Towards improving workers' health by matching work and workers
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Chapter 8
General Discussion
From an occupational health perspective, the objective of this thesis was to gain knowledge on the match between work and workers in specific work settings and worker populations. Using this information, specific high job demands and work-related health complaints were identified. This is the first step needed to optimise workers’ health by recommending and implementing preventive measures for specific work settings and worker populations. Three research questions were formulated. In the first part (Chapter 2-3) the objective was to study the match between work aspects and workers’ resources in specific work settings. Secondly, the match between workers’ resources and work aspects was studied in specific worker populations (Chapter 4-6). Finally, the match between self-report of work-related illness and expert assessment was studied (Chapter 7).

In this chapter the main findings are described and discussed. Methodological considerations and the interpretation of findings are given, and recommendations are presented.

Main Findings

1. Do work and workers match in different work settings?
In the work setting of a Dutch railway company, some specific high physical and high mental demands were found, resulting in a high risk for mismatches between work aspects and workers’ resources (Chapter 2) and specific requirements to match the job are defined (Chapter 3).

It appeared that the work of train conductors and service electricians contained some high physical work demands that did not match health guidelines aimed at reducing the risk for developing musculoskeletal complaints in workers (Chapter 2). Standing for too long a period, climbing a flight of stairs too often, kneeling and squatting for too long duration, and working in awkward postures were the risk factors found. These risk factors increase the numbers of workers with musculoskeletal complaints in knees, hips and shoulders. Train drivers were exposed to adverse work demands for which they have to meet specific psychological and cognitive requirements to match their job (Chapter 3). Having the abilities to stay aware for long periods during a working day, to perceive, to interpret, to recognize, to anticipate and to act on environmental signals in specific situations are suggested as requirements. Furthermore, train drivers should have the ability continue working while being concentrated, to perform their work accurately and
to memorise relevant information to be able to work safely. Selective, divided and sustained attention are required and the drivers should be capable of coping with emotional demands, low decision latitude and a solitary environment. Finally, they must have the ability to deal with and recover from feelings of fatigue. When train drivers do not match these requirements, impaired functioning may lead to errors or mistakes, eventually leading to accidents (Chapter 3).

2. Do workers and work match in different worker populations?

In the specific worker populations of workers with chronic disabilities (Chapter 4) and workers of different ages (Chapter 5, 6), both matches and mismatches were found.

In workers with various chronic disabilities, matches between work capacities and work demands were found, but cases of under- and overload on specific physical activities and psychological/social characteristics were also seen frequently (Chapter 4). The mismatches in terms of underload were mainly found in relatively low demanding physical activities (finger dexterity and manipulation) and psychological/social characteristics (speaking, reading and writing), in which underload does seem not harmful. Physical overload was most often due to activities involving weight lifting and standing for long periods. More than 90% of the employees showed overload on one or more psychological/social characteristics, most often occurring in characteristics of work execution (endurance, critical control and carefulness). The assessment of workers’ capacities and work demands provided useful information to assess whether workers with chronic disabilities can be placed in specific jobs (Chapter 4).

In workers of different age groups, for both workers with musculoskeletal complaints and with psychological health complaints, health problems seemed to be associated with work aspects (Chapter 6) and were experienced as work impairing (Chapter 5). This indicates that mismatches between workers and work occurred, desiring preventive measures in work. The question concerning whether age-specific preventive measures are desired to optimise the match between workers and work can be answered with a simple ‘yes’; age-specific differences were found in the associations found between work and health complaints (Chapter 5, 6). In Chapter 5, age-specific differences were found in the occurrence of musculoskeletal complaints, related work impairments and desirable adjustments in work. Age turned out to be relevant in musculoskeletal complaints in the neck, arm and at least one other body region. Age was also relevant for the reported impairments in work due to the musculoskeletal complaints for lower back complaints. Regarding adjustments in work, proportionally more of the youngest
employees with musculoskeletal complaints found it desirable and feasible to switch to another job in the company, whereas proportionally more employees in the oldest age group found it desirable and feasible to work fewer days per week. In Chapter 6, age-specific differences were found in the association between some psychosocial work aspects and psychological health complaints. In the two youngest groups of employees, worse emotional workload was associated with a significant higher risk of having psychological complaints (OR = 5 for work-related fatigue, OR = 7 for stress and OR = 34 for burnout). In the two oldest groups of employees, lack of social support from both colleagues and supervisor was associated with a significant higher risk of having psychological health complaints (OR = 3-4 for work-related fatigue, OR = 4 for stress and OR = 3-6 for burnout).

3. To what extent does self-reporting of work-related illness match with expert assessment?

The match between workers’ self-report and expert assessment of a health condition was found to be low to moderate. Furthermore, little evidence has been published on the match between self-report and expert assessment of the work relatedness of a health condition (Chapter 7). By performing a systematic literature review, 32 studies were found that compared self-report of a health condition with expert opinion. The agreement was mainly low to moderate and the sensitivity and specificity highly variable. Only four studies were found in which workers were explicitly asked to self-assess the work relatedness of their self-reported illness or symptoms, showing low to moderate agreement with expert assessment. The health condition, type of questionnaire, and the case definitions for both self-report and reference standards seem to have influenced the results of validation studies that were performed.

Methodological Considerations

In this section, methodological considerations of this thesis are addressed. Performing all studies in practical work situations was of influence for the choices of study designs, work populations, work settings and the methods used. The strengths and weaknesses of these choices are discussed below.
Work and Workers: What’s New?

In this thesis, broad and diverse points of view on the topic of matching work and workers were taken: the study populations of the studies in this thesis were diverse, as were the work settings. The approach of matching work and workers was from both specific physically and mentally demanding jobs, and also from the perspective of workers with different health problems and workers of different age groups.

Chapter 2 was an example of how to assess the work demands of specific physically demanding jobs, in order to examine if these demands are safe for the workers or exceed health guidelines. This information emphasizes the need for adaptations in the workplace and encourages employers to take preventive measures. Chapter 3 was an example of proposing a list of psychological and cognitive requirements that are needed to perform a specific mentally demanding job. The translation of work demands and workload into requirements is a useful method to develop evidence-based screening of job-specific health requirements and is, to the knowledge of the authors, most often not performed for mentally demanding jobs.

The focus in this thesis on the specific populations of ‘workers with disabilities’ and ‘workers of different age-group’ was important from the societal perspective as these are currently societal spearheads in occupational health. Since it can be difficult for persons with disabilities to find and perform suitable work and because the (Dutch) government supports organisations to hire these workers, this group deserves special attention. Also age is becoming more and more an important issue in occupational health, since the working population is ageing and statutory ages of retirement are being raised. The age-related studies in this thesis were innovative because age was a relevant factor in both work and health. In most other studies, age is often included as a descriptive variable, covariate or confounding factor, or is only related to either work or health. Gathering detailed information about age-related associations between work and health complaints provide better possibilities to make decisions about age-specific preventive measures to improve health and work functioning.

The studies in this thesis and results may serve as examples of population-specific and work setting-specific research and may encourage this type of research in other industries to gain insight into the match between work and worker. This may be of special relevance since we know that health complaints, whether or not work-related, are common in the general working population. However, there are also workplaces in which relatively low numbers of workers experience specific (work-related) health complaints. For example the relatively low prevalence of musculoskeletal complaints in the lower
extremities in workers of the communication sector compared to workers performing a more physical demanding job like that of workers in the construction industry.\textsuperscript{7} Another example is the relatively low prevalence of psychological health complaints in workers in the agriculture sector compared to workers in a more mentally demanding job like that of workers in the education sector.\textsuperscript{7} Furthermore, workers with health complaints may not automatically be restricted in their work; in the general Dutch work population it was found that about fifty percent of the workers that experienced chronic health complaints did not feel restricted in performing their work.\textsuperscript{7} Therefore, the kind of studies as presented in this thesis should only be performed in jobs with high demands or groups of workers where work-related health complaints and related work restrictions are expected to be highly prevalent. It is only then that extensively signaling of work and health problems is needed, and that performing population-specific and work setting-specific research seems the most valuable.

In chapter 7, a systematic review on the validity of self-report to assess the work relatedness of health complaints was presented. Self-report is a common approach used to assess work-related health complaints in, for example, labour surveys. For epidemiological and surveillance purposes it is important to know how well the self-reported work relatedness of health complaints reflects the judgement of the experts. Although there are many reviews on self-report, to the knowledge of the authors, no reviews evaluating the self-reported work relatedness of health problems have been presented up till now.

**Terminology**

A methodological point that needs to be addressed when considering the used study methods in this thesis is the variety in terminology that is used when talking about work aspects and workers’ resources. The use of different terms may lead to confusion when measuring work aspects and workers’ resources. In the General Introduction of this thesis, a conceptual model was presented to give insight into the aspects of work and workers, to define these terms and to describe their interrelationship. Based on this model, a distinction was made between work demands and workload to differentiate between the aspects in the work itself and their short-term effects. Work demands are based on the tasks and activities that have to be performed\textsuperscript{8}, while workload covers the direct human response due to work.\textsuperscript{9,10} However, these terms are often mixed up, as if they are the same. For example, the content of the Dutch VBBA scales\textsuperscript{11}, which were used in Chapter 6,
were developed to focus on measuring work demands. However, when studying the
questions of the subscales, not only questions on work demands level are included, but
also at workload level. For example, the question ‘do you feel personally attacked or
threatened in your work?’ focuses on the emotional effect (e.g. load) on the worker.
Furthermore, in the English language some subscales were translated into ‘load’ scales.
The fact that the questions are answered by means of self-report, which depends on the
experience of the individual worker, might also imply that in addition to the demands also,
the effects on the workers (e.g. workload) are automatically included in the answers. This
indicates that differentiating work demands and workload is not always that simple but
that both are important and relevant aspects when studying work and workers.

Assessment Methods
In Chapter 3, it appeared that several assessment methods were used to determine the
psychological work characteristics and workload of train drivers. Questionnaires,
observations as well as mental models and expert groups were identified as methods
used. There did not seem to be any standardized methods, which made it very difficult to
compare results and draw general conclusions. This is a general problem in studying
psychological work demands and workload. Since no golden standard method is available,
using more methods from several perspectives seems the best methods.

Regarding the assessment methods used in Chapter 4, the duration and intensity of the
assessment methods relative to a normal working day should be discussed. Concerning
the duration, it is important to realise that the capacities of the workers with chronic
disabilities are assessed during short-duration test situations, using the Ergo-Kit and
Melba, and are then translated to provide a prognosis about workers’ capacities for a
whole work day. Furthermore, regarding the intensity of observational assessment
methods, it is likely that ‘social facilitation’ might occur during the observational
measurement, which is an increase or decrease in behaviour in the presence of another. On the one hand, workers might try to perform to their maximum capacity
when they are being observed while in everyday practice it is not desirable and
reasonable to allow a worker to perform to their maximum capacities day in and day out.
On the other hand, workers may underperform on the tasks because the knowledge
of being watched can lead to low-self esteem and neuroticism. The translations of the
short-duration and high-intensity observational assessment methods to the prognosis of
the work capacities for a whole work day lack a solid basis. So, although observational
assessment methods seem useful to obtain a generic insight into workers’ capacities, these methods run the risk that workers’ capacities are under- or overestimated and more employees may be under- or overloaded when matching them on their jobs based on the results of capacity tests only. The consequence for chapter 2 might be that the found matches actually are not a perfect match but might also include some more under- and overload for the employees.

For an optimal job placement, it is recommended to combine information from different sources (e.g. anamnesis, physical examination, observation and task analysis) of both the worker and work. The occupational therapists in Chapter 4 combined information from the Ergo-Kit and Melba with the information from their intake (interests and job preferences), observations of workers and knowledge of availability of the jobs, before placing workers on a job. The use of both methods was considered complementary for the occupational therapists to provide insight into the level of functioning of workers in simulated work situations. However, the job placement seems to depend partly on the occupational therapists’ interpretation and judgement. The reliability of these types of methods is not guaranteed. Additionally, the occupational therapists did not gather standardised information from the workplaces before job placement. This was only done afterwards in the study of Chapter 4. In the future, to facilitate a match between workers with disabilities and work, both the work demands and workers’ resources should be assessed before matching workers with disabilities with work.

Another methodological discussion is the assumption that was taken that the judgement of a physician, using their clinical expertise, is the best standard available to assess the work relatedness of health problems (Chapter 7). In this thesis, the evidence found on the match between self-report and expert assessment on the work relatedness of health problems was scarce. Nevertheless, it may be suggested that it is not the judgement of the physician, but the self-report of the worker that reflects the most important outcome when studying the work relatedness of health problems. Even when the physician does not judge the health problem as being work-related, negative feelings of the worker towards their work demands and health may persist and may have negative consequences for their work functioning. So, despite the fact that the validity of self-report in relation to expert judgement was found to be low to moderate in a scarce number of studies, self-report has to be taken seriously as an adequate, fast and cost-effective method to assess the work relatedness of health problems. Adding well-developed questions to a specific
medical diagnosis exploring the relationship between health problems and work may be a good strategy.

**Interpretation of findings**

**Towards Interventions**
In this thesis, high physical work demands were found in train conductors and service electricians exceeding health guidelines, and high mental work demands were found in train drivers for whom specific psychological requirements seem to be valid. Furthermore, mismatches were found in workers with chronic disabilities and workers of different ages.

In general, when high demanding jobs or mismatches between work and workers occur, the focus should in the first place be on trying to lower the job demands and improving the match between work and workers in order to decrease the risk of work-related health complaints. It is generally assumed that prevention of work-related health complaints is more effective than treatment. Interventions can be invested at two levels, namely at the group level and at the individual level, both of which are discussed below.

**Interventions at the group level**
One way to implement preventive measures is at the group level, where all workers of an organisation are taken together. For instance, participatory ergonomic interventions can be implemented to decrease work demands or workload and that focus on ‘practical ergonomics with participation of the necessary actors in problem solving’.22 Both the systematic reviews of Rivilis et al.23 and Leyshon et al.24 suggest that there is partial to moderate evidence that practical ergonomics interventions have a positive impact on musculoskeletal symptoms in workers of different sectors23;24, reducing injuries and causing a reduction in lost days from work or sickness absence.23 However, further research is needed to support the effectiveness of ergonomic interventions23;24 and to determine the cost-effectiveness of ergonomic interventions in the workplace.25

Also the group of workers with chronic disabilities can be seen as a separate group that needs specific attention. People with chronic disabilities are just as likely to want a job and are similar in their views of the importance of income and job security as non-disabled persons are26, but they often experience difficulties with employment including obtaining and maintaining jobs.27;28 In this thesis, workers with disabilities were studied who were
working in a sheltered workshop. Sheltered workshops are specifically developed to provide employment opportunities for employees who are recognised as having a disability. This means that there is special attention and acceptance for the restrictions of these workers. Nevertheless, underload and overload were found in the studied social workshop of this thesis.

Nowadays, the (Dutch) government stimulates these employees to work in regular organisations, in order to promote the participation of workers with a disability in society.\textsuperscript{29} Regular organisations even receive subsidies when hiring workers with disabilities.\textsuperscript{29;30} However, the risk for workers with disabilities when working in a regular organisation is that they receive too little attention and are even more often mismatched on a job than occurred in a sheltered workshop. Furthermore, it is known that workers with disabilities often lack social acceptance by non-disabled colleagues\textsuperscript{31-34} and that the transition from a sheltered workshop to regular work requires training to improve certain skills of employees with disabilities.\textsuperscript{35} It is recommended to develop guidelines for groups of workers with specific disabilities, focussing on their health and work functioning. In line with this, Kirsh et al.\textsuperscript{32} presented a framework for guiding the development of further research and promoting changes to support work integration. Examples of adjustments that can be implemented at the group level and are often desired are adjustments in furniture or tools, amount of work and working times.\textsuperscript{36} In addition, individual attention to these workers seems necessary, which will be discussed in the section on interventions at the individual level.

Another strategy to implement interventions at the group level might be at the level of workers of different age groups. In this thesis it was studied if age-specific differences in the association between work and health complaints exist and if implementation of age-specific preventive measures might be considered as a useful intervention strategy. As stated before, much research has been done on the relation between age and health or age and work\textsuperscript{37-42}, but few articles have been published that studied the associations between age, health and work.

In this thesis it was found that the psychological health of older employees was significantly associated to adverse social support, while this was not the result in younger employees. Furthermore, older workers with musculoskeletal complaints desired other changes in work than their younger colleagues. This result was in line with the results of de Lange et al.\textsuperscript{43} who, in a work situation survey of Dutch workers, found that low social support from supervisors and colleagues was a significant predictor for decreased
psychological health (emotional exhaustion) in workers older than 50 years. Also, more years of work experience in the company was associated with emotional exhaustion. In a study that investigated the factors that influence early retirement in Dutch workers, it was also found that conflicts at work is an important factor for older workers to retire early. However, in the study of Nolen-Hoeksema & Ahrens, it was found that especially the work environment was valuable for older workers: work environment was more strongly related to depressive symptoms among older workers (45-55 years) compared to younger workers (22-35 years). For the younger workers, the result of this thesis was that emotional workload was more strongly associated with psychological health complaints and that younger workers with musculoskeletal complaints found it more desirable and feasible to switch to another job, compared with older employees. In other studies, evidence was found in younger workers that psychological health was associated with low workplace justice in Taiwanese workers and high job demands in Dutch workers.

It should be noticed that it is probably not the chronological age itself that determines the relation between work and health, but rather the factors that are prominent in certain age periods, like the home situation, interests and preferences. Even more important, since there is a high correlation between age and duration of work exposure, the relation between work and health is also dependent on cumulative work exposure.

Now it has become more clear that workers of different age-groups differ in the association between work and health, it is recommended to consider age-specific preventive measures. For example, during a yearly job evaluation, supervisors should focus on the younger workers on providing career guidance and training to enable them to switch between jobs successfully, whereas for older workers the focus should be for instance on the amount of work and social support in the workplace. However, longitudinal studies are needed to collect more evidence for these age-related differences. Attention should focus both on older and younger employees. Health should be monitored during the whole working career of employees starting from a younger age. This idea has also been stated by other studies that found age-related differences in work stress, work satisfaction, need for recovery and work ability.

To implement interventions at the group-level, specifically developed blueprints can be used to guide implementations of interventions in the workplace. For age-specific interventions too, literature is available that provides some general recommendations on how to adapt work organisations to keep older workers healthy on their job and make
sure that younger workers will age without any deleterious work effect later on.\textsuperscript{51} However, implementation of interventions at the group level are often hard to accomplish, for instance due to insufficient available resources (time, material, and personnel), an adverse organisational climate, scarce support of the intervention from management, supervisors and workers or unanticipated events.\textsuperscript{52-54} Furthermore, as mentioned earlier, the effectiveness of group-level interventions on sustainable employability needs a better scientific basis.

\textbf{Interventions at the individual level}

In this thesis, the focus was on studying groups (e.g. age groups and the specific group of workers with disabilities), because from a practical point of view it is often desirable to implement preventive measures to reduce health complaints collectively at the group level. However, discussing interventions at the group level, one might argue that groups of workers always consist of a range of individual workers with inter-individual differences in complaints, wishes and possibilities, who cannot all be treated as one. With interventions at the group level, common group problems may be solved but individual attention is still needed. Therefore, in addition to interventions at the group level, implementing preventive measurements focussing on the individual level must be considered as well.

First a ‘high-risk-profile’ must be established. Without knowing which individual workers experience problems in work or health, it is impossible to take specific interventions at the individual level. For example, company surveys that present percentages of employees with problems in health and work as an outcome can offer insight into common work and health problems, but do not record individual problems. Performing a periodic workers’ health surveillance (WHS) is relevant to trace individual workers who need health- and workability-related attention and to judge if there is a match or mismatch between work and worker throughout the worker’s careers.\textsuperscript{55} A WHS is a voluntary medical examination that an employer offers to their workers with the aim of detecting, preventing or treating high workplace risks and workers’ health problems, focussing on sustainable employability.\textsuperscript{56} For example a job-specific WHS in construction workers resulted in increased workers’ knowledge about their health status and increased work ability.\textsuperscript{57} Furthermore, preventative actions were advised more often, which turned out to be effective on health behaviour.\textsuperscript{57} Other examples of job-specific WHS programmes in highly demanding jobs are that of fire fighters\textsuperscript{58}, hospital physicians\textsuperscript{59} and nurses and health professionals.\textsuperscript{60}
For individual workers with disabilities, screening at the individual level for health and work problems seems useful as well. However, for this vulnerable group of workers, this might not suffice. This thesis supports screening both workers’ capacities and work demands, before placing workers with disabilities on a job. This could for example be a part of supported employment, which is an evidence-based practice for helping people with severe illness gain employment in regular work. However, in line with the European Law on Anti-Discrimination (2007), this procedure should be offered on a voluntary basis for these workers and may only be offered post-offer and pre-placement. In other words: assessment of workers and work should be performed to the advantage of the workers’ health, and employers may not refuse workers based on their disabilities.

After work and health problems have been individually traced, interventions should be implemented focussing on the individual problems. For example, cognitive behavioural theory-based training or physical exercise training focussing on coordination, strength and aerobic power can be implemented to decrease musculoskeletal complaints, which was done in four Danish job groups, i.e. cleaners, health-care workers, construction workers and industrial workers. Although the physical status of the workers seems to increase after such a training programme, the question remains as to whether the work functioning is therefore also improved. Furthermore, in addition to the evidence that individual interventions have positive effects on reducing disability pensions and sick leave days in workers that are already absent, research should also focus on the effect of these programmes with the purpose of prevention, i.e. sustainable employability in workers who do experience health problems but are still at work. Examples of such training programmes, specifically focussing on working with chronic diseases, are described in the thesis of Varekamp and Detaille.

In the studies of de Boer and colleagues, intervention programmes were created for workers of the construction industry and workers of a large international company which develops and manufactures electronic equipments who were at risk of early retirement detected by low work ability scores. The intervention in construction workers, based on individual counselling, education and coaching in the workplace, was slightly effective in improving the work ability but not in reducing work disability pensions. A more comprehensive multidisciplinary intervention programme was recommended. Workers at risk of early retirement who followed an occupational health intervention programme had better work ability six months after baseline, less burnout and better quality of life than employees in the control group. Although these effects faded after
two years, this programme proved to be a promising intervention in the prevention of early retirement.

Oude Hengel and colleagues\textsuperscript{73} studied the effect of an intervention programme for construction workers consisting of individual training sessions of a physical therapist, a rest-break tool and empowerment training sessions. No effects were found on improving work engagement, social support at work and need for recovery. So, continuing development of interventions and studies on its effectiveness on sustained employability in specific work settings remains necessary.

\textit{Combining interventions at the group and individual level}

A combination of both interventions at the group level and at the individual level seems the most effective strategy to optimise workers’ health. For example, in the Netherlands an age-dependent guideline was developed and implemented for waste collection. This guideline specifies different work methods and prescribes maximum acceptable work demands in terms of maximum number of bags/containers and maximum number of hours that waste collecting tasks may be performed during an eight-hour working day.\textsuperscript{74} In addition to this intervention at the group level, a periodic WHS was suggested to monitor specific work-related diseases of individual workers. The combination of such a group intervention in combination with an individual level as ‘safety net’ minimise the chance of missing workers in the process of assessing and improving occupational health. However, to prove the effect of these dual interventions on the match between work and workers and thereby sustainable employability, evaluation studies are scarce but needed.

\textbf{Recommendations for practice and research}

\textbf{Recommendations for practice}

\textit{Detect mismatches between work and workers}

In this thesis, mismatches between work and workers, leading to high risks of problems in work and health, occurred. In order to detect these mismatches in the companies at both the group and individual level, it is recommended to:
• **Improve the interaction between employers and occupational health services.**
  The role of employees is to be the first to alert employers of problems in work and health. Next, employers should take an active role to appeal to occupational health services and occupational physicians. So, employers should take the responsibility for detecting mismatches of work and workers and for asking for advice from experts. These parties together should take responsibility in initiating the development and implementation of desirable interventions at both the group and individual level.

• **Establish high-risk profiles for workers who really need individual attention and interventions.**
  For worker settings with specific high physical or psychological job demands, mandatory (pre- and on-employment) medical examinations are needed. For work settings where no specific high job demands are found, but where health problems are prevalent, it is recommended to offer a voluntary (job-specific) WHS to trace mismatches between work and workers. The Dutch Guidelines workers’ health surveillance should be used to develop and implement a (job-specific) WHS. With a WHS, individual problems can be signalled whereupon individual interventions can be taken.

**Take Action: Implement interventions**
Since mismatches between work and workers were found, (monitoring of) implementation of interventions is needed.

• **Special attention for workers with disabilities**
  In this thesis, assessment of workers’ capacities and work demands was found to provide useful information to assess whether workers with chronic disabilities can be placed on a job. It is therefore recommended to assess and document the work demands of jobs offered to workers with disabilities. After hiring a worker with disabilities, a voluntary post-offer pre-placement assessment should be offered to assess the workers’ capacities. Thereafter it is possible to place these vulnerable workers on a job where workers’ capacities match the work demands of a job, or adapt the demands of a job, in order to diminish the risk of work-related health problems.
• **Consider age-specific interventions**
Since age-specific differences in the mismatch between workers and work were found, it is recommended to consider the implementation of age-specific measures in work to optimise workers’ health and keep workers healthy on their job throughout their career. For example, in a (job-specific) WHS programme, including protocols focusing on age-specific policy should be considered.

**Recommendations for research**

**Develop Assessment Methods**

• **Develop better assessment methods to detect mismatches.**
In this thesis, advantages and disadvantages of several assessment methods for the assessment of work and workers were discussed. Reliable and valid methods are the starting point for improving the assessment of workers’ capacities and work demands in order to assess the match between them. Furthermore assessment methods should be developed to screen workers on specific work requirements needed to perform their job.

• **Develop assessment methods for self-report of the work relatedness of health problems.**
Since workers’ self-report may provide valuable information of the presence of work-related health problems, evidence-based questionnaires should be developed to explore these health problems and the relationship with the work.

**Study the Effect of Interventions on Workers’ Health**
In order to help companies in offering evidence-based interventions for workers after detecting mismatches, further research into the effectiveness of group- and individual-level interventions on sustainable employability are needed.
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