Towards improving workers' health by matching work and workers
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Chapter 1
General Introduction
Background

In the definition of occupational health, all aspects of health and safety in the workplace are integrated, including work conditions, determining risk factors leading to workers’ health complaints, and prevention of these health complaints.\(^1\text{-}^3\)

Various studies have noted that people attribute positive meaning to work.\(^4\text{-}^5\) In a random sample of British people, work was judged as the sixth most important aspect of quality of life by healthy persons and the third most important aspect by persons with a chronic illness.\(^6\) In a population-based study in Sweden, unemployed people reported significantly lower scores on a quality of life questionnaire than employed people.\(^7\) Being employed can contribute to social inclusion, offers financial benefits and can give a sense of self-esteem.\(^7\text{-}^9\) Waddel & Burton\(^4\) concluded in their review that there is strong evidence that work is generally good for physical and psychological health and well-being; being unemployed resulted in poorer health and higher rates of mortality.

The match between work and workers is the central topic in this thesis designed to gain knowledge for the purpose of optimising occupational health. In this thesis, the term work will be understood to mean a combination of physical, mental and psychosocial work demands. The term workers represents the resources of workers, in terms of capacities, health status and age. When the work and worker do not match, work can affect the worker in a negative way, in terms of becoming sick and developing work-related health complaints.\(^10\text{-}^{12}\) Workers with health complaints may be limited in their ability to perform work.\(^13\text{-}^{21}\) In practice, the match between work and worker is a dynamic process of searching for the optimal balance.

A first step in improving workers’ occupational health is gaining insight into both the work (i.e. work demands) and workers (i.e. workers’ resources) and examining the question of whether these match. Studying the match between work and workers is essential for identifying highly demanding jobs that ask special requirements of the worker, and for identifying workers with specific health complaints, their associated impairments and desired adjustments. Identifying high demanding jobs and work-related health complaints gives the opportunity to take preventive measures in the work situation in order to maintain workers’ health on their job\(^22\), avoiding increased risk of work-related complaints and an increasing burden of costs associated with health care, absenteeism and early retirement.\(^23\)
**Work and workers**

Theoretical frameworks and models have been developed to give insight into the aspects of work and workers and to describe their interrelationship.²⁴-²⁷ These models use their own terminology and classifications. For instance, in the general dynamic model of workload by van Dijk and colleagues²⁴ a distinction is made between work stressors, which are factors in the work itself, and short-term and long-term effects on the worker. Van Dormolen and colleagues²⁵ adapted this model, adding the terms ‘workers’ capacity’ and ‘recovery’ to the model.

Based on these models, the approach in this thesis focuses on a selection of aspects that can be addressed when matching work and workers. This conceptual model is shown in Figure 1. In the following section, the aspects are described in more detail.

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**Fig. 1 Conceptual model of a selection of aspects that are addressed when matching work and worker**

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**Work and Workload**

By performing work, work demands are imposed on the worker. Work demands arise from the tasks and activities that have to be performed and refer to the aspects in work that require effort from the worker.²⁸ Work demands can be physical, referring to energetic demands (aerobic or anaerobic) and biomechanical demands (static or dynamic demands on the musculoskeletal system). Physical demands arise from physical tasks and activities like standing, kneeling, repetitive movements or static work postures. Work demands can also be mental, for instance demanding concentration, divided attention and
memory, and imposing a high work pressure (like working under time pressure and having to do a lot in too little time). Furthermore, work demands may be psychosocial in nature, imposing high emotional demands (like feeling personally affected, and dealing with difficult persons) and experiencing less autonomy and less support from supervisor and colleagues.

Workload covers the direct human response due to the work.\textsuperscript{24,25} It is the temporary effect of the work, from which a person can recover, meeting the following day with the same work potential as the previous day.\textsuperscript{29} Examples of these short-term effects are increased heart rate variability, disturbed cortisol pattern, making errors in work tasks and feelings of tiredness. These short-term effects determine a worker’s need for recovery, which is defined as the desire to recuperate from the temporary feeling of overload, irritability, social withdrawal, lack of energy for new effort, and reduced performance, experienced after a day of work.\textsuperscript{29} In a safe and healthy work situation, workers have sufficient recovery opportunities to recuperate from the work demands, thereby returning to their original level. However, work demands may exceed guidelines for healthy and safe performance on the job for the workers or their environment. In line with the Dutch Act on Medical Examinations, which came into force in 1998, this thesis defines high demanding jobs as jobs where the job demands cannot be eliminated and which exceed exposure safety levels or average human capacities, leading to an increased risk of longer-term work-related health complaints. Since each job is different and has its own work demands, jobs have to be studied individually to identify high job demands. In this thesis, both physical and mental jobs are studied for high job demands.

**Workers’ Resources**

**Capacities**

Each worker has physical, psychological and social capacities. Physical capacities are for example the ability to walk, lift, stand and reach. Examples of psychological capacities are being able to work in a concentrated manner and divide attention across different aspects. Social capacities concern communicating and cooperating. General personal factors which are expected to influence these capacities are for example education, intelligence, personality, attitude and motivation.\textsuperscript{25} The health status of a worker may also be of influence on the worker’s capacities.\textsuperscript{30,31}
Health Status and Work Performance

According to Huber and colleagues\(^32\), health can be formulated as “the ability to adapt and to self-manage in the face of social, physical and emotional challenges”. Research showed that decreased physical or psychological health is associated with impaired daily functioning.\(^33\)-\(^35\) For instance, Woolf and colleagues\(^33\) showed that Europeans with musculoskeletal health complaints felt impaired in daily life by feeling limited in performing tasks and reported low mean scores on a quality of life questionnaire. In a later study, the same researchers showed that two thirds (67%) of Irish respondents with chronic musculoskeletal complaints reported that pain interfered with their normal work, reducing their quality of life.\(^35\) Also, psychological disorders are associated with a reduced quality of life.\(^36\)-\(^39\)

Health complaints may limit the ability to perform activities in the context of work in several ways. Workers may go to work despite having health complaints and the feeling that they should have taken sick leave. This behaviour is called presenteeism and did, for example, occur on one or more days during the previous year in almost two thirds (64%) of workers who participated in a Swedish labour market survey.\(^40\) The consequence of presenteeism may be reduced productivity at work. For example, moderate and severe work impairments due to health problems were found to be associated with decreased work productivity of Dutch workers, with an Odds Ratio of 1.3 and 1.6 respectively.\(^19\) Furthermore, studies showed that both physical and psychological health complaints may lead to work absenteeism\(^13;16;41\), and in the long term even work disability.\(^18;20;21\) Finally, health complaints can contribute to the decision to retire early\(^14;17\): receiving a medical diagnosis showed to be an important determinant of retirement planning in older Danish workers.\(^42\)

In the same way that health status can affect work performance, work can also affect the health of the worker. Executing work can lead to work-related health complaints in the long term.\(^10;12\) Work-related health complaints can be physical, like musculoskeletal complaints in the neck, back, shoulders or knees.\(^16;43\) In a systematic review of Da Costa and Vieira\(^44\), a relationship between performing physical work and the development of musculoskeletal disorders was found. Psychological work-related health complaints also occur, like burn-out, stress and extreme fatigue.\(^45;46\) For example, Nieuwenhuijse and colleagues\(^12\) found strong evidence that exposure to psychosocial work factors, like high job demands and low support from co-workers and supervisor, predict the incidence of stress-related disorders.
So, work and health affect each other; reduced health of workers can lead to reduced workers’ capacity and high demanding work can lead to health complaints in workers. It is important to prevent health complaints, both work-related and non work-related, for both the worker and the employer. Additionally, attention should be paid to employees with chronic disabilities due to chronic diseases, since it can be difficult for them to find and perform suitable work. In this thesis the match between work capacities and work demands is studied in a specific population of workers with chronic disabilities.

Age
An aspect that needs attention in the field of workers’ occupational health is the age of the worker. It is questionable if age is an important factor in matching work and workers and whether age-specific measures are needed during a career. This question is becoming more and more important because the working population is ageing worldwide and especially in the developed European countries. The expectancy is that the proportion of the population in developed countries aged 60 years or over will be more than doubled by 2050, from 9% to 19%. Fewer young workers are entering the working population. To reduce the costs of the expanding retiring population, the statutory age of retirement will have to be raised in the future. To stimulate longer working careers, keeping workers healthy throughout their career for longer is becoming more and more important. To consider age-specific measures, the scarce research into the role of age in the match between work and workers will need to be expanded. The few studies that have been done seem to find evidence that younger workers may differ from older workers in their relation to work. Recently, Mauno and colleagues concluded that younger Finnish service sector employees have more difficulties with work-family imbalance and high workload, while their older colleagues have more difficulties in coping with job insecurity. In a study among Belgian employees from the public sector, the older employees had a significantly higher risk of presenting with a high need for recovery after working time compared to the younger employees. In contrast, Bos and colleagues found age-related differences in job dissatisfaction, but not for need for recovery. In this thesis, age-related differences are studied in relation to the match between workers and work.
Studying work and workers

To optimise workers’ occupational health, the aspects of work and workers described above have to be studied in order to identify work-related risk factors and workers’ health. The starting point for studying the match between the aspects of work and workers can be two-fold. First, a work-specific approach may be taken, with a certain specific physically or mentally demanding job as starting point. Second, a high-risk approach at the worker level may be taken, starting from a specific group of workers with their own capacities or health complaints. In this thesis, the match between work and workers is studied from both perspectives.

How to measure work and workers

To measure work demands, several methods may be used, like direct measurements (e.g. observations) or indirect methods (e.g. self-reports). For example, work postures and movements may be studied through observation to assess the physical work demands.\textsuperscript{55,56} Self-reporting, for instance with the help of questionnaires, may be a useful and cost-effective method to measure cumulative exposure of employees to high physical, mental and psychosocial demands over time.\textsuperscript{57}

Workload may for example be measured through self-reporting with the ‘need for recovery scale’, which makes the measurement of early symptoms of fatigue at work operational.\textsuperscript{58} Heart rate variability measures may be used as an example of direct measurement to study the workload on employees.\textsuperscript{59,60}

Workers’ capacities also can be studied through self-report or assessment instruments, which may be performed both pre-employment and on-employment. For instance, a Functional Capacity Evaluation (FCE) test may be performed to assess the current maximal physical work capacity of workers. FCE tests are performance-based assessments that evaluate the performance of workers during tests that reflect work-related activities, such as lifting, carrying or finger dexterity.\textsuperscript{61} Psychological work capacities of the worker may be studied for instance with neuropsychological screening instruments, in context-free or context-specific memory and attention tests.\textsuperscript{62,63}

Valid health symptom questionnaires may be used to screen for common psychological health disorders like sleep disorders\textsuperscript{64}, depression\textsuperscript{65} or post-traumatic stress disorder.\textsuperscript{66}

A method to assess the work-relatedness of worker’s health complaints is assessment by an expert, using clinical examination and testing methods. Another
generally used method is through self-reports. However, it is not known if self-reporting of work-related worker’s health matches with the assessment of an expert. This question is also addressed in this thesis.

**Thesis objective and research questions**

The objective of this thesis is to gain knowledge on the match between work and workers in specific work settings and worker populations. This information helps to identify high demanding jobs and groups of workers with work-related health complaints and requirements. This is the first step needed if we wish to optimise workers’ health by recommending and implementing preventive measures for these specific work settings and worker populations.

Furthermore, the validity of self-reporting is studied in relation to work-related diseases.

The following research questions have been formulated:

1. Do work and workers match in specific work settings?
   a. Do physical work demands of specific physically demanding jobs exceed health guidelines? – Chapter 2
   b. What psychological and cognitive requirements of workers match the mental demands of a specific job? – Chapter 3

2. Do workers and work match in specific worker populations?
   a. Do the physical, psychological and social work capacities of workers with disabilities match their work demands? – Chapter 4
   b. Are age-specific preventive measures desired to optimise the match between workers and work?
      i. Are age-specific differences found in musculoskeletal complaints, related work impairment and desirable adjustments in work? – Chapter 5
      ii. Are age-specific differences found in the association between psychosocial work aspects and psychological health complaints? – Chapter 6

3. To what extent does self-reporting of work-related illness match with expert assessment? – Chapter 7
Thesis Outline

The first two chapters focus on the match between work and workers in specific work settings. In Chapter 2 the exposure to physical work demands of train conductors and service electricians at a railway company in the Netherlands is assessed by means of on-site observations. It is studied if guidelines are exceeded that identify risk factors for the development of certain musculoskeletal complaints. In Chapter 3 a systematic literature search is performed to assess the specific psychological tasks, demands and workload of train drivers. The psychological and cognitive requirements for periodical assessment are defined.

In the second part of this thesis, the match between workers and work in specific worker populations is presented. Chapter 4 focuses on workers with both physical and psychological chronic disabilities, while chapters 5 and 6 concentrate on groups of workers of different ages. Chapter 4 investigates whether the work capacities of workers with disabilities, working in a sheltered workshop, match their work demands. Workers underwent a post-offer and pre-placement assessment to assess physical work capacities – by means of a Functional Capacities Evaluation (FCE) – and psychological and social capacities – by means of the MELBA-capacity-profile. Physical work demands are assessed by systematic on-site observations and psychological and social work demands are assessed with the help of the MELBA-demands-profile. By comparing the work capacities and work demands, it can be determined if workers were adequately placed in jobs. In Chapter 5 employees of a railway company are asked to fill out a questionnaire about musculoskeletal complaints by body region, the associated work impairment and the desirable and feasible adjustments in their own work situation. The focus lies on the differences between employees of four age groups. In Chapter 6 differences between workers in these same four age groups in the association between psychosocial work aspects and psychological health complaints of workers is explored.

Chapter 7 presents the results of a systematic literature search about the match between self-reported work-related illness and assessment by a (medical) expert. Both the validity of workers’ self-reported illness and the validity of the self-assessed work-relatedness of their illness is studied.

Finally, Chapter 8 describes the main findings and discusses the aspects that are addressed when matching work and workers. The results are summarized and recommendations are presented.


Chapter 1.

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General introduction

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