1. BACKGROUND

*It is questionable if all the mechanical inventions yet made have lightened the day’s toil of any human being – John Stuart Mill (1806-1873)*

1.1 Challenges due to changes in the nature of work

Over the last decades, the industrial economy based on manufacturing has changed to a service economy driven by innovation and knowledge. The traditional working pattern is affected by various developments such as the use of communication technology, mobile information and the globalization of the economy. These advances in technology along with significant demographic shifts in the lifespan of the population (i.e., the grey wave), as well as the ethnic and gender composition of the workforce, have influenced the work setting dramatically (1;2). Also, there has been an increase in non-traditional methods of employment practices (e.g., temporary work, part-time work and teleworking) (1;3-5). Depending on the type of work, technology allows employees to work practically anywhere, which increasingly blurs the boundaries between work and home. All these changes have impacted the modern workplace and impose a strong demand on the cycle of rest and recovery of individuals. The fact is that almost one fifth of the European employees are struggling to strike a satisfactory work-life balance, a number which is increasing since 2000 (6). The striking changes in the nature of work itself are likely to give rise to various stress-related problems. In 2005, work-related stress was found to be the second most common work-related health problem across the European Union (only back pain was more common) (7). In the Netherlands, a survey held in 2011 showed that almost one in eight employees (13%) suffered from work-related stress. Stress and burnout complaints were mostly reported in occupations with high workload and low job control (8). This is reflected by the high amount of office employees in financial settings indicating to work at high pace regularly (45%), in addition to a 38.6% count of employees who admit being under pressure and a 40.4% fearing for their job (8). Work days lost to presenteeism (i.e., employees tend not to call in sick, but are less productive at work due to health problems) and sickness absence associated with mental health problems totalled in the Netherlands to 2.7 billion Euros in 2009 (9;10).
1.2 Challenges due to changes in demographics: “the grey wave”

The considerable proportion of employees affected by mental health problems raises the concern about sustainable employability of employees. Sustainable employability is reached when employees are able to participate in a healthy, vital and productive manner in paid work until they are eligible for a pension (11). This concern is particularly important given that Europe is faced with the challenge of an ageing workforce, popularly referred to as ‘the grey wave’. The number of Dutch people in the potential workforce (aged 20 to 64) is expected to decrease with more than three-quarter million from now till 2040 (12). Consequently, there will be a significant rise in the number of retirees, while the number of those economically active is decreasing (13). Therefore, the Dutch government is gradually raising the official retirement age in the coming decades to 67 in the year 2021, an action that is expected to reduce the shrinking of the labour force with 0.4 million instead of the forecasted 0.8 million (12). As 40% of European employees does not feel confident to remain in their current job over the age of 60 (6), worksite health promotion should be offered to employees of all ages to enhance health and vitality. The main aim of worksite health promotion is to improve the capacities of employees by securing them with sufficient resources for current and future work situations.

2. NEED FOR RECOVERY

2.1 The concept need for recovery

One of the most important factors influencing physical and mental health of an employee is whether one is able to recover from fatigue and stress at work (14). Need for recovery (NFR) after work is a natural consequence of expended effort. However, it becomes problematic when there is not enough recovery offered between two periods of work effort. The effort recovery model developed by Meijman & Mulder (1998) describes the role of the NFR (15). This model depicts job demands and the associated effort expenditure. If job demands continue to strain the individual and no recovery is allowed to occur, excessive load reactions will accumulate, resulting in physical and mental impairment. Recovery occurs when no further effort is needed and load reactions are reduced, so one can return to pre-stressor levels of functioning in which homeostasis of physiological and psychological systems is attained.
2.2 Characteristics of need for recovery
A high NFR is characterized by complaints such as feelings of overload and/or irritation, the urge to disengage socially or the lack of energy for new endeavors (16). A high NFR has detrimental consequences for the individual worker as it is associated with a high blood pressure, sleeping problems and fatigue (17-19). A raised NFR may also be a good indicator for future sickness absence, which imposes a large financial burden on companies (20). These feelings of temporary overload after work can be measured with the NFR after Work scale of the Dutch perception and evaluation of work questionnaire (Dutch abbreviation: VBBA) (16). It contains eleven dichotomous items (yes/no) that has proven to be valid and reliable (alpha 0.86).

2.3 Intensification of need for recovery research
Over the last decade, research focussing on recovery after work has increased substantially. Two main reasons can be attributed to this. First, incomplete recovery has been detected as a result of unfavourable working conditions such as high job demands, longer working days and low job control (18;21). Second, insufficient recovery have been found to be associated with an increased risk for developing work-related diseases such as burnout, cardiovascular disease and musculoskeletal disorders (14;22-25). The prevalence of burn-out has increased over the last years and was 13.1% in 2011 (8). Concerning cardiovascular diseases, out of all deaths in 2010, 29% of men and 30% of women died of this disease (26). Since the NFR is associated with elevated risk for developing the abovementioned work-related conditions, there is a strong need to develop interventions that involve reducing the NFR among employees.

3. STRATEGIES TO REDUCE THE NEED FOR RECOVERY

3.1 Physical activity
Engaging in physical activity (e.g., exercise, sports, walking and cycling) has been associated with a lower NFR (21). Physical activity is helpful for recovery, not only because the individual takes a step back from work demands, he/she also benefits from activating different cognitive capacities than those needed in most jobs where
relieve from symptoms of work-induced fatigue is necessary (27). Besides, by being physically active, an individual can disengage from work. A temporary relief from work-related demands allows the functional systems to recover. Moreover, physical activity stimulates physiological and psychological processes (e.g., positive mood) that are beneficial to individual well-being and health (28). Research has shown that people who spend more time on physical activities, reported higher well-being before going to bed (29;30). Also, physical activity serves as an antidote to stress, in the sense that involvement in physical activity helps to improve physical fitness and well-being (34).

3.2 Reducing sedentary time
Another benefit gained from physical activity is that it helps to reduce and break up sedentary time. The relevance of this issue appears when considering that, in our modern society, work has become less physically demanding and more sedentary over the past decades. This rapid shift towards a sedentary work life with less physical activity is a risk factor for developing overweight and obesity (31). Moreover, it has been shown that prolonged sitting increases the risk of morbidity and mortality (32;33). Therefore, disrupting sitting behaviour by means of physical activity aids in reducing the total amount of sitting time.

3.3 Psychological detachment and relaxation
Next to physical activity, research has shown that detachment and relaxation are related to increasing one’s feeling of recovery (34-38). Moreover, it was shown that lower levels of detachment and relaxation are associated with weaker health, emotional exhaustion and sleeping problems (35). The term detachment was introduced by Etzion, Eden and Lapidot (1998) and defined as “an individual’s sense of being away from the work situation” (p. 579) (39). Detachment involves not being occupied with work-related tasks such as phone calls after work hours or engaging in other work activities. Being just physically away from the workplace might not be sufficient for recovery; also being psychologically detached from work is necessary (39). By disengaging from work, the negative consequences of straining job demands are reversed and the employee is returned to pre-stressor levels. Relaxation is often
linked to leisure activities, such as meditation, having a light walk in the nature or listening to music. Relaxation poses no further demands on the functional system (e.g., neuro-endocrine and cardiovascular systems) and internal resources (e.g., self-regulation). Relaxation activities are associated with a decreased resting heart rate, lowered resting breath rate and alleviated resting muscle tension (40).

In a study performed by Binnewies, Sonnentag and Mozja (2008), it was shown that having time to detach and relax during the weekend was related to being refreshed and recovered on Monday morning (41). Detachment and relaxation after work can be measured with the Recovery Experience Questionnaire (35). Within the area of work recovery, an instrument to measure detachment and relaxation during work hours does not exist yet. A reliable, valid and responsive instrument is the prerequisite for establishing the effectiveness of an intervention on detachment and relaxation during work hours.

3.4 Within workday recovery

Previous research has highlighted the importance of recovery activities undertaken after work (e.g., in the evening after work, during the weekend, on vacations) and ignored the importance of within workday recovery (42). Usually, recovery happens after work hours. However, sometimes recovery can unfold during work hours such as during meal breaks (43). Active breaks within a workday can help to counteract the negative effects of work-related stress and physical inactivity, and can have positive effects on feelings of energy and restoration (44). When employees have the possibility to take a break in the absence of job demands, they are likely to regain resources which are necessary to cope with future (work) demands (45). So far, only one study in the area of work recovery has been conducted. This study showed that, within a group of service employees, enjoyable and restful within workday breaks improved their recovery (46). We expect that work breaks containing physical activity, detachment or relaxation will result in a lower NFR after working hours.
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4. WORKSITE HEALTH PROMOTION PROGRAMS

4.1 Promising results of WHP programs

The workplace is an important setting for improving recovery (47), because two thirds of the Dutch population (48) belongs to the labour force (age 15-65) and thus are likely to spend a significant amount of time at work. The World Health Organization (WHO) and the European Union have stressed the importance of implementing Worksite Health Promotion (WHP) programs (49-51). A typical worksite comprises a relatively homogenous group of employees that share a common purpose and culture, situated in a small number of geographic sites (52). Health promotion can be offered through the organization’s infrastructure (e.g., existing communication channels and social networks) to promote or discourage certain lifestyle behaviours (52;53).

A number of reviews have indicated that results of WHP programs are encouraging for improving healthy lifestyle behaviours (54-56). Most of the programs focused on improving dietary behaviour, physical activity and smoking cessation (54-56). Also, positive effects were found on work-related outcomes such as absenteeism, presenteeism and work ability (55;57-59).

4.2 Socio-ecological model

Research indicated an increase in the number of programs not only targeting individuals, but also in interventions embedded within a socio-ecological model. McLaren & Hawe (60) defined the socio-ecological model as “a model that assigns attention to individual and environmental determinants of behaviour”. The socio-ecological model of health promotion combines different approaches, focusing at making changes to the individual, as well as to the social, political and/or organizational environment. To illustrate, physical activity may be a function of individual factors, such as beliefs, but it could also be influenced by social factors, such as social norms and environmental/political factors, such as the availability of walking/cycling tracks (see Figure 1). Until now, few WHP programs have focused on the physical environment. In 2005, a review by Engbers and colleagues (61) contained a small number of studies using physical environmental modifications.
These studies showed improvements in dietary intake and physical activity, but there were no effects on health risk indicators. Environmental modification strategies can be defined as strategies that do not require the individual to self-select into a defined educational program (e.g., self-help classes or groups) (62). The steering of unconscious and conscious behaviour can be realised by providing and promoting more healthy options, more facilities (i.e., fitness center) or by establishing policies that require healthy choices and restrict the number of less healthy options. Examples of environmental modifications are appealing stairwells, a ‘healthy’ canteen (i.e., offering healthy menu options), and fitness facilities. Previous research indicated that a combined social and physical environmental intervention has an advantage over individual interventions (63-67). It stands therefore to reason that improving employees’ physical activity and relaxation through a social environmental and a physical environmental intervention can be considered as promising to positively affect the NFR.

Figure 1. Socio-ecological model (adapted from Davison & Birch 2001; (68))
5. OBJECTIVES AND OUTLINE OF THIS THESIS

This thesis addresses five objectives:

1) To investigate associations between NFR and overweight/obesity, self-perceived health, physical activity, detachment and relaxation in office employees during and after a workday;

2) To systematically develop and describe the design of the worksite social and physical environmental intervention program for office employees to reduce the NFR;

3) To investigate the measurement properties of the Detachment and Relaxation At Work (DRAW) scale and to assess the responsiveness of the Individual Work Performance Questionnaire (IWPQ);

4) To evaluate the process of implementation of the worksite social and physical environmental intervention program;

5) To study the (cost-) effectiveness of the worksite social and physical environmental intervention program.

Objective 1: Associations between NFR and several outcome variables

Starting point of the thesis was to investigate the associations between the NFR and overweight, obesity and self-perceived health. No previous study has been conducted to test for these associations. Within this thesis, the results are presented in chapter 2.

Also, recovery opportunities during and after work hours and its association with the NFR has received limited attention to date. Therefore, one of the aims of the present thesis was to investigate the associations between the NFR and during and after work hours physical activity, detachment and relaxation. The results of the cross-sectional study are described in chapter 3.

Objective 2: Design program

A social environmental and physical environmental intervention program was developed by applying a modified intervention mapping protocol (69). That is, a blueprint for the interventions was developed in close cooperation with employees
of the research population, combining scientific evidence with practice-based information of the target population. The design and details of the program are described in chapter 4.

Objective 3: Measurement properties DRAW and responsiveness IWPQ
We adapted the subscales detachment and relaxation from the Recovery Experience Questionnaire of Sonnentag (35) to a within workday context. In chapter 5, the assessment of the reliability, validity and responsiveness of the Detachment and Relaxation At Work (DRAW) scale is described.

Individual work performance, defined as “employee behaviours or actions that are relevant to the goals of the organization (70)”, is an important outcome measure for evaluating WHP programs. For this purpose, the Individual Work Performance Questionnaire (IWPQ) was previously developed (71) and validated (72). To investigate the effectiveness of the interventions on individual work performance, the responsiveness, i.e., the ability of an instrument to detect changes over time (73), of the IWPQ was investigated alongside the present trial. Results on the responsiveness of the IWPQ are described in chapter 6.

Objective 4: Process evaluation program
Several studies have stressed the importance of better and more comprehensive evaluation of WHP programs (74). The process evaluation is important as it facilitates the interpretation of study findings. Also, it can be of assistance in understanding the (lack of) effectiveness of a program, and can be helpful in providing points for improvements for better implementation in the future. The process of implementation of the social environmental and physical environmental intervention is presented in chapter 7.

Objective 5: (Cost-) Effectiveness program
The social environmental and physical environmental interventions were evaluated among 412 office employees of a Dutch financial service provider in a 2X2 factorial study design. It was expected that the combined social and physical environmental intervention would be more effective than the separate interventions compared to
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the control group. The results of the social and physical environmental interventions on the NFR, physical activity, detachment and relaxation are described in chapter 8. The effectiveness of the social and physical environmental interventions on presenteeism, absenteeism, work performance and work engagement is described in chapter 9.

Lastly, for company decision makers it is important to have insight into resource allocation in terms of time, effort and money. As such, an economic evaluation was conducted from a societal and an employers’ perspective to consider the costs in relation to the effects and financial benefits of the social and physical environmental interventions. The results are presented in chapter 10.

And finally, chapter 11 summarizes the main findings, and discusses the methodological issues, possible program and/or theory failure, and implications and recommendations for research and practice are provided.
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