fw	ww	wf	ff	fw					1	2	3	3	9	9	100%
67	ff	fw	wf	ff		ww	ww	ww						3	1	1	2	7	9	78%
68	ww	wf	ff	fw	ww	ww	ww	ww						5	1	1	1	8	8	100%
69		fw				fw	ww	wf	ff					1	1	2	1	5	9	56%
70	wf	fw	wf	ff	fw	wf	fw							0	3	3	1	7	9	78%
71	ww	wf	fw	ww	ww	ww	wf	ff	ff					4	2	1	2	9	9	100%
72			ff	ff	fw	ww	ww	wf	ff					2	1	1	3	7	9	78%
73	ww	ww	ww	wf	ff	ff	fw	ww	wf					4	2	1	2	9	9	100%
74			ff	ff	fw	ww	ww	wf	ff					2	1	1	3	7	9	78%
75	ww	ww	wf	ff	fw	ww	ww		fw					4	1	2	1	8	9	89%
76	wf	ff	fw	ww	wf	ff	ff	fw	ww					2	2	2	3	9	9	100%
77	ww	ww	wf	ff	fw	ww	ww	ww						5	1	1	1	8	9	89%
78	ww	ww	ww	ww	wf	ff	fw	ww	wf					5	2	1	1	9	9	100%
79	wf	fw	wf	ff	fw		ww	ww		wf				2	3	2	1	8	10	80%
80	fw	ww	wf	ff	fw	ww	ww	wf	ff					3	2	2	2	9	9	100%
81	ww	wf	ff	ff	fw									1	1	1	2	5	7	71%
													Total	226	127	127	135	615	715	86.01%
													Mean	2.83	1.59	1.59	1.69	7.6875		85.87%
													Scenario (Fig. 5.2)	**a**	**c**	**b**	**d**			
													Expected RP (80*9)	720						
													%	85.42%						

Note. RP= Recovery Period, w = working day, f = free day

**= there is one extra or uncommon questionnaire*

7.4 Appendix 4. Cronbach's Alpha (main constructs)

The following table depicts the computed values of the Cronbach's Alpha of the main constructs for the then consecutive days of measurement.

Table 7.3 Reliabilities (Cronbach's Alpha coefficient ten consecutive days)

	CONSTRUCT	VARIABLE	Day1	Day2	Day3	Day4	Day5	Day6	Day7	Day8	Day9	Day10	MIN	MEAN	MAX
Adverse Health	Cognitive Complaints	COGCOM1w2 COGCOM2w2 COGCOM3w2	0.900	0.895	0.923	0.826	0.958	0.958	0.898	0.950	0.964	0.959	0.83	0.92	0.96
	Emotional Complaints	EMOCOM1w2 EMOCOM2w2 EMOCOM3w2	0.775	0.795	0.866	0.760	0.912	0.797	0.877	0.902	0.766	0.805	0.76	0.83	0.91
	Physical Complaints	PHYCOM1w2 PHYCOM2w2 PHYCOM3w2	0.812	0.783	0.638	0.849	0.820	0.585	0.762	0.670	0.673	0.716	0.59	0.73	0.85
Emotions after work	Posituve Emotions	POSEMO1w2 POSEMO2w2 POSEMO3w2 POSEMO4w2	0.842	0.841	0.789	0.735	0.659	0.892	0.858	0.784	0.835	0.904	0.66	0.81	0.90
	Negative Emotions	NEGEMO1w2 NEGEMO2w2 NEGEMO3w2 NEGEMO4w2	0.864	0.869	0.903	0.884	0.952	0.843	0.818	0.923	0.818	0.922	0.82	0.88	0.95
Recovery /Detachment	Cognitive Detachment	RC1w3 RC2w3	0.736	0.876	0.926	0.973	0.905	0.873	0.906	0.881	0.939	0.958	0.74	0.90	0.97
	Emotional Detachment	RE1w3 RE2w3	0.877	0.823	0.950	0.927	0.922	0.897	0.867	0.900	0.914	0.964	0.82	0.90	0.96
	Physical Detachment	RP1w3 RP2w3	0.613	0.693	0.750	0.640	0.705	0.820	0.842	0.830	0.794	0.923	0.61	0.76	0.92