

Work functioning beyond return to work past cancer diagnosis

The impact of chronic late effects of cancer treatments, autonomy and support at work on work functioning 2 - 10 years past cancer diagnosis

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Ingrid G. Boelhouwer

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CHAPTER 1



General introduction

General introduction

Ten years ago, in 2012, in the Netherlands 103,464 people were diagnosed with cancer, of which 14,331 with invasive breast cancer. On May 23rd, 2012, one woman sent the following email to her colleagues after being diagnosed with this type of cancer: *“Dear all, this morning I heard that I have breast cancer. So, there was little time between the moment I noticed something myself (on Ascension Day) and the diagnosis. It’s amazing how much your life can change in one week. I will have to undergo some additional examinations before the treatment plan is made. Until ‘something’ happens, I want to do everything at work as usual, but good planning is extra important now of course. Anyhow, you are all informed. See you again in the workplace.”* This woman’s PhD dissertation you are reading now.

That day in May 2012 marked the start of a period in which my body and my mind went through a lot. A new world was entered and discovered; primarily a medical world, in which people are suddenly very vulnerable. I didn’t want to be there, but I knew that I had no choice if I wanted to survive. However, looking back, that’s when the preliminary investigation of this research started as a sort of unplanned participatory observation, for instance during conversations with fellow patients during the chemotherapy or interacting about experiences and ideas in an online support group with peers in different stages of recovery and several of those peers with recurrent or metastatic disease. It was also in those peer groups that I first heard about possible late effects of cancer treatments. But above all, it was clear how lives were turned upside down and also realizing that not all of us would survive was an undeniable reality that put everyday life in another perspective, including work.

People who are diagnosed with cancer may feel they look death in the eye. Even with relatively favorable survival percentages at group level, many people will fear not to outlive. The risk of not making it is real. Moreover, a number of people know immediately or fairly soon after the diagnosis that they have distant metastases. The experiences that people confronted with cancer share, are impressive. Some of these experiences appeared in the media or were documented in writing (Bastiaan-Trinthamer, 2017; Buurman, 2020; De Groot, 2017; Hairwassers, 2009). Getting a cancer diagnosis and the treatments are usually an intense experience. It is sometimes said that there is a life before diagnosis and a life past diagnosis.

The extent to which people can, must and want to do paid work after a cancer diagnosis will vary. Some can no longer work. It is also possible that people decide for themselves not to carry out paid work anymore, because work is prioritized differently than before. However, work can remain very important, not only from a financial point of view, but also from a personal point of view wanting to continue ‘normal life’. A significant group of workers who have had cancer in the past and have returned to work are now active in the labour market and this group is increasing in size.

For some time, research has been done on work functioning during the first two years past diagnosis and prognostic factors for return to work. However, much less is known

about the period thereafter, beyond return to work. The main research focus on the first two years past cancer diagnosis in the Netherlands has undoubtedly arisen from the use of a two-year period for reintegration within the Dutch sickness and absenteeism legislation and has therefore influenced the study populations of studies aimed at work after cancer diagnosis. As a result, we hardly know how workers are doing beyond return to work past cancer diagnosis.

However, workers beyond two years past diagnosis may experience physical complaints, fatigue or cognitive complaints associated with the cancer treatments. Therefore, the focus of this PhD research is on these chronic late effects of cancer treatments 2 - 10 years past cancer diagnosis and work functioning. However, this general introduction first focuses on workers confronted with a cancer diagnosis and on possible return to work during the first two years. Thereafter, the possible late effects of cancer treatments among workers more than two years past cancer diagnosis are brought forward. Next, in line with the Job-Demands Resources model (Bakker & Demerouti, 2017; Bakker & Demerouti, 2007), the focus is on possible targets for interventions in the workplace derived from this model, namely autonomy and support at work. Finally, the aim, objectives, research questions and outline of this thesis are presented.

Workers confronted with a cancer diagnosis and return to work

The most recent figures concern the year 2021. In that year, almost 124,000 new cases of cancer were diagnosed in the Netherlands (IKNL, 2022). The 5-year survival rate in the Netherlands increased from 25% to 65% over the past 60 years (Kanker.nl, 2020). The chance of surviving cancer varies greatly depending on the characteristics of the cancer (for example, the type of cancer, the stage, and genetic characteristics). For the most common type of cancer of working age women, breast cancer, the general 5-year survival rate for those diagnosed in 2017 was reported to be 88% (KWF, 2022). It is estimated that every year about 50,000 workers are confronted with a cancer diagnosis. More than a decade ago, the prevalence of cancer among the working population in the Netherlands was estimated at a few per cent (Kuijpers, 2008). This prevalence will only have increased further and will continue to rise.

The shock that a cancer diagnosis can give, affects not only the person with cancer, but also the surrounding social environment. If the person who gets cancer is also active on the labor market, the diagnosis can be a shocking message for colleagues, supervisors, employers and for customers as well. The worker confronted with a cancer diagnosis, colleagues, supervisors and others within and outside the working environment, will all experience feelings and have perceptions about this situation. These perceptions largely determine how one handles possible choices regarding work and also if and how one communicates about the situation. Recovering working life is not always easy, however certain factors influence the success of the return to work.

For some time now, research has been done on prognostic factors for return to work after a cancer diagnosis (Islam et al., 2014; Spelten et al., 2002; Sun et al., 2017; Van

Muijen et al., 2013). Various health related factors play a role in return to work. Certain groups are at highest risk of disability or quitting work, such as those with cancer of the central nervous system, head and neck, and Stage IV blood and lymph malignancies (Short et al., 2005). Behavioural factors are also focus of studies concerning return to work. Both employers and workers are in need of support (Tiedtke et al., 2017). In recent years, more attention also has been paid to discussing the role of work in the patient's life as soon as possible after diagnosis within the healthcare. New strategies were recommended to integrate return to work support in the medical oriented cancer care in the Netherlands (Tamminga et al., 2010). Regularly, attention is drawn to the consequences of the currently separated domains between the Ministry of Health, Welfare and Sport and the Ministry of Social Affairs and Employment in the Netherlands given the importance for all workers of facilitating structural financing of work-oriented care (Senden et al., 2018).

The vast majority of workers who were confronted with a cancer diagnosis is still active in paid work in the years after diagnosis. A recent systematic review and meta-analysis reports a general long term return-to-work rate of 73% (De Boer et al., 2020). Furthermore, it is reported that the self-employed more often continue working during treatment (Torp et al., 2019). However, cancer survivors were 1.4 times more likely to be unemployed than healthy control participants (De Boer et al., 2009).

Interventions with the aim to enhance return to work do not all show an effect. A Cochrane systematic review and meta-analysis covering fifteen randomised controlled trials (De Boer et al., 2015), included four types of interventions; 1) psycho-educational, learning participants about physical side effects, stress and coping, also using group discussions, 2) physical, with exercises such as walking, 3) medical, like medical function conserving versus medical more radical treatments, and 4) multidisciplinary interventions in which for instance vocational counselling, patient education, patient counselling, biofeedback-assisted behavioural training and/or physical exercises were used in various combinations. No vocational intervention exclusively aimed at work-related issues was found. The review and meta-analysis showed that multidisciplinary interventions, that also may involve vocational components, led to more return to work than care as usual (De Boer et al., 2015). This seems to indicate that the components related to the work environment offer opportunities, which may have a positive impact on the numbers of return to work after a cancer diagnosis. Since this review, a Dutch study concerning the effectiveness of a web-based intervention targeted at employers with the objective of enhancing cancer survivors' successful return to work was published. However, a follow-up study with an alternative study design was reported to be necessary (Greidanus et al., 2021). Therefore, no clear statement can be made at this point about the effect of vocational interventions with the aim to enhance return to work. Hence, evidence-based interventions aimed at workers past cancer diagnosis beyond return to work to support their work functioning and to prevent relapse have not yet been identified.

Workers more than 2 years past cancer diagnosis and possible late effects of cancer treatments.

Cancer treatments usually produce several side-effects that occur quickly and in many cases disappear again after the treatments. However, less is known about the undesirable effects of the treatments that last for a long time or even just become noticeable months or years after the treatments (Stein et al., 2008). These so-called late effects may persist for many years or can even be characterized as chronic (Phillips & Currow, 2010) and may affect work functioning.

The late effects of cancer treatments concern several physical and psychological changes (Ganz, 2001; Heins et al., 2022). Already in the last century several physical late effects were well-known, for instance, the physical late effects of radiotherapy (Wallgren, 1992). Also surgery, endocrine therapy and other systemic treatments were already reported to cause a range of late effects such as lymphedema (Cormier et al., 2010), cardiovascular disease (Drafts et al., 2013; Keating et al., 2006), or osteoporose (Miller et al., 2016). Furthermore, a common and persistent late effect is fatigue (Minton et al., 2013; O'Higgins et al., 2018; Prue et al., 2006; Reinertsen et al., 2010; Wagner & Cella, 2004), although the prevalence of cancer related fatigue varies between studies (Prue et al., 2006). However, this does not alter the fact that the number of people that has or has had cancer in the past suffering 'a lot' from fatigue is significantly higher than in the general population (IKNL, 2019). Fatigue because of cancer or cancer treatments has been described as disproportionate to the effort exerted, occurring intensely and unexpectedly. Another possible late effect are cognitive problems. Cognitive problems are reported as possibly occurring after chemotherapy (Schagen et al., 1999; Wefel et al., 2011; Wefel & Schagen, 2012), and also may be an effect of endocrine therapy (Bender et al., 2015; Ehrenstein et al., 2020; Oerlemans et al., 2021; Schilder et al., 2010). Cognitive problems, for instance, involve concentration, learning and memory. There are two methods to assess problems with cognitive functioning: self-report or neuropsychological examination. Self-reported problems with cognition are referred to as cognitive complaints, and problems identified using a neuropsychological examination are referred to as cognitive impairments. A neuropsychological examination uses validated tests, and the results are compared against group norms or premorbid functioning. In this way deficiencies can be identified on specific neuropsychological domains. Cognitive impairments identified in a neuropsychological examination and self-reported cognitive complaints do not have to go together (Poppelreuter et al., 2004). Just like fatigue, the number of people that has or has had cancer in the past suffering 'a lot' from cognitive complaints is significantly higher than in the general population (IKNL, 2019). Self-perceived problems in cognitive functioning are therefore clearly also a late effect observed among people with a past cancer diagnosis, notably most of all among those younger than 50 years (Oerlemans et al., 2021). Research also shows that self-reported cognitive complaints can be related to psychological distress (Hutchinson et al., 2012) or with fatigue and emotional functioning (Wefel et al., 2015; Wefel & Schagen, 2012). Within this PhD project data has been collected exclusively on self-reported late effects and therefore studies self-reported cognitive complaints and work functioning.

In general, workers more than two years past cancer diagnosis will undoubtedly be a diverse group, because of the broad range of effects of treatments and possible visible and non-visible impairments and complaints. However, it is also important to immediately mention that not everyone who has been treated for cancer is confronted with late effects of cancer treatments, but a part of this group does, possibly even without realising themselves that the complaints are in fact late effects.

Furthermore, the majority of cancer therapies also have the potential to complicate various possible pre-existing chronic comorbid conditions (Ogle et al., 2000). Only few significant differences between disability rates for cancer and chronic diseases are reported, which may be an argument for viewing cancer survivorship as a chronic condition as well (Phillips & Currow, 2010; Short et al., 2008). On the other hand, workers who have had a cancer diagnosis will possibly experience their condition as fundamentally different and more threatening than those with a history that does not include cancer diagnosis, although the symptoms of certain chronic diseases objectively resemble the late effects after cancer treatments. That is why it is important to study the group that had cancer separately.

Not directly related to the treatment, but rather to having or having had cancer are psychological complaints, for instance anxiety (Mitchell et al., 2013) or the fear of the recurrence or progression of the cancer (Lebel et al., 2016; Mutsaers et al., 2020; Sharpe et al., 2018; Völker & Verhulst, 2018). While one person can be convinced that he or she has been cured quite quickly, another person must cope for many years with the uncertain risk to be diagnosed with distant metastases, such as, for example, in the bones, lungs or in the brain. Furthermore, some workers know they have metastases and are active on the labour market. They may fear progression of the disease. In other words, many may live a life with an uncertain perspective.

It is unclear to what extent workers more than two years past cancer diagnosis want to be transparent and can be clear about their medical situation, feelings, and problems within their work situation. There may be workers choosing to be covert about the diagnosis as much as possible, and colleagues and supervisors may not be informed about this previous life event and the treatments that the worker has undergone, or maybe still is undergoing. Furthermore, it is also unclear, for example, to what extent late effects of cancer treatments are shared with professionals. For example, a Dutch study showed that only 27% of breast cancer survivors experiencing fatigue and 8% of those experiencing memory and concentration problems visited a healthcare provider for this problem (Heins et al., 2022). Possibly, these problems are shared more openly within patient associations, walk-in centres and patient-support groups. The Dutch Federation of Cancer Patient Organizations (NFK) draws attention to the issue of the possible late effects of having been confronted with cancer and having undergone (or still undergoing) cancer treatments (NFK, 2022), and these effects may also affect work functioning. If the worker is affected by late effects of cancer treatments like physical complaints, fatigue or cognitive complaints, the work tasks and functioning within the work environment may be experienced as more difficult than before the cancer diagnosis. However, studies on this issue are scarce. It is important to know what targets

for interventions within the work environment are available or may be introduced in order to reduce the influence of the late effects of cancer treatments on work functioning in order to prevent relapse and to enhance work functioning.

The associations of late effects of cancer treatments and work functioning: targets for interventions.

This PhD research focuses in particular on work ability and burnout complaints as outcome measures for work functioning, as these are both well-known and useful measures. Work ability generally refers to the extent to which someone is able to carry out his or her work, taking the demands of the job, and health and mental resources into account (Ilmarinen et al., 2005). Work ability is mostly measured by one or more items of the Work Ability Index (WAI) questionnaire (Ilmarinen, 2007). The level of work ability is regarded as a valid indicator for other work outcome measures, like disability pension (Alavinia et al., 2009). Work ability is also reported to be negatively related to sickness-related absences, future disability status, and withdrawal behaviors (Cadiz et al., 2019), and therefore work ability is important to preserve and enhance. There are already studies available that focus on the work ability of workers past cancer diagnosis. Burnout complaints are regarded as a prolonged stress response to chronic stressors at work. Burnout can be defined by three dimensions; exhaustion, cynicism, and inefficacy (Maslach et al., 2001), which are in line with the subscales of the Utrecht Burnout Scale (UBOS) (Schaufeli & Van Dierendonck, 2000). A lot of studies have been done concerning burnout complaints among various groups of workers, such as absenteeism among university personnel indicating that the burnout dimension 'emotional exhaustion' predicted exceptional absenteeism (Schouteten, 2017). Burnout complaints among the population of workers more than two years past cancer diagnosis have not previously received attention within scientific studies, as far as known. Furthermore, maybe burnout complaints experienced by workers past cancer diagnosis may be less easily recognizable or appear to be intertwined with the symptoms that the possible late effects of cancer treatments can cause. As the choice of interventions will also depend on the causes of the symptoms, it is therefore important to study this issue specifically among workers beyond a cancer diagnosis.

All in all, for workers past cancer diagnosis it is important to preserve or enhance work ability and prevent clinical burnout, despite the late effects. When the experienced late effects can be overcome by organizing the work and the interactions in a certain way, this is a gain for the worker and for the organization or company. Therefore, an important question within this PhD research is what factors available in the workplace can be identified to optimize work ability and prevent burnout complaints given that the possible late effects of cancer treatments may lower work ability, resulting in job demands being experienced higher.

Possible targets for intervention: job resources

One of the many issues needing answers is insight into the effective components of rehabilitation for work retention in cancer survivors (Feuerstein, 2009). Generic strategies and elements of the interventions for workers with chronic conditions may be suitable for this population as well, but interventions specifically aimed at the post-cancer-

diagnosis population are considered important (Stapelfeldt et al., 2019). However, research into work-site adjustments among workers more than two years after cancer diagnosis is scarce. One study concerned workers in Norway ($N = 563$) 15–39 months after cancer diagnosis and reported that the most common work adjustments were to reduce/change the number of work hours per week and to change work tasks to reduce physical and mental strains (Torp et al., 2012). Also a modified workstation or a modified schedule was suggested for workers beyond cancer diagnosis (Alleaume et al., 2020). A study concerning work adjustments in a representative sample of employees with a chronic disease in the Netherlands (Boot et al., 2013) focused on working times as well, and among others also on the amount of work and tasks or job.

The measures taken by employers to enhance the work functioning of employees can be classified as accommodative measures or vitalizing measures (Van Vuuren, 2012; Van Vuuren & Van Dam, 2022). The above-mentioned measures can be classified as accommodative measures, as these are meant to adapt the workload. However, sometimes such measures may be experienced by the worker as taking away tasks or responsibilities without insight into what gives pleasure at work (Van Rooijen, 2021). Furthermore, researchers report that these accommodative measures may not be the most effective to stimulate sustainable employability, while vitalizing measures may offer more results, not only among the older working population (Van Dam et al., 2016; Van Vuuren, 2012). Therefore, this PhD research is focused on vitalizing measures, specifically job resources in the workplace according to the well-established Job Demands-Resources (JD-R) model, with the aim to enhance work ability and to prevent burnout complaints.

Job Demands-Resources model

This PhD research investigates a number of job resources, according to the well-established Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2007; Lesener et al., 2019) as possible targets for interventions to optimize work ability and prevent burnout complaints. The JD-R model focuses on job demands, the aspects of the job that require effort, and on job resources, supporting factors in achieving work goals (Demerouti et al., 2001) or reduce job demands (Schaufeli & Bakker, 2004). Job resources may be more personally oriented, or clearly linked to activities and behaviour within organizations and in the workplace. The latter group of job resources is studied in this PhD research project. Among general populations, job resources are reported to be positively related to work ability (Brady et al., 2019) and also reported to buffer the impact of job demands on burn-out (Bakker et al., 2005; Xanthopoulou et al., 2007).

The assumption in this PhD project is that the complaints that are related to the late effects of cancer treatment (physical complaints, fatigue or cognitive complaints) can increase the perception of job demands because these are experienced as heavier due to less work capacity. Then, the question is whether the investigated job resources (autonomy and support at work) have a positive direct effect on work ability or burnout complaints or even a buffering effect on the presumed relationship between the late effects of cancer treatments and lower work ability or higher burnout complaints. See Figure 1.

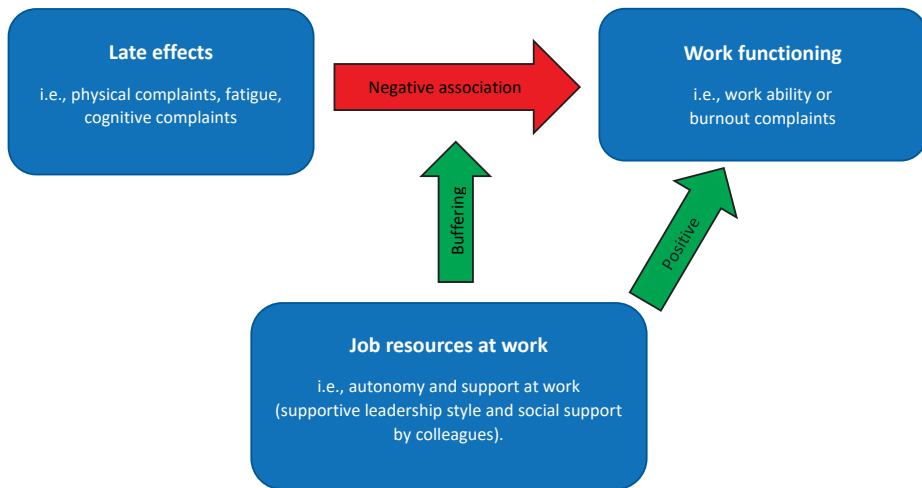


Figure 1. Study-model.

Aim, objectives, research questions and outline of this thesis

First, it is important to point out that this research enters an area about which little is known. Workers who were confronted with a cancer diagnosis several years ago and who have already returned to work receive less attention from researchers than when they are relatively short after diagnosis.

This PhD project combines several perspectives, namely from 1) the workers, 2) the managers or supervisors, in other words employers, and 3) the professionals who provide support or guidance regarding work or aimed at functioning within the context of work. First, the aim is to identify possible negative associations between the late effects of cancer treatments (i.e., physical complaints, fatigue and cognitive complaints) and work functioning. Second, the effect of a selection of job resources are studied to identify possible targets for interventions in the workplace to stimulate work ability and to prevent burnout complaints, among workers who experience relatively high levels of physical complaints, fatigue or cognitive complaints 2 - 10 years past cancer diagnosis.

This central research question is divided in five sub-questions:

1. *What is the current state of knowledge about the association between possible late effects of cancer treatment (physical complaints, fatigue or cognitive complaints) and work functioning in workers, more than two years after the cancer diagnosis, who returned to work, and about the possible buffering by job resources of this assumed association?* This question is answered by a systematic literature review in **Chapter 2**. The associations between possible late effects of cancer treatment (i.e., physical complaints, fatigue, or cognitive complaints) and work ability among workers beyond two years after cancer diagnosis who returned to work was investigated using 36 included quantitative studies. The role of job resources (social support, autonomy, leadership style, coaching, and organizational culture) is also evaluated.
2. *What is the influence of psychological and/or physical chronic diseases on occupational well-being and do job resources buffer this presumed relationship?* This question is answered by a quantitative cross-sectional study among employees ($N = 1951$) in educational and (semi-) governmental organizations in the Netherlands ($N = 1951$) in **Chapter 3**. Only nine participants were confronted with cancer without comorbidities, which made separate analyses for this group impossible from a methodological point of view. The association of chronic diseases (i.e., physical, psychological, or both physical and psychological) with occupational well-being (i.e., work ability, burnout complaints, and work engagement) was studied, as well as the association of four job resources (i.e., autonomy, social support by colleagues, supportive leadership style, and open and communicative culture) with occupational well-being and buffering of the presumed relationship of chronic disease group with occupational well-being.
3. *What is the association of late treatment effects (physical complaints, fatigue and cognitive complaints) and of job resources (autonomy, supportive leadership style, and colleagues' social support) with the future work ability of employees living 2 - 10 years beyond a breast cancer diagnosis?* This question is answered by a quantitative longitudinal study among this population ($N = 287$) in **Chapter 4**.
4. *To what extent do the late effects of cancer treatment (physical complaints, fatigue, and cognitive complaints) and job resources (autonomy and supportive leadership style) have an association with future burnout complaints among employees with a breast cancer diagnosis 2 - 10 years ago?* This question is also answered by a quantitative longitudinal study among this population ($N = 287$) in **Chapter 5**.
5. *What are the experiences and ideas of managers or supervisors and professionals about the guidance of workers in the case of late effects of cancer (treatment) and what is their idea regarding the effect of autonomy, social support by colleagues and an open organisational culture?* These questions were investigated with a qualitative survey design, in which semi-structured interviews were conducted with managers or supervisors ($N = 11$) and professionals ($N = 47$). The results of this study can be read in **Chapter 6**.

Finally, in **Chapter 7** the conclusion of this thesis will be presented in the general discussion.

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CHAPTER 2



The associations between late effects of cancer treatment, work ability and job resources: A systematic review

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Abstract

Objective. The aim of this review is to evaluate associations between possible late effects of cancer treatment (i.e. physical complaints, fatigue, or cognitive complaints) and work ability among workers beyond 2 years after cancer diagnosis who returned to work. The role of job resources (social support, autonomy, leadership style, coaching, and organizational culture) is also evaluated.

Methods. The search for studies was conducted in PsycINFO, Medline, Business Source Premier, ABI/Inform, CINAHL, Cochrane Library and Web of Science. A quality assessment was used to clarify the quality across studies.

Results. The searches included 2303 records. Finally, 36 studies were included. Work ability seemed to decline shortly after cancer treatment and recover in the first 2 years after diagnosis, although it might still be lower than among healthy workers. No data were available on the course of work ability beyond the first 2 years. Late physical complaints, fatigue and cognitive complaints were negatively related with work ability across all relevant studies. Furthermore, social support and autonomy were associated with higher work ability, but no data were available on a possible buffering effect of these job resources on the relationship between late effects and work ability. As far as reported, most research was carried out among salaried workers.

Conclusion. It is unknown if late effects of cancer treatment diminish work ability beyond two years after being diagnosed with cancer. Therefore, more longitudinal research into the associations between possible late effects of cancer treatment and work ability needs to be carried out. Moreover, research is needed on the buffering effect of job resources, both for salaried and self-employed workers.

Introduction

A growing number of people in the workforce have experienced a cancer diagnosis at some time during their life. The majority of working people diagnosed with cancer re-enter the workplace. The mean rates of return to work reported in reviews are 62% (Spelten et al., 2002), 64% (Mehnert, 2011), and 73% (De Boer et al., 2020). Return to work pathways vary, among others because of differences in reintegration strategies between countries (Kiasuwa Mbengi et al., 2018), the availability of disability pension (Tikka et al., 2017), or the effectiveness of programs to support return to work (De Boer et al., 2015).

Compared to healthy people 1.4 times more unemployment is observed among cancer patients (De Boer et al., 2009). However, the group of workers with a cancer diagnosis in their life history will continue to expand as survival rates are greatly improving, as the incidence of cancer is expected to rise a further 75% over the next two decades (Stewart & Wild, 2014; World Health Organization, 2012) and as the retirement age is expected to be raised even further in many countries. As studies concerning cancer and work merely focus on the first two years after diagnosis and often concern whether people return to work, less is known about the population after return to work beyond these first two years. As a consequence, it is important to focus on the occupational well-being and the situation in the workplace of this group of workers after they returned to work.

A range of long-term physical and psychological changes can be experienced by cancer survivors (Ganz, 2001). These changes may present during active treatment and persist on the long term, beyond the first two years after cancer diagnosis, or changes may appear months or years later as late effects (Stein et al., 2008). As a clear distinction between long-term and late effects is not always possible, in this review all these long-term changes that affect daily functioning are indicated as late effects in line with the definition of the Dutch Federation of Cancer Patient Organizations (Dutch Federation of Cancer Patient Organizations NFK, 2017). Late effects of cancer treatment include, for instance, fatigue (Prue et al., 2006; Reinertsen et al., 2010; Servaes et al., 2007), lymphedema (Cormier et al., 2010), cardiovascular disease (Drafts et al., 2013; Keating et al., 2006), osteoporosis (Miller et al., 2016), anxiety (Mitchell et al., 2013), fear of recurrence (Lebel et al., 2016), or cognitive complaints (e.g. problems with concentration, learning and memory) (Wefel et al., 2015). Late effects of cancer treatment may continue to influence the ability to function at work for as long as ten or even more years after diagnosis (Koppelmans et al., 2012; Silver et al., 2013). The Dutch Federation for Cancer Patient Organizations reported that impairments resulting from these late effects were experienced in particular also in the context of work (Dutch Federation of Cancer Patient Organizations NFK, 2017). This underlines the importance of studying late effects in the context of work.

To make comparisons possible it is necessary to study the associations of late effects of cancer treatment with a work outcome measure also used in studies among the general population or populations with chronic diseases. Therefore, a useful concept is 'work ability', which generally refers to the extent to which someone is able to carry out their work, taking the demands of the job, and health and mental resources into account

(Ilmarinen et al., 2005). Work ability is reported to be a predictor of other work outcome measures among healthy populations, like absenteeism or early retirement (Ilmarinen & Tuomi, 2004). In general, different (chronic) health problems are reported to be associated with decreased work ability (Leijten et al., 2014), and predictors of work ability are similar for workers with and without chronic health conditions (Koolhaas et al., 2014). However, other definitions are also used in the scientific literature (Lederer et al., 2014) and measurement methods of work ability may vary between studies (Brady et al., 2019; Cadiz et al., 2019). About a decade ago in an overview by Munir, Yarker, and McDermott (2009) on work ability and cancer, it was reported that very few well-validated measures of work ability had been used in previous studies. Therefore, it is important to report about the way work ability was assessed in the included studies within the current systematic literature review as well.

Furthermore, it is important to determine whether specific supporting factors in achieving work goals, so-called job resources within the Job Demands-Resources (JD-R) model (Demerouti et al., 2001), demonstrate an association with work ability in this specific population workers past cancer diagnosis or if job resources can even buffer a possible negative association of late effects of cancer treatment with a lower work ability. In the JD-R model, job demands are regarded as the aspects of the job that require effort and it is possible that the late effects of cancer treatment result in work demands being experienced as heavier. Furthermore, across studies among general populations job resources are positively related to work ability (Brady et al., 2019). In addition, in some studies job resources were reported to buffer the impact of job demands on burn-out (Bakker et al., 2005; Xanthopoulou et al., 2007). Clearly, job resources in the current work situation might be of great importance for work functioning among workers experiencing any late effects of cancer treatment after they returned to work.

As there is a shift in labor markets towards more flexible contracts, and smaller enterprises, the subpopulation of self-employed, freelancers and entrepreneurs, in other words the non-salaried, grows in several European Union member states (CBS, 2019). These workers show different behavior after a cancer diagnosis than the salaried (Torp et al., 2018), as they more often continue working during treatment and take fewer time off work due to cancer. This might be due to the financial necessity to earn an income. Another difference is that the non-salaried have neither an employer, a supervisor, a human resource manager, an occupational physician, nor colleagues to provide job resources such as social support.

In short, this systematic literature review will focus on the work ability of all people working after a cancer diagnosis and cancer treatment (salaried and non-salaried). The aim is to present an overview of the studies that present data on work ability, also reporting on the method used to assess work ability. Furthermore, any available results on a possible association of late effects (physical complaints, fatigue or cognitive complaints) and work ability beyond the first 2 years after diagnosis will be reviewed. Finally, the role of job resources will also be evaluated.

Methods

Search strategy

To structure this systematic literature review the checklist of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used (Moher et al., 2009). Systematic searches for publications were conducted on March 10th, 2020 in the databases PsycINFO, Medline, Business Source Premier and CINAHL, and on March 13th, 2020 in the databases ABI/Inform, Cochrane Library and Web of Science. Search terms were determined by the first author and an information specialist in mutual agreement with the other authors. In general, the search consisted of search terms for cancer combined with search terms for paid work. Search terms were broad to ensure no relevant studies would be missed. No restrictions were placed on publication date. For full search strategies, see Appendix 1. Additional searches consisted of citation tracking by the first author to discover articles not found by the systematic search.

Inclusion criteria: considered studies had to (1) be published in English peer-reviewed journals, (2) be an original quantitative research article (including pilot studies), (3) focus on work ability in people working after a cancer diagnosis, and (4) include adults (18 years or older).

Exclusion criteria: articles were excluded if they focused on (1) work-related risk factors for cancer, or (2) the ability to work if regarded as the ability to be at work rather than in the sense of work ability during work, or (3) populations entirely without paid work, or (4) populations entirely on long term sick leave, or (5) predicting return to work by work ability, or (6) the assessment of the effect of an intervention regarding return to work after a cancer diagnosis.

Study selection

First, after the removal of duplicates, the search results were screened by title and abstract in Rayyan (Ouzzani et al., 2016) independently by the first author and two other researchers (the second author and research trainees). Those papers clearly not relevant to this review were eliminated. In case of a missing abstract or missing relevant details needed for screening, full paper copies were retrieved and screened. Second, the then included papers were used for additional citation tracking by the first author to identify possible additional studies. Third, the three authors discussed the eligibility of the remaining papers based on the criteria for inclusion and exclusion.

Data extraction

After this, the first author extracted a range of data from the included papers relevant for this review, including data on (1) study design, (2) population (e.g. number of participants included in analyses, age, gender, cancer type, time since cancer diagnosis), (3) setting, (4) the assessment method of work ability, (5) possible late effects of cancer treatment, namely physical complaints, fatigue, and cognitive complaints, and (6) possible job resources (leadership style, coaching, organizational culture, social support, and autonomy). This data-extraction was reviewed by the second and the third author.

Study characteristics

The searches included 2303 records, including two results by additional citation tracking. After the removal of duplicates, 1565 titles and abstracts were screened. After elimination of the studies clearly not relevant to this review and after close reading 36 studies remained. A reason for this decrease in numbers was that studies on cancer and work mostly concern whether people return to work during the first 2 years after diagnosis and that these studies also focus on many other work-related aspects other than work ability. The study selection is documented in a PRISMA flow diagram, see Fig. 1. The data-extraction of the 36 studies is presented in Table 1.

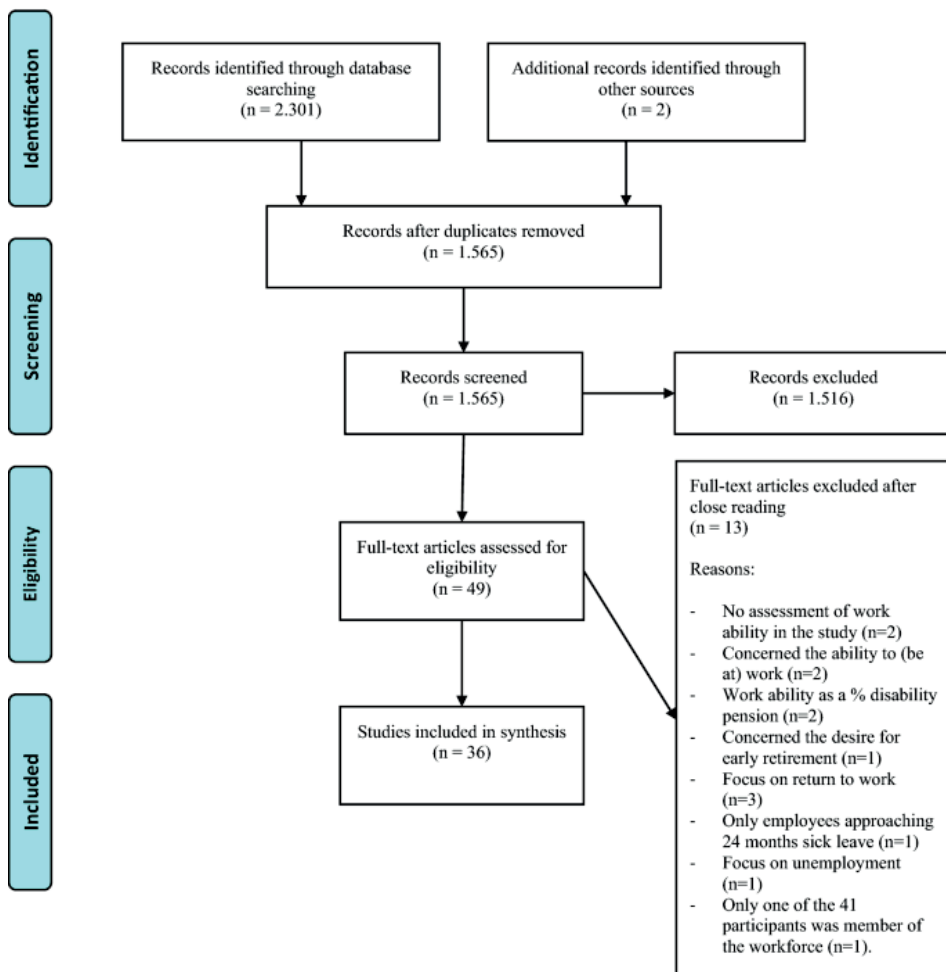


Figure 1. PRISMA 2009 flow diagram

Table 1. Summary of study results on the work ability in (self)-employed populations with a past cancer diagnosis

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability
	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints Fatigue Cognitive complaints Job resources: social support, leadership style, coaching, autonomy, organizational culture
Bains et al. (2012)	Colorectal, primary diagnosis with curative treatment, N=49 at T2. 44% female, mean age 52.49 (SD 5.42), 39% working at T2, United Kingdom	Longitudinal, T0= post-surgery/pre-treatment, T1= 3 months, T2= 6 months	WAI item 1 is described (the method refers to three items)	Item 1: High work ability at baseline was associated with greater work ability at follow-up ($\beta=0.67, t=3.99, p=.0005, f^2=0.53$)	
Bielik et al. (2020)	Ovarian, 13.8% metastatic, N = 123, female, mean age 59.7, 34.1% currently employed, Slovakia	Cross-sectional, mean 3.13 years after diagnosis	Current work ability 1 (worst)–10 (best) work ability covered by different dimensions surveys	Current work ability: Full health: 9.58 Without cancer: 9.07 At diagnosis: 4.20* At time of survey: 6.22 *Significant difference $p < .001$	

Study population		Study design	Work ability	Late effects of cancer treatment and work ability (>2 years after diagnosis)			Job resources and work ability
Authors and year of publication	Type of cancer, N= (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Physical complaints	Fatigue	Cognitive complaints	Job resources: social support, leadership style, coaching, autonomy, organizational culture
Carlsen et al. (2013)	Breast, N=170, recurrence excluded, female, mean age 54.2 (range 42–64), controls N= 391, Denmark	Case-control, 5–8 years after diagnosis	WAI Item 1	Item 1: mean 8.66 (controls 8.99), $p < .0001$	Fatigue (often), was associated with reduced work ability in a fully adjusted model (also health-related factors) (OR 10.7, CI 3.31–34.3) [stronger as among controls, 4.11 (1.97–8.57)]		Less help and support from a supervisor was significantly associated with reduced work ability (OR 2.40; CI 1.04–5.54) among the cancer survivors in the full model (also controlled for health-related factors). The latter was not the case for help and support from colleagues, but when only controlled for age this support showed a significant association (OR 3.47, CI 1.73–6.97)

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	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints	Fatigue	Cognitive complaints
Cheung et al. (2017)	Breast, primarily diagnosed, N = 151, mean age 49.98 (range 22–66), 43.1% currently working, 9.7% self-employed, Hong Kong	Cross-sectional, 1–16 years after diagnosis Work ability before diagnosis, during treatment and currently reported at time of survey	WAI items 1, 2, 3, and 6.	Item 1: work ability before diagnosis mean 8.48, SD 1.26, during treatment mean 4.95, SD 2.91, current mean 7.21, SD 1.81 Item 2 physical work ability (N=54): 7.4% very good, 1.1% good, 64.8% moderate, 13.0% poor Item 2 mental work ability (N=55): 10.9% very good, 45.5% good, 36.4 moderate, 5.5% poor Item 6 35% of the currently working not sure if they could continue to work in the subsequent 2 years Work ability before the diagnosis and work ability during treatment were associated with current work ability (0.63, $p = .005$ resp. .49, $p < .0001$) higher current work ability if less effects of health-related problems	Control at work was correlated with current work ability (Spearman's rho 0.29, $p = .038$)	Job resources: social support, leadership style, coaching, autonomy, organizational culture	

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability			
	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% employment), at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints	Fatigue	Cognitive complaints	
Couwenberg et al. (2020)	Rectal, N = 172, 8,7% metastatic, 71% male, median age 57, 100% paid employment, Dutch	Prospective cohort study (survey before treatment, 3, 6, 12, 18, and 24 months after treatment) controls N = 58	WAI	Significant decrease at 3, and 6 months Significantly lower than controls at 24 months				Job resources: social support, leadership style, coaching, autonomy, organizational culture
Dahl et al. (2020)	Prostate, N = 730, 100% male, mean age 65.5 (SD 5.9), 46% working at time of survey, Norway	Cross-sectional, 3 years (SD 1.4) after treatment	WAI item 1	Current work ability 7.4 (SD 2.1)				
Dahl et al. (2016)	Prostate, N = 563, mean age 62.6 (SD 5.38) with 66% < 65 years, 93% working at time of survey, Norway	Cross-sectional, merge of national prospective study (questionnaires at baseline, 3, 12 and 24 months) and a cross-sectional single-hospital based survey, performed up to 6 years after radical prostatectomy	WAI items 1 and 2	Item 1 (N = 563): 8.6 (SD 0.5) Score 10: 30%, 8–9: 46%, 6–7: 15%, 0–5: 9% Item 2 (N = 542) physical work ability 55% very good, 28% pretty good, 13% fairly good, 3% quite bad, 1% very bad Item 2 (N = 539) mental work ability: 56% very good, 28% pretty good, 12% fairly good, 3% quite bad 1% very bad				

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (>2 years after diagnosis)	Job resources and work ability	
	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% employed) at work, type of setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints Fatigue Cognitive complaints	
Dahl et al. (2019)	Breast, colorectal, leukemia, non-Hodgkin lymphoma, melanoma 63% female, median age 49 years (range 27–65), N = 1189, 75% employed (3% sick leave), Norway	Cross-sectional, median time since first cancer diagnosis was 16 years (range 6–31)	WAI item 1	Current work ability 8.3 (SD 1.8) among employed	Those with low work ability reported significantly higher mean levels of general health $p < 0.001$ Those with low work ability reported significantly higher mean levels of total fatigue $p < 0.001$	Job resources: social support, leadership style, coaching, autonomy, organizational culture
De Boer et al. (2011)	Esophageal, stomach, colorectal, hepatic, pancreatic or biliary, new patients; 22% female, mean age 56 (SD 8), N = 333, 95 (self-) employed of whom 45 participated, the Netherlands	Cross-sectional, before treatment	WAI items 1 and 2	Item 1: mean current work ability was 5.4; for the subgroup not on sick leave higher (7.1, SD 2.7), than for the subgroup on sick leave (3.7, SD 2.2), $p < .001$ Item 2: Physical work ability and mental work ability higher for the group not on sick leave		

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	Type of cancer, <i>N</i> = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints	Fatigue	Cognitive complaints	
De Boer et al. (2008)	Breast, female genitals or gynecological mostly, primary diagnosis of cancer, <i>N</i> = 195 at T3 (24% already returned to work at 6 months), 60% female, mean age 42.2 (<i>SD</i> 9.3), the Netherlands	Longitudinal (prospective), T1 = 6 months after first day of sick leave, T2 = 12 months after first day of sick leave, T3 = 18 months after first day of sick leave	WAI items 1 and 2	Item 1: significant rise in scores from T1 to T2 and from T2 to T3 (4.6, <i>SD</i> 3.2, 6.3, <i>SD</i> 2.7, and 6.7, <i>SD</i> 2.7 resp.) Both men and women improved over time ($p < .001$), but women improved more ($p = .002$) Patients with cancer of the female genitals and breast cancer patients improved most over time ($p = .01$)				Job resources: social support, leadership style, coaching, autonomy, organizational culture
Doll et al. (2016)	Uterine, ovarian, cervical, vulvar, and other (only new), and also benign disease, <i>N</i> = 185 at baseline, female, mean age 56.5 (<i>SD</i> 13), <i>N</i> = 174 at T3, United States of America	Longitudinal (prospective), T1 = 1 month after surgery, T2 = 3 months after surgery, T3 = 6 months after surgery	A subset of questions of the WAI, in this study item 1 is used	Item 1: Baseline without surgical complications 8.8 (<i>SD</i> 2.3), with surgical complications 7.7 (<i>SD</i> 3.2)				

Study population		Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)			Job resources and work ability	
Authors and year of publication	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints	Fatigue	Cognitive complaints	
Duijts et al. (2017)	Various (48% breast), part 1 of the study: N=252, 69.8% female, mean age 50.7 (SD 7.4) at T0, all with employment contract at T2, self-employed, temporary agency workers and workers without an employment contract excluded, The Netherlands	Longitudinal (prospective), T0 = 2 years after diagnosis, T1 = 3 years after diagnosis, T2 = 4 years after diagnosis	WAI Item 1	Item 1: Group N = 151 'continuously working' 5.6 (SD 1.8) Multivariate time lag model: current work ability predictor of work continuation one year later ($p = .007$), $\beta = 0.38$ (SE 0.14) / OR 1.46; CI 1.11–1.92	Physical complaints	Fatigue	Cognitive complaints	Job resources: social support, leadership style, coaching, autonomy, organizational culture
Fosså et al. (2015)	Prostate, N = 612 (30% working), mean age 69 (range 47–105, with 30% < 65) Norway	Cross-sectional, median observation time since diagnosis 4.0 years (range, 0–23 years)	Self-reported reduction of work ability ("no"; score of 0–5 vs. "yes"; score of 6–10)	Limitations of work ability: 10–22%	Significantly fewer patients experienced limitations of their work ability after radical prostatectomy (10%) than after high-dose radiotherapy (22%)			
Gregorowitsch et al. (2019)	Breast, N = 939 (68% employed at baseline, median age 52), The Netherlands	Prospective cohort study (baseline, 6, 18, and 30 months) Controls N = 3,641	WAI	Employed: baseline 71% moderate-poor work ability 30 months 24% moderate-poor work ability (lower than controls)				



Study population		Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)			Job resources and work ability	
Authors and year of publication	Type of cancer, <i>N</i> = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints	Fatigue	Cognitive complaints	
Gudbergsson et al. (2008a)	Breast, testicular, or prostate, <i>N</i> = 446 (all returned to work), 51% female, age 49.1 (<i>SD</i> 9.3), (also self-employed) and norm group <i>N</i> = 588, Norway	Case-control 2–6 years after primary surgery or chemotherapy	WAI items 1, 2 and 3	Item 1: Survivors scored lower (mean 8.2, <i>SD</i> 2.0) than norm group (mean 8.6, <i>SD</i> 1.6), <i>p</i> < .001, effect size 0.25 Item 2: Survivors scored more moderate/rather poor/poor physical work ability (21% versus 9%, <i>p</i> < .001, effect size 0.34) and more moderate/rather poor/poor mental work ability (19% versus 9%, <i>p</i> < .001, effect size 0.30)				Survivors experienced more support from colleagues at work (<i>p</i> = .005), but similar control as the norm group No data on possible associations of these factors with work ability reported

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<p>Type of cancer, N= (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment),</p> <p>Gudbergsson et al. (2008b)</p>	<p>Breast, testicular, or prostate, first cancer diagnosis between 25–57 years of age, N=513, 51% female, 84% had returned to work, and of this group 83% had no work changes and 17% did have work changes, Norway</p>	<p>Cross-sectional, 2–6 years after primary treatment</p>	<p>Assessment method</p> <p>WAI items 1, 2, and 3</p>	<p>Results in general</p> <p>Item 1: the subgroup with work changes scored lower (mean 6.9, SD 2.4) than group without work changes (mean 8.5, SD 1.8), $p < .001$, effect size 0.75 ($\beta = 0.396, p < .001$)</p> <p>Item 2: The subgroup without work changes scored less low (moderate, rather poor, poor) on physical work ability (16% versus 38% and mental work ability (14% versus 30%) than the subgroup with work changes (both $p < .001$, effect sizes 0.51 and 0.61)</p> <p>Mental work ability (and not physical work ability) reduced due to cancer was associated with current work ability in univariate and multivariate analyses ($\beta = -0.139, p = .003$)</p>	<p>Physical complaints</p> <p>Symptom scale score was associated with current work ability in univariate analyses ($\beta = 0.241, p < .001$)</p> <p>No data on possible association of control with work ability reported</p> <p>Fatigue</p> <p>Cognitive complaints</p> <p>Job resources: social support, leadership style, coaching, autonomy, organizational culture</p>

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (>2 years after diagnosis)	Job resources and work ability
<p>Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment),</p>	<p>Study approach and time points measured</p>	<p>Assessment method</p>	<p>Results in general</p>	<p>Physical complaints</p> <p>Fatigue</p> <p>Cognitive complaints</p>	<p>Job resources: social support, leadership style, coaching, autonomy, organizational culture</p>
<p>Gudbergsson et al. (2011)</p>	<p>Breast, testicular, or prostate, N=446, 52% female, mean age 52.9 (SD 6.5), and control group N=588, Norway</p>	<p>Case control, 2–6 years after primary treatment</p>	<p>WAI items 1, 2 and 3</p>	<p>Somatic symptoms were associated with overall current work ability in univariate analyses and multivariate analyses ($\beta = -0.078, p = .012$)</p>	<p>Support from colleagues and supervisors was assessed and combined with communication</p> <p>No separate data of an association of only social support with overall current work ability</p>

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability	
Hartung et al. (2018)	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% employment), setting Hematological, N = 91 at baseline, 67% male, mean age 49 (SD 8), N = 52 at T1, N = 40 at T2, 10% self-employed, Germany	Study approach and time points measured Longitudinal, baseline (less than 4 weeks before treatment), 6 months, and 1 year	Assessment method WAI	Results in general Mean WAI significantly increased from 18.5 at baseline to 28.3 after 12 months (p = 0.001)	Physical complaints Fatigue Cognitive complaints	Job resources: social support, leadership style, coaching, autonomy, organizational culture
Ho et al. (2018)	Breast, N = 327, female, 6% recurrent disease, mean age at time of diagnosis: 47 (range 42–52), mean age at time of survey: 53 (range 48–58), 53% employed, Singapore	Cross-sectional, 3–8 years after diagnosis	WAI	Item 1 N = 168 employed: work ability 8% poor, 29% moderate, 48% good, and 15% excellent	Survivors with suboptimal work ability expressed more breast and arm symptoms, as compared with survivors with good or excellent work ability General, physical, and mental fatigue were less common in survivors with optimal work ability Higher level of physical fatigue remained significant-ly associated with poorer work ability in the full model	Breast cancer survivors with suboptimal current workability had lower scores for cognitive functioning

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Authors and year of publication	Type of cancer, <i>N</i> = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints	Fatigue	Cognitive complaints
Kiserud et al. (2016)	Lymphoma, <i>N</i> = 312, also second cancers, 85% working or on sick leave at baseline and 58% at moment of survey, 40% female, mean age 41.5 (<i>SD</i> 13.5) at diagnosis and 54.0 (<i>SD</i> 11.3) at time of survey, Norway	Cross-sectional follow-up study, mean time from diagnosis to survey was 12.4 years (<i>SD</i> 6.1) and from HDT-ASCT to survey 9.7 years (<i>SD</i> 5.1)	WAI items 1 and 2	Item 1: The subgroup employed at follow up: 9.2 (<i>SD</i> 1.8) at diagnosis and 7.3 (<i>SD</i> 2.5) at moment of survey			Job resources: social support, leadership style, coaching, autonomy, organizational culture
Lee et al. (2008)	Stomach, <i>N</i> = 408, 73.5% male, also self-employed and not-working included, also 994 general population, Korea	Case control, 21–36 months after diagnosis	Multiple-choice item regarding lessened work-related ability than before cancer diagnosis	More cancer survivors had lessened work-related ability (37%) than the general population (10.6%), OR 6.11, CI 3.64–10.27		Easily fatigued and exhausted in the workplace: 50% of the cancer survivors versus 22.4% in the general population (OR 4.02, CI 2.55–6.33) No data on the association with work ability	

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Lindbohm et al. (2012)	<p>Type of cancer, $N =$ (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment),</p> <p>Breast, testicular, prostate, or lymphoma, $N = 1449$, 66% female, age 25–57 at time of diagnosis, reference group $N = 2709$, Denmark, Finland, Iceland, and Norway (in the Iceland sample cancer recurrence excluded)</p>	<p>Study approach and time points measured</p> <p>Case control, 1–8 years after diagnosis</p>	<p>Assessment method</p> <p>WAI Item 1</p>	<p>Results in general</p> <p>Item 1: age-adjusted mean work ability was slightly lower among the breast cancer survivors (8.41) than among the female reference group (8.58, $p < .01$). No difference in work ability between men with testicular cancer diagnosis (8.76) and the male reference group (8.69). Prostate cancer survivors had a lower work ability (8.28) than the male reference group ($p < .01$)</p>	<p>Physical complaints</p> <p>Fatigue</p> <p>Cognitive complaints</p>	<p>Job resources: social support, leadership style, coaching, autonomy, organizational culture</p> <p>Low support from supervisor or colleagues were associated with low work ability among both men and women in the cancer group and the reference group</p> <p>High colleagues' avoidance behavior was related to lower work ability among female cancer survivors ($p < .001$) (and not in female references)</p> <p>Supervisors' high avoidance behavior was related to lower work ability among male cancer survivors ($p < .01$) (and not in references)</p> <p>No data of an association of social climate with work ability</p>

Study population		Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)			Job resources and work ability
Authors and year of publication	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Physical complaints	Fatigue	Cognitive complaints	Job resources: social support, leadership style, coaching, autonomy, organizational culture
Moskowitz et al. (2014)	Breast, testicular, colorectal, and prostate cancer, Hodgkin lymphoma and non-Hodgkin Lymphoma, among others, N = 1525, 15.8% recurrence or secondary cancer, 61.6% female, mean age 49.1 (SD 10.8), also self-employed included, United States of America	Cross-sectional, average time since completion of treatment was 3 years (range 0–464 months)	Whether unable to work full time, unable to work the same as before cancer, or unable to work at all	A greater level of functional limitations (physical, cognitive and social) were significantly related to limited work ability ($\beta = 5.88, p < .001$)	A greater level of functional limitations (physical, cognitive and social) were significantly related to limited work ability ($\beta = 5.88, p < .001$)	A greater level of symptoms (cognitive, distress, fatigue, cancer fear, family fear) were not significantly related to limited work ability	
Musti et al. (2018)	Breast, N = 503, mean age 51.5 (SD 3.6), permanent, fixed term and other type of contract, Italy	Cross-sectional, survey 3.2 (SD 0.9) years since treatment, retrospective about moment return to work (23.0% experienced > 6 months sick leave)	Same or reduced work ability	43.5% reduced work ability at moment of return to work	Support/solidarity from employer 85.1% in group with no reduced work ability and 70.2% in group with reduced work ability, $p < 0.001$	Support/solidarity from colleagues 91.5% in group with no reduced work ability and 76.8% in group with reduced work ability, $p < 0.001$	

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Neudeck et al. (2017)	Type of cancer, <i>N</i> = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting Thyroid, <i>N</i> = 66, 69.7% female, 68% working, Switzerland	Study approach and time points measured Cross-sectional, max. 7 years after treatment. Mean time since the diagnosis of thyroid cancer was 37.8 months (SD 21.7; range: 7–79)	Assessment method Ad hoc questionnaire	Results in general 71.2% felt impaired with respect to their work ability during the first year after the diagnosis	Physical complaints Fatigue Cognitive complaints Job resources: social support, leadership style, coaching, autonomy, organizational culture
Nieuwenhuijsen et al. (2009)	Gastrointestinal, breast, female genitals, male genitals, urological haematological, and other types, primary diagnosis of cancer, <i>N</i> = 195 at T1 (of whom <i>N</i> = 45 neuropsychological tested at T2), 67% female, mean age 44 (SD 9), the Netherlands	Longitudinal (prospective), T1 = 6 months after first day of sick leave, T2 = 12 months after first day of sick leave, also neuro-psychological testing, T3 = 18 months after first day of sick leave	WAI item 1 on T2	Item 1: At T1 no difference ($p = .27$) between the participants in the neuro-psychological study (4.1, SD 3.0) and the rest of the cohort (4.7, SD 3.3)	

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Nilsson et al. (2016)	Breast, female, N = 692 at T1, mean age 50.8 (SD 8.07), Sweden	Longitudinal (prospective), T1 = 4 weeks after surgery T2-T6 during 24 months	WAI Item 2	Results in general	Physical complaints	Fatigue	Job resources: social support, leadership style, coaching, autonomy, organizational culture
				Item 2: significant difference in physical work ability between baseline ($\beta=0.354, p < .001$) and 4 months ($\beta=0.138, p < .001$) as well as between 4 and 8 months ($\beta=0.285, p < .001$)			
				Item 2: significant differences in mental/social work ability were found between 8 and 12 months ($\beta=0.286, p < .001$)			
Ortega et al. (2018)	Breast, N = 114 (three treatment groups of N = 38), female, mean ages 48.1–50.1, self-employed 36.8–52.6%, Brazil	Cross-sectional, > 1 year after treatment	Work Limitations Questionnaire (the percentage of time limited in performing work tasks in the last 2 weeks)	Results in general			
				Patients in the mastectomy and breast-conserving surgery groups showed reduced work effectiveness (presenteeism) and loss of productivity compared with women in the breast reconstruction and control groups ($p=0.0004$ and $p=0.0006$, respectively)			

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<p>Type of cancer, N= (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting</p>	<p>Study approach and time points measured</p>	<p>Assessment method</p>	<p>Results in general</p>	<p>Physical complaints</p> <p>Fatigue</p> <p>Cognitive complaints</p>	<p>Job resources: social support, leadership style, coaching, autonomy, organizational culture</p>
<p>Tamminga et al. (2019)</p>	<p>Breast (61%), gynecological cancer (35%), or other type of cancer (4%) Intervention group N=49, mean age 47.1 (SD 8.2), 98% female Control group N=57, mean age 47.8 (SD 7.6), 100% female, 4% self-employed, The Netherlands</p>	<p>Longitudinal, baseline and at 6, 12, 18, and 24 months of follow-up</p>	<p>WAI items 1 and 2</p>	<p>Work ability improved from baseline to 1 year and stable from 1 to 2 years</p>	

	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability
Authors and year of publication	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints
Taskila et al. (2007)	Breast, lymphoma, testicular or prostate, no distant metastasis, N = 591, 73.9% female, age 25–57 at time of diagnosis, also freelancers and entrepreneurs included, also 757 referents, Finland	Case control, 2–6 years after diagnosis	WAI items 1 and 2	Item 1: nearly the same as in referents and highest mean value for men with testicular cancer (8.95), and lowest for men with prostate cancer (8.00) Item 2: 26% reported deteriorated physical work ability due to cancer 19% reported deteriorated mental work ability due to cancer	Fatigue Cognitive complaints
					Job resources: social support, leadership style, coaching, autonomy, organizational culture
					Among the female survivors (and male referents, but not among male survivors), co-workers' support was related to reduced risk of impaired physical work ability (OR 0.83, CI 0.73–0.94) and for impaired mental work ability (OR 0.84, CI 0.73–0.96) A better social climate at work was only related to impaired mental work ability (and not to physical work ability), for male survivors (OR 0.80, CI 0.70–0.91) and for female survivors (OR 0.84, CI 0.76–0.94)

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability
<p>Torp et al. (2012)</p>	<p>Type of cancer, $N =$ (ex-) cancer patients in analysis, (gender), age in years, (% employment), at work, type of setting</p> <p>15 most common cancers: like breast, gynecological, prostate, testicular, $N = 653$, primary diagnoses, 9% with metastasis, 68% female, mean age 51.9 (SD 7.9), 6% self-employed, Norway</p>	<p>Study approach and time points measured</p> <p>Cross-sectional, 15–39 months after cancer diagnosis</p>	<p>Assessment method</p> <p>WAI items 1 and 2</p>	<p>Results in general</p> <p>Item 1: mean total (current) work ability was 8.6 (SD 1.8) among men and 8.6 (SD 1.7) among women Self-employment was a predictor for lower work ability. Comorbidity (36%) was strongly correlated with work ability Item 2: 31% reported a reduction in physical work ability due to cancer 23% reported a reduction in mental work ability. More women than men had reduced mental work ability due to cancer</p>	<p>Physical complaints</p> <p>Fatigue</p> <p>Cognitive complaints</p> <p>Job resources: social support, leadership style, coaching, autonomy, organizational culture</p> <p>General social support ($\beta = 0.15, p \leq .001$) is a significant predictor of total work ability in univariate (and not in multivariate) regression Cancer-related colleague support was a significant predictor of total work ability ($\beta = 0.15, p \leq .01$) in multivariate regression Cancer-related supervisor support was not a significant predictor of total work ability in regression analyses Decision latitude ($\beta = 0.08, p \leq .05$) is a significant predictor of work ability in univariate (and not in multivariate) regression</p>

	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability			
<p>Authors and year of publication</p> <p>Torp et al. (2017)</p>	<p>Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting</p> <p>Most common invasive types of cancer: colon, rectal, lung, skin (melanoma), breast, cervical, uterine, ovarian, prostate, testicular, bladder, central nervous system, thyroid, non-Hodgkin lymphoma, and leukemia, N = 1115, 69% female, 8% self-employed</p> <p>Not returned to work at time of survey: 24% self-employed and 18% salaried</p>	<p>Study approach and time points measured</p> <p>Cross-sectional, 15–39 months after diagnosis</p>	<p>Assessment method</p> <p>WAI items 1 and 2</p>	<p>Results in general</p> <p>Item 1: compared with the salaried workers, the self-employed people reported significantly more often reduced total work ability ($p = .02$, effect size 0.26). The negative effect of self-employment on total work ability seems to be mediated by reduced work hours and a negative cancer-related financial change</p> <p>Item 2: no significant differences between the salaried and the self-employed</p>	<p>Physical complaints</p> <p>Poor-self rated health status correlated significantly with low total work ability in logistic regression analyses</p>	<p>Fatigue</p> <p>Fatigue</p>	<p>Cognitive complaints</p> <p>Cognitive complaints</p>	<p>Job resources: social support, leadership style, coaching, autonomy, organizational culture</p> <p>Having higher decision latitude at work was a factor preventing low total work ability (OR 0.80, CI 0.68–0.94)</p>

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability
	Type of cancer, N= (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints Fatigue Cognitive complaints
Von Ah et al. (2018)	Breast, N= 68, exclusion of secondary cancers or metastasis, mean age 52.12 (SD 8.16), United States of America	Cross-sectional, study population on average 5 (SD 3.8) years post-treatment (minimum 1 year)	WAI	Mean 38.9 (SD 7.5), Poor or moderate work ability: 26.5%	Significant relationship between perceived cognitive impairment and work ability ($\beta = -0.658, p < .000$) Explained variance: 46.5%
Von Ah et al. (2017)	Breast N= 68, exclusion of brain metastasis, mean age 52.12 (SD 8.603), 1% self-employed, United States of America	Cross-sectional, study population on average 4.97 (SD 3.36) years post-treatment (minimum 1 year)	WAI	WAI: Mean 38.91 (SD 7.45) Poor 7–27: 10%, moderate 28–36: 16%, good 37–43: 46%, excellent 44–49: 28%	Explained variance: 46.5% Significant relationship between perceived cognitive ability and work ability ($\beta = -0.472, p < .000$) Explained variance: 29.9%
				Linear regression: significant relationship between attentional fatigue (higher = higher level of attention) and perceived work ability ($\beta = -0.627, p < .001$). Explained variance: 39%	Job resources: social support, leadership style, coaching, autonomy, organizational culture

Authors and year of publication	Study population	Study design	Work ability	Late effects of cancer treatment and work ability (> 2 years after diagnosis)	Job resources and work ability
	Type of cancer, N = (ex-) cancer patients in analysis, (gender), age in years, (% at work, type of employment), setting	Study approach and time points measured	Assessment method	Results in general	Physical complaints Fatigue Cognitive complaints
Wolwers et al. (2019)	Breast 84%, colorectal, Non-Hodgkin, lymphoma, other, N=89, 91% female, mean age 47.9 (7.2), 10% self-employed, The Netherlands	Longitudinal intervention study, baseline: 6, 12, 18 months	WAI Item 1	Inverse, longitudinal association between fatigue and perceived work ability	Job resources: social support, leadership style, coaching, autonomy, organizational culture
Zanville et al. (2016)	Breast, N = 44 (22 chemo-therapy-treated and 22 chemo-therapy-naïve), non-metastatic, female, mean age resp. 49,68 (SD 8.0) and 52.68 (SD 9.3), United States of America	Longitudinal, T0 = pre-treatment (approximately one third of chemotherapy-treated received neo-adjuvant chemotherapy and were surgery naïve at baseline), T1 = approximately 1-month post-chemotherapy, T2 = approximately 1 year after T1	Item from Functional Well-Being subscale of FACT/GOG-Ntx (version 4)	-	

Note. N Number, SD Standard Deviation, OR Odds Ratio, CI Confidence Interval

The 36 studies covered 12 (33%) longitudinal studies (Bains et al., 2012; Couwenberg et al., 2020; De Boer et al., 2008; Doll et al., 2016; Duijts et al., 2017; Gregorowitsch et al., 2019; Hartung et al., 2018; Nieuwenhuijsen et al., 2009; Nilsson et al., 2016; Tamminga et al., 2019; Wolvers et al., 2019; Zanville et al., 2016), six (17%) case–control studies (Carlsen et al., 2013; Gudbergsson et al., 2008b, 2011; Lee et al., 2008; Lindbohm et al., 2012; Taskila et al., 2007), and 18 (50%) cross-sectional studies. Almost half of all included studies was published in 2017 or later. The setting of 14 studies was Northern Europe. Other European settings were the Netherlands (eight studies), and the United Kingdom, Germany, Italy, Switzerland, and Slovakia with one study each. Other settings outside Europe were the United States of America (five studies), Brazil (one study), and Asia (three studies). The studies focused on a combination of types of cancer in 16 studies, breast cancer in ten studies, prostate cancer in three studies, and ovarian, rectal, colorectal, thyroid, stomach cancer, hematological cancer and lymphoma in one study each. Gender was not mentioned in five studies (14%) among populations with a past breast cancer diagnosis, very likely to be women but possibly not all, and not in two studies among prostate cancer diagnoses, the latter certainly concerning men. The gender distribution therefore showed eight studies (22%) among women, five (14%) not with full certainty only among women, three studies (8%) among men, and 20 studies (56%) among both genders. Type of employment was not clear in 16 studies (44%). The other 20 studies concerned 13 studies (36%) with both employed and self-employed, 7 studies with employed only (20%), and none of the studies only included self-employed. The baseline of the data collection varied from the moment of diagnosis, the first day of sick leave, to the end of primary treatments.

Quality assessment

The methodological quality of the studies was assessed using three quality assessment checklists. For cohort and case–control studies the checklists from the ‘Critical Appraisal Skills Program’ (CASP) were used (CASP, 2018a, 2018b). Some items were adapted to the current study. These adjustments are described in the notes below the Tables 2, 3 and 4. For cross-sectional studies (except case–control studies) the Appraisal tool for Cross Sectional Studies (AXIS tool) (Downes et al., 2016) was used. The quality assessment was used to test the quality across studies.

The quality assessment was performed for all 36 studies by the first author. The second and the third author independently assessed the quality of different subsets of cohort, case–control and cross-sectional studies. The results were discussed afterwards, and agreement was reached on the level of quality of each of the included studies for the present study.

The 12 cohort studies were all of good quality and therefore no studies were excluded. Of the 12 included cohort studies two studies made use of a follow up period long enough to possibly investigate late effects of cancer treatment that is beyond two years after diagnosis (Duijts et al., 2017; Gregorowitsch et al., 2019). Furthermore, these two studies concerned European populations.

Also the six case–control studies were all of good quality, not resulting in any exclusions. The time since diagnosis was beyond 2 year after diagnosis in four studies and two studies also included participants within the first two years after diagnosis. Five studies of the

case–control studies concerned European populations (Carlsen et al., 2013; Gudbergsson et al., 2008b, 2008a, 2011; Lindbohm et al., 2012; Taskila et al., 2007).

The 18 cross-sectional studies showed some quality differences, but the quality of all studies was acceptable. The selection process in two pilot studies might have impaired representativeness (Bielik et al., 2020; Neudeck et al., 2017). In one cross-sectional study the time since diagnosis was not clear (Ortega et al., 2018), but the other 17 cross-sectional studies concerned populations with participants beyond 2 years after diagnosis. For the checklists see Tables 2, 3 and 4.

Assessment methods used to measure work ability

Six (17%) of the included studies (Couwenberg et al., 2020; Gregorowitsch et al., 2019; Hartung et al., 2018; Ho et al., 2018; Von Ah et al., 2017, 2018) used the complete Work Ability Index (WAI), a questionnaire that consists of seven items. These 7 items are (1) current work ability compared with the lifetime-best (on a scale of 0–10), (2) work ability in relation to the (physical and mental) demands of the job, (3) number of current diseases diagnosed by a physician, (4) estimated work impairment due to diseases, (5) sick leave during the past 12 months, (6) own prognosis of work ability two years from now, and (7) mental resources. Only partial use of the WAI (one or more items) was made by 22 (61%) studies, with the first WAI item being used in 21 studies (see Table 1).

Of the eight (22%) studies not using the complete or partial WAI, different ways to assess work ability were used, namely (1) the Functional Well-Being subscale of the FACT/GOG-Ntx (version 4) (Zanville et al., 2016), (2) a multiple-choice question regarding lessened work-related ability (Lee et al., 2008), (3) a self-reported reduction of work ability (Fosså & Dahl, 2015; Musti et al., 2018), (4) a multiple choice question regarding being unable to work full time, unable to work the same as before cancer or unable to work at all (Moskowitz et al., 2014), (5) the Work Limitations Questionnaire (the percentage of time limited in performing work tasks in the last two weeks) (Ortega et al., 2018), (6) a question on current work ability in combination with other information (Bielik et al., 2020), and (7) a non-validated ad hoc questionnaire (Neudeck et al., 2017). In brief, 22% of the studies did not use the complete or partial WAI but other ways to assess work ability.

Results: work ability in working people with a past cancer diagnosis

After a cancer diagnosis the level of work ability tended to be experienced as lower than before diagnosis. However, cohort studies demonstrated that the level of work ability among workers during the first two years past cancer diagnosis appeared to improve significantly (De Boer et al., 2008; Nilsson et al., 2016). One longitudinal study with a two year follow up reported work ability improved over time most prominently from baseline to 1 year of follow-up and thereafter remained stable up to 2 years of follow-up (Tamminga et al., 2019). However, other longitudinal studies that focused on the first two years did not have data on the course of work ability (Bains et al., 2012; Doll et al., 2016; Nieuwenhuijsen et al., 2009; Zanville et al., 2016), nor had the study with a follow-period of four years past cancer diagnosis (Duijts et al., 2017). However, compared to controls work ability was reported to be significantly lower when 2 years after diagnosis (Couwenberg et al., 2020).

Table 2. Quality assessment for the cohort studies by means of the checklist from the ‘Critical Appraisal Skills Program’ (CASP)

	Bains et al. (2012)	De Boer et al. (2008)	Couwenberg et al. (2020)	Doll et al. (2016)	Duijts et al. (2017)	Gregorowitsch et al. (2019)	Hartung et al. (2018)	Nieuwenhuijsen et al. (2009)	Nilsson et al. (2016)	Tamminga et al. (2019)	Wolwers et al. (2019)	Zanville et al. (2016)
1. Did the study address a clearly focused issue?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Was the cohort recruited in an acceptable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Was the exposure accurately measured to minimize bias?	Yes	Yes	Yes	No Benign tumors included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Was work ability accurately measured to minimize bias?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Have the authors identified all important confounding factors?	Yes	N.a	Yes	N.a	N.a	N.a	Yes	N.a	N.a	Yes	Yes	Yes
6. Have they taken account of the confounding factors in the design and/or analysis?	Yes	N.a	Yes	N.a	N.a	N.a	Yes	N.a	N.a	Yes	Yes	Yes
7. Was the follow up of subjects complete enough?	Yes	Yes	Yes	N.a.	N.a	Yes	Yes	N.a	N.a	Yes	Yes	Yes
8. Was the follow up of subjects long enough to investigate late effects?	No (6 months)	No (18 months)	No (24 months)	No (6 months)	Yes	Yes	No (12 months)	No (18 months) Sub-sectional study was cross-sectional	No (2 years)	No (2 years)	No (18 months)	No (1 year)
9. What are the results of this study?	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1
10. Are the results precise?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11. Do you believe the results?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12. Can the results be applied to the local (European) population?	Yes	Yes	Yes	No (USA)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No (USA)

	Bains et al. (2012)	De Boer et al. (2008)	Couwenberg et al. (2020)	Doll et al. (2016)	Duijts et al. (2017)	Gregorowitsch et al. (2019)	Hartung et al. (2018)	Nieuwenhuijsen et al. (2009)	Nilsson et al. (2016)	Tamminga et al. (2019)	Wolvers et al. (2019)	Zanville et al. (2016)
13. Do the results of this study fit with other available evidence with regard to work ability?	Yes	Yes	Yes	N.a	N.a	Yes	Yes	N.a	N.a	Yes	Yes	Yes
14. What are the implications of this study for practice?	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1

(a) Because of the aim of the systematic literature review in questions 3 a past cancer diagnosis was regarded as exposure

(b) Because of the aim of the systematic literature review questions 5 and 6 were answered in the case that 'work ability' was an outcome measure. In all other cases 'N.a.' was noted

(c) Because of the aim of the systematic literature review in question 8 the criterion is two years

(d) In question 7 and 13 the quality assessment is only made in the case of measurements of the level of work ability at different time points. In all other cases 'N.a.' was noted

(e) In question 8 'late effects?' was added

(f) Question 10 was rephrased

(g) In question 12 Europe was regarded as the region of the local population

(h) In question 13 'with regard to work ability' is added

Cross-sectional studies that used data reported by the respondents retrospectively with regard to different time points after cancer diagnosis, also reported that work ability was lowered after cancer diagnosis and experienced as increasing again (Bielik et al., 2020; Cheung et al., 2017; Kiserud et al., 2016; Musti et al., 2018). Some studies only focused on the association of different types of treatment and work ability (Dahl et al., 2020; Ortega et al., 2018). Furthermore, when the complete Work Ability Index (WAI) was used to assess work ability the results were as follows. Suboptimal work ability was reported in 26% and 37% of cases (Ho et al., 2018; Von Ah et al., 2017) and among a population with a prostate cancer diagnosis in the previous 0–23 years (mean 4 years) and partially at work, 10% or 22% reported a reduction of their work ability (Fosså & Dahl, 2015). As the studies made use of different ways to assess work ability at various moments after diagnosis and also included different types of cancer, case–control studies offer a possibility to make comparisons between workers with and workers without a past cancer diagnosis. Six studies made use of a reference group or a norm group, mostly beyond the first two years after diagnosis of which five studies found that work ability was lower in workers with a past cancer diagnosis, than in workers without such a diagnosis (Carlsen et al., 2013; Gudbergsson et al., 2008b, 2011; Lee et al., 2008; Lindbohm et al., 2012). Only one study, using a sample 2–6 years after different types of cancer diagnosis, did not report any differences (Taskila et al., 2007). These results demonstrate that work ability tends to be lower among cancer survivors than among samples without a past cancer diagnosis also on the long term. In summary, a number of the cross-sectional and case–control studies showed that workers more than 2 years past cancer diagnoses experience a lower level of work ability than before the cancer diagnosis.

An important finding was that a lower work ability at baseline was one of the strongest predictors of poorer follow-up work ability at 6 months after treatment among a sample with colorectal cancer in one of the longitudinal studies (Bains et al., 2012). Also in a cross-sectional study among a sample 1–16 years after breast cancer diagnosis, the retrospectively self-reported work ability during treatment, as well as that before diagnosis, was associated with current work ability (Cheung et al., 2017). Moreover, in a cross-sectional study 2–6 years after primary treatment of breast, testicular or prostate cancer, mental work ability (and not physical work ability) correlated with lower current work ability (Gudbergsson et al., 2008a). Another finding is that a higher current work ability is associated with work continuation one year later (Duijts et al., 2017).

Furthermore, self-employment among cancer survivors appeared to be a predictor for lower work ability (Torp et al., 2012). Moreover, the negative effect of self-employment on work ability among cancer survivors was reported to be mediated by reduced working hours and a negative cancer-related financial change (Torp et al., 2017). All in all, self-employed, without employees (freelancers) or with employees (entrepreneurs), were not a prominent focus in the included studies. The few available results among the non-salaried show a lower work ability and the importance of negative changes in the financial situation.

Table 3. Quality assessment for the case–control studies by means of the checklist from the ‘Critical Appraisal Skills Program’ (CASP)

	Carlisen et al. (2013)	Gudbergsson et al. (2008a)	Gudbergsson et al. (2011)	Lee et al. (2008)	Lindbohm et al. (2012)	Taskila et al. (2007)
1. Did the study address a clearly focused issue?	Yes	Yes	Yes	Yes	Yes	Yes
2. Did the authors use an appropriate method to answer their question?	Yes	Yes	Yes	Yes	Yes	Yes
3. Were the cases recruited in an acceptable way?	Yes	Yes	Yes	Yes	Yes	Yes
4. Were the controls selected in an acceptable way?	Yes	Yes	Yes	Yes	Yes	Yes
5. Was the exposure accurately measured to minimize bias?	Yes	Yes	Yes	Yes	Yes	Yes
6. Aside from the experimental intervention (cancer–no cancer), were the groups treated equally?	Yes	Yes	Yes	Yes	Yes	Yes
7. Have the authors taken account of the potential confounding factors in the design and/or in their analysis?	Yes	Yes	Yes	Yes	Yes	Yes
8. How large was the treatment (cancer–no cancer) effect?	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1
9. How precise was the estimate of the treatment effect?	N.a	N.a	N.a	N.a	N.a	N.a
10. Do you believe the results?	Yes	Yes	Yes	Yes	Yes	Yes
11. Can the results be applied to the local (European) population?	Yes	Yes	Yes	No (Korea)	Yes	Yes
12. Do the results of this study fit with other available evidence?	Yes	Yes	Yes	Yes	Yes	Yes

(a) Because of the aim of the systematic literature review in questions 6 and 8 ‘(cancer–no cancer)’ was added

(b) Question 9 was not applicable as there is no treatment effect involved

(c) In question 11 Europe was regarded as the region of the local population

Gender differences in work ability among cancer survivors were also reported, but it is difficult to present an overview of possible gender differences with regard to work ability, as factors like type of cancer (and connected gender and age differences) and differences in physical and mental work ability cloud the issue. For instance, breast cancer, testicular cancer and prostate cancer have different profiles with regard to gender and age. Men had a higher current work ability (8.4, *SD* 1.8) than women (8.0, *SD* 2.1), $p < 0.04$, effect size = 0.20, while no gender differences were reported for current work ability in the group of matched controls without a past cancer diagnosis (8.6, *SD* 1.6) (Gudbergsson et al., 2011). Furthermore, female survivors had lower mental work ability than controls (effect size 0.30, $p < 0.001$) but no lower physical work ability, while male survivors had lower physical work ability (effect size 0.37, $p < 0.001$) and also lower mental work ability (effect size 0.27, $p = 0.004$) than male controls (Gudbergsson et al., 2011). In a study among workers 15–39 months after a diagnosis with one of the most common cancer types high current work ability was reported for men (8.6, *SD* 1.8), as well as for women (8.6, *SD* 1.7) (Torp et al., 2012). Taskila et al. (2007) reported the highest mean current work ability for testicular cancer (9.0) and the lowest for prostate cancer (8.0), in a study which also covered breast cancer and lymphoma. Furthermore, in another study no difference in work ability between men with testicular cancer diagnosis (8.8) and controls (8.7) was reported, while prostate cancer survivors had a lower work ability (8.3) than controls ($p < 0.01$) (Lindbohm et al., 2012).

Results: late effects of cancer treatment and work ability

Physical complaints and work ability

Eight (22%) of the included studies analyzed a possible association between late physical complaints and work ability. One study had a case–control design (Gudbergsson et al., 2011), and the other studies were cross-sectional (Dahl et al., 2019; Dahl et al., 2016; Fosså & Dahl, 2015; Gudbergsson et al., 2008a; Ho et al., 2018; Moskowitz et al., 2014; Torp et al., 2017). In the studies physical impairments or the experienced limitations were associated with lower work ability or were seen more frequently in cases of suboptimal work ability beyond 2 years after diagnosis. In short, physical complaints after cancer treatment continue to show associations with lower work ability beyond the first two years after cancer diagnosis.

Fatigue and work ability

Four (11%) of the included studies analyzed a possible association between late fatigue and work ability. Carlsen et al. (2013), used the first WAI item in a case–control study design, and reported that fatigue was associated with reduced current work ability 5–8 years after a breast cancer diagnosis, and that this association was stronger among cancer survivors (OR 10.7, CI 3.31–34.3) than among the controls (OR 4.11, CI 1.97–8.57), suggesting moderation. The other three studies were cross-sectional. In one of these studies the complete WAI to assess work ability was used, and general, physical, and mental fatigue were reported to be less common in breast cancer survivors with optimal work ability. A higher level of physical fatigue was significantly associated with poorer work ability (Ho et al., 2018).

	Bielik et al. (2020)	Cheung et al. (2017)	Dahl et al. (2020)	Dahl et al. (2016)	Dahl et al. (2019)	De Boer et al. (2011)	Fosá et al. (2015)	Gudbergsson et al. (2008b)	Ho et al. (2018)	Kiserud et al. (2016)	Moskowitz et al. (2014)	Musti et al. (2018)	Neudeck et al. (2017)	Ortega et al. (2018)	Torp et al. (2012)	Torp, Syse et al. (2017)	Von Ah et al. (2018)	Von Ah et al. (2017)
7. Were measures undertaken to address and categorize non-responders?	Don't know. No information	Yes	Yes	Don't know from other studies	N.a	Yes	No	Yes	Yes	Yes	No	Yes	No	Don't know. No information	No	No	No	No
8. Was work ability measured appropriate to the aims of the work ability study?	Mixed: current work ability appropriate, work ability unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Was work ability measured correctly using instruments/measurements that had been trailed, piloted or published previously?	Don't know	Yes	Yes	Yes	Yes	Yes	Don't know. No information	Yes	Yes	Yes	Don't know. No information	Don't know. No information	No. A non-validated ad hoc questionnaire	Yes	Yes	Yes	Yes	Yes
10. Is it clear what was used to determine statistical significance and/or precision estimates? (e.g., p values, CIs)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11. Were the methods (including statistical methods) sufficiently described to enable them to be repeated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12. Were the basic data adequately described?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Time since diagnosis unclear	Yes	Yes	Yes	Yes
13. Does the response rate raise concerns about non-response bias?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

	Bielik et al. (2020)	Cheung et al. (2017)	Dahl et al. (2020)	Dahl et al. (2016)	Dahl et al. (2019)	De Boer et al. (2011)	Fossá et al. (2015)	Gudbergsson et al. (2008b)	Ho et al. (2018)	Kiserud et al. (2016)	Moskowitz et al. (2014)	Musti et al. (2018)	Neudeck et al. (2017)	Ortega et al. (2018)	Torp et al. (2012)	Torp, Syse et al. (2017)	Von Ah et al. (2018)	Von Ah et al. (2017)
14. If appropriate, was information about non-responders described?	Yes	Yes	Yes	No	N.a	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No	No
15. Were the results internally consistent?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16. Were the results for the analyses described in the methods, presented?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17. Were the authors' discussions and conclusions justified by the results?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18. Were the limitations of the study discussed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19. Were there any funding sources or conflicts of interest that may affect the authors' interpretation of the results?	No	No	No	No	No	No	No	No	No	No	No	No	Don't know. Pilot-study	No	No	No	No	No
20. Was ethical approval or consent of participants attained?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(a) Because of the aim of the systematic literature review in questions 8 and 9 'work ability' was inserted

Another cross-sectional study used the first item of the WAI to assess work ability and reported that those with low work ability had significantly higher mean levels of total fatigue (Dahl et al., 2019). Another cross-sectional study did not report a significant association of fatigue with work ability, however fatigue was part of more comprehensive constructs, making specific inferences difficult. Furthermore, in this study work ability was assessed by a multiple choice question regarding being unable to work full time, unable to work the same as before cancer or unable to work at all (Moskowitz et al., 2014). To summarize, the scarce data demonstrate that fatigue can be associated with lower work ability among workers with a past cancer diagnosis.

Cognitive complaints and work ability

Four (11%) of the included studies analyzed a possible association between late cognitive complaints and work ability. The study designs were all cross-sectional. In this systematic literature review attentional fatigue, i.e. experiencing lower levels of attention, is regarded as a cognitive complaint. A significant relationship ($\beta = 0.627, p < 0.001$) between higher levels of attention and perceived work ability assessed by the complete WAI, was reported by Von Ah et al. (2017). Attentional fatigue explained 40% of the variance in perceived work ability among 68 breast cancer survivors on average 5 years after diagnosis. Von Ah et al. (2018) also reported that cognitive impairment was associated with poorer work ability ($\beta = -0.66, p < 0.000$) and that perceived cognitive ability was significantly related to higher levels of work ability ($\beta = 0.47, p < 0.000$). Furthermore, Ho et al. (2018) reported breast cancer survivors (3–8 years after diagnosis) to have lower scores for cognitive functioning in case of suboptimal work ability. Another study, by Moskowitz et al. (2014), also included cognitive symptoms, but as part of more comprehensive constructs, making specific inferences difficult. So, although results are scarce, recent studies indicate that cognitive complaints can be associated with low work ability among working cancer survivors.

Results: current job resources and work ability

As has already been stated, job resources can be of importance for work functioning, also among workers who returned to work after cancer treatment and experiencing any late effects of cancer treatments. Job resources can among others be provided by (1) social support, (2) autonomy, (3) leadership style, (4) coaching, or (5) organizational culture (Demerouti et al., 2001). Of these job resources the current experienced level and their possible association with work ability was taken into consideration in nine (25%) of the included studies; three case–control studies and six cross-sectional studies.

Social support by colleagues was reported to be associated with positive outcomes with regard to higher work ability in case–control studies (Carlsen et al., 2013; Lindbohm et al., 2012; Taskila et al., 2007), as well in cross-sectional studies (Gudbergsson et al., 2008a; Musti et al., 2018; Torp et al., 2012). For instance, a high level of cancer-related support by colleagues was associated with higher work ability 15–39 months after diagnosis, also in multivariate regression (Torp et al., 2012). Social support by supervisors was reported to be associated with positive outcomes with regard to higher work ability as well in case–

control studies (Carlsen et al., 2013; Lindbohm et al., 2012), as in cross-sectional studies (Musti et al., 2018; Torp et al., 2012). For instance, less help and support from a supervisor was significantly associated with reduced work ability among workers 5–8 years after breast cancer diagnosis (Carlsen et al., 2013).

Three cross-sectional studies analyzed a possible association of autonomy at work with work ability, although the construct of autonomy was defined somewhat differently. In two of these studies the respondents reported the 'decision latitude' (opportunities to learn new things at work and decide how to carry out the work tasks) at the time of the cancer diagnosis (Torp et al., 2012, 2017). Decision latitude was found to be significantly related with work ability among a sample workers who returned to work after various cancer diagnoses, 6% of whom were self-employed (Torp et al., 2012). In addition, it was also reported that the self-employed experienced a higher decision latitude, preventing low work ability (Torp et al., 2017). Furthermore, Cheung et al. (2017) reported 'control', a related concept, to be correlated with work ability ($R_s = 0.29$, $p = 0.04$).

Leadership style, coaching and organizational culture were assessed in almost none of the included studies. However, social climate at work, a concept related to organizational culture (Ehrhart & Schneider, 2016), was assessed in two studies (Lindbohm et al., 2012; Taskila et al., 2007), with only one study analyzing a possible association with work ability. This study showed that a better social climate at work was related to a higher mental work ability (Taskila et al., 2007). The only behavior of supervisors related to leadership style that was assessed in some of the studies was social support from supervisors and their avoidance behavior. Worth noting is that male workers with a cancer diagnosis experienced lower work ability as a result of supervisors' avoidance behavior ($p < 0.001$), while female workers with a cancer diagnosis in their past experienced lower work ability if avoidance behavior of colleagues was higher ($p < 0.001$) (Lindbohm et al., 2012).

All in all, the attention paid to job resources among the included studies was limited. Nevertheless, the scarce results indicate a positive association between job resources and work ability, although no data on job resources that affect the strength of the association of the late effects with work ability have been found.

Discussion

As high numbers of working people diagnosed with cancer re-enter the workplace and the group of workers with a cancer diagnosis in their life history will continue to expand, it is important to have an overview over the current state of knowledge about the course of work ability after diagnosis, and about the associations between late effects of cancer treatment and work ability. Knowledge about the role of job resources (social support, autonomy, leadership style, coaching, and organizational culture) in this is also relevant.

The searches included 2303 records in total, and 36 studies were selected. A quality assessment was used to clarify the quality across studies and we found that most

research was cross-sectional (50%). These studies and the six case-control studies were mostly completely or in part focused on workers beyond two years past cancer diagnosis. However, only two of the 12 cohort studies had a follow-up beyond 2 years after diagnosis.

It is an important finding that studies with various study populations and study designs demonstrate that work ability seems to be lowered shortly after the start of cancer treatment and tends to recover during the first two years after the diagnosis, although work ability might still be lower than in healthy populations. Because there is a lack of longitudinal data beyond the first two years after diagnoses, the further course of work ability is not clear. Differences in the level of work ability between workers with different types of cancer diagnosis in the past are reported. Late physical complaints, fatigue or cognitive complaints are associated with lower work ability across all relevant studies. None of these studies had a longitudinal design.

Social support and characteristics of autonomy were assessed in some of the studies, indicating that these current job resources are associated with higher work ability, in line with results in the healthy population (Gould et al., 2000) and also in populations experiencing chronic health problems (Leijten et al., 2014). No data were available on the possible buffering effects of social support and autonomy on the relationship between late effects of cancer treatments and work ability. Organizational culture in general was not investigated, only social climate at work in one study, which was positively related to a higher work ability. No results were found for leadership style, and coaching. In short, research on late effects of cancer treatment and work ability among workers past cancer diagnosis has not yet been enriched or combined with investigations of possible buffering by job resources.

Limitations

First, of the 36 studies included, ten studies (28%) solely concerned workers with a breast cancer diagnosis, which may have caused bias. The other studies used in this review included considerable variations in type(s) of cancer and cancer treatments. However, the impact of differences in diagnosis is not clear. For instance, survivors of testicular cancer reported the highest work ability (even comparable to controls), survivors with prostate cancer the lowest level, and the breast cancer population in between (Lindbohm et al., 2012; Taskila et al., 2007). It is important to be aware of the very different profiles with regard to gender and age of these types of cancer. Among healthy populations age is generally associated with work ability, younger workers usually estimating their work ability at a higher level (Bender et al., 2015; Gould et al., 2000; Van den Berg et al., 2010). Also, variation among participants in the disease status may cause a lack of comparability, as there are differences between studies with regard to including participants with recurrence, or distant metastasis, while awareness of disease progression or the possibility of the cancer not being curable, might influence perceived work ability.

Second, the way that work ability was measured did not seem to influence the results. The complete WAI (Work Ability Index) was used in a few studies only, while the vast

majority of studies used only one or more of the items adopted from the WAI, with the first item (current work ability compared to life-time best) being used most frequently. The complete WAI is reported to be a very predictive and cross-nationally stable instrument (Radkiewicz & Widerszal-Bazyl, 2005) to predict work disability, retirement and mortality in a reliable way (Ilmarinen & Tuomi, 2004). Furthermore, the first item of the WAI is reported to have a very strong association with the complete WAI (Ahlstrom et al., 2010), and to show similar strong predictive value for the degree of sick leave, health-related quality of life (Ahlstrom et al., 2010) and future disability (Alavinia et al., 2009). Although in the general populations the use of the complete WAI might result in a higher probability of lower work ability in women compared to using only the first item of the WAI (El Fassi et al., 2013), using only one item of the WAI is regarded as a good alternative for the complete WAI. A minority of the included studies did not use any of the WAI items, but used different surveys, ad hoc questions, a perception of the participant, etcetera. In short, when interpreting results on work ability in workers with a past cancer diagnosis, conscientiousness in reviewing the assessment tool of work ability is wise, although the results across the studies included in this review do not lead to different conclusions.

Third, the late effects of cancer treatment evaluated in this systematic literature review were not all possible prevalent late effects. For instance, depression was not included, and the effect of co-morbidities was not clear. However, the scarce studies that investigated a possible association of late physical complaints, fatigue and cognitive complaints with work ability, indicated that these complaints after cancer treatment were associated with lower work ability in almost all included studies. It is important to be alert of the likelihood of stronger associations of specific complaints with work ability in the cancer population, as this was already reported for fatigue in one of the included studies (Carlsen et al., 2013). More knowledge is needed to be able to know what subgroups are at risk and aim rehabilitation interventions at the right objectives. Furthermore, it is important to realize that the prevalence of late effects might also differ due to different types of treatment (Stein et al., 2008), while these differences are not always taken into account.

Fourth, the work status, the type of employment and the personal work histories of the study participants were not clear in a vast majority of the studies. Study samples did not in all instances include participants who had fully recovered 100% of their previous working hours currently or were not always entirely actively at work during the study's data selection for unknown reasons. Only some studies mentioned type of work, like blue or white collar. Also, information on previous work adjustments, previous changes of job or of employer, was mostly not presented. So, results might be biased by those not actually active in work, by differences in type of work or already made adjustments in job demands made in an earlier stage. Furthermore, the setting of 75% of the studies was a European country, preventing global generalizability.

Fifth, only 13 (36%) of the 36 studies mentioned the inclusion of self-employed workers; freelancers, or entrepreneurs (Cheung et al., 2017; De Boer et al., 2011; Gudbergsson et al., 2008b; Hartung et al., 2018; Lee et al., 2008; Moskowitz et al., 2014; Ortega et al., 2018;

Tamminga et al., 2019; Taskila et al., 2007; Torp et al., 2017, 2012; Von Ah et al., 2017; Wolvers et al., 2019). However, the self-employed might have different characteristics in regard to age, educational level, and gender and decision latitude, as was reported in one of the studies (Torp et al., 2017). Also, a recent European multi-country study (Torp et al., 2018), reported that differences in work ability could be observed between salaried and self-employed but that the direction and magnitude of these differences differed across countries. The variation between different kinds of self-employment should probably be considered too, as self-employment occurs in very different professional areas, and among the healthy population agricultural entrepreneurs, for instance, have a lower work ability than other occupational groups (Gould et al., 2000). The conclusion from this review is that the non-salaried workers among cancer survivors are reported to have a lower work ability than salaried workers. However, differentiation in occupational groups within the self-employed is not clear, stressing the need to take this into account as self-employment shows varying profiles. This review does not clarify whether predictors of lower work ability in this type of employment differ from the predictors of lower work ability in the salaried work situation. Nevertheless, the role of reduced working hours and a negative cancer-related financial change underlines that targets for occupational rehabilitation in this group of workers could also be interventions directed at business support, as some rehabilitation providers focusing on the self-employed are already offering. Future studies should focus on the needs of this specific group of the non-salaried workers with a past cancer diagnosis.

Finally, this review was limited to five well-known job-resources for the general working population. Other job resources, such as growth opportunities, performance feedback or organizational prestige, might also be relevant for the salaried, and also or even exclusively for the non-salaried. Furthermore, also personal resources are important (McGonagle et al., 2015), however these were not the focus of this review.

Strengths

This is the first review to focus on late effects of cancer treatment, work ability and job resources. This review combines findings on the effects of cancer treatment with work ability (Ilmarinen et al., 2005), and with the Job Demands-Resources (JD-R) model (Demerouti et al., 2001), which is unique to our knowledge. The goal of sustainable work participation of cancer survivors needs tailored interventions (De Boer et al., 2020) and the outcome measure of work ability is an important factor in this research area. This review integrates concepts originated in different research disciplines with the intention to be able to focus on targets in the workplace to preserve and enhance work ability among workers experiencing late effects of cancer treatment beyond the first two years after cancer diagnosis.

Conclusion

To conclude, this systematic literature review confirms that a lowered work ability after the start of cancer treatment, might recover during the first two years after diagnosis. However, at two or more years beyond cancer diagnosis work ability might still be lower

than before the cancer diagnosis. The course of work ability among workers beyond the first two years after diagnoses is unknown as no longitudinal data are available. Longitudinal research in salaried and non-salaried populations is needed to study in more detail what factors are important for sustainable occupational rehabilitation after cancer treatment. Besides this, an interesting methodological finding is that although the majority of the studies uses one of more items of the Work Ability Index (WAI) to assess work ability, also a substantive part of the included studies makes use of a variety of validated and non-validated measurement tools. The method to measure work ability did not seem to lead to different conclusions.

Physical complaints, fatigue and cognitive complaints may be present as late effects of cancer treatment beyond two years after diagnosis and can be associated with a lower level of work ability. However, data on the association between late effects and work ability is scarce. Furthermore, it is unknown if late effects of cancer treatment diminish work ability beyond two years after being diagnosed with cancer because longitudinal studies are lacking.

Furthermore, this review also makes clear that the job resources leadership style, coaching and organizational culture were not taken into account in studies on late effects of cancer treatment and work ability, and that for the job resources that were included (autonomy and social support in the workplace) no possible buffering effect was analyzed. However, autonomy and social support were associated with higher work ability and therefore are important for work functioning among workers past cancer diagnosis and it is recommended to enhance these job resources as much as possible.

This review indicates that there is an urgent need to close this gap in our knowledge. It is important to study late effects of cancer treatment, work ability and job resources in combination within studies among various samples of workers with a past cancer diagnosis, as well in large international cohorts. These studies need to be carried out beyond the first two years of cancer diagnosis. A focus on a broad range of job resources is essential, both for salaried and self-employed workers. It should be clear what range of job resources might accelerate a recovery of work ability, creating an important step towards clarifying the issue of the rehabilitation of work ability beyond return to work among workers with a history of cancer.

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Appendix 1. Search strategies

The searches below yielded the following results on March, 2020; PsycINFO (164 references), MEDLINE (811 references), Business Source Premier (47 references), ABI/Inform (91 references), CINAHL- NOT Medline (99 references), Cochrane Library (68 references), Web of Science (1.021 references). This yielded a total of 2.301 references.

PsycINFO (Ovid, 1806 to 10th March 2020)

1. neoplasms/ OR breast neoplasms/ OR endocrine neoplasms/ OR leukemias/ OR melanoma/ OR (cancer* OR tumor* OR neoplasm* OR carcinoma* OR melanom* OR leukemi* OR melanom*).ti,ab,id.
2. (((work OR employ*) ADJ2 (ability OR continu* OR sustain*)) OR occupationally active OR beyond return to work* OR working patient*).ti,ab,id,tm.
3. 1 AND 2

Key: / = subject heading, ti = title, ab = abstract, id = key concepts (other keywords added by PsycINFO indexers to supplement the subject headings), tm = tests & measures

MEDLINE (Ovid MEDLINE, including epub ahead of print, in-process & other non-indexed citations and Ovid MEDLINE Daily, 1946 to 10th March 2020)

1. exp neoplasms/ OR (cancer* OR tumor* OR neoplasm* OR carcinoma* OR melanom* OR leukemi* OR melanom* OR lymphoma*).ti,ab,kf.
2. (((work OR employ*) ADJ2 (ability OR continu* OR sustain*)) OR occupationally active OR beyond return to work*).ti,ab,kf.
3. 1 AND 2

Key: / = medical subject heading (MeSH), ti = title, ab = abstract, kf = author supplied keywords

Business Source Premier (EBSCO, 1886 to 10th March 2020)

1. TI("cancer*" OR "tumor*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*") OR AB("cancer*" OR "tumor*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*") OR KW("cancer*" OR "tumor*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*")
2. TI(((("work" OR "employ*") N2 ("ability" OR "continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*") OR AB("work ability" OR ("work" OR "employ*") N2 ("continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*") OR KW("work ability" OR ("work" OR "employ*") N2 ("continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*")
3. 1 AND 2

Key: TI = title, AB = abstract, KW = author supplied keywords

CINAHL (EBSCO, CINAHL Plus with full text, 1937 to 10th March 2020)

1. MH("Neoplasms+" OR "cancer patients" OR "cancer survivors") OR TI("cancer*" OR "tumo#r*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*") OR AB("cancer*" OR "tumo#r*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*") OR KW("cancer*" OR "tumo#r*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*")
2. TI(("work" OR "employ*") N2 ("ability" OR "continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*" OR AB("work ability" OR ("work" OR "employ*") N2 ("continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*" OR KW("work ability" OR ("work" OR "employ*") N2 ("continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*")
3. 1 AND 2
4. 3 NOT MEDLINE

Key: MH = CINAHL Subject Headings, TI = title, AB = abstract, KW = author supplied keywords

Web of Science (Web of Science Core Collection, 1975 to 13th March 2020)

1. TS=("cancer*" OR "tumor*" OR "tumour*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*")
2. TS(("work" OR "employ*") NEAR/2 ("ability" OR "continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*")
3. 1 AND 2

Key: TS = topic, which includes title, abstract, author keywords and Web of Science Keywords Plus

ABI/Inform (Proquest, 1971 to 13th March 2020)

1. TI,AB,SU("cancer*" OR "tumor*" OR "tumour*" OR "neoplasm*" OR "carcinoma*" OR "melanom*" OR "leukemi*" OR "melanom*")
2. TI,AB,SU(("work" OR "employ*") NEAR/2 ("ability" OR "continu*" OR "sustain*")) OR "occupationally active" OR "beyond return to work*")
3. 1 AND 2
4. From 3 exclude wire feeds, trade journals and newspapers

Key: TI = title, AB = abstract, SU = subject headings

Cochrane Library to 13th March 2020)

1. "cancer*":ti,ab,kw OR "tumor*":ti,ab,kw OR "tumour*":ti,ab,kw OR
"neoplasm*":ti,ab,kw OR "carcinoma*":ti,ab,kw OR "melanom*":ti,ab,kw OR
"leukemi*":ti,ab,kw OR "melanom*":ti,ab,kw
2. (("work":ti,ab,kw OR "employ*":ti,ab,kw) NEAR/2 ("ability":ti,ab,kw OR
"continu*":ti,ab,kw OR "sustain*":ti,ab,kw)) OR "occupationally active":ti,ab,kw OR
"beyond return to work*":ti,ab,kw
3. 1 AND 2

Key: ti = title, ab = abstract, kw = keyword

CHAPTER 3

3

Work ability, burnout complaints, and work engagement among employees with chronic diseases: Job resources as targets for intervention?

Boelhouwer, I. G., Vermeer, W., & Van Vuuren, T. (2020).

Abstract

Purpose. The aim of this study was to investigate the occupational well-being among employees with chronic diseases, and the buffering effect of four job resources, possibly offering targets to enhance occupational well-being.

Method. This cross-sectional study ($N = 1951$) was carried out among employees in educational and (semi-)governmental organizations in the Netherlands. The dimensions of the survey were chronic diseases (i.e., physical, mental, or both physical and mental), occupational well-being (i.e., work ability, burnout complaints, and work engagement), and job resources (i.e., autonomy, social support by colleagues, supportive leadership style, and open and communicative culture). First, it was analyzed if chronic diseases were associated with occupational well-being. Second, it was analyzed if each of the four job resources would predict better occupational well-being. Third, possible moderation effects between the chronic disease groups and each job resource on occupational well-being were examined. Regression analyses were used, controlling for age.

Results. Each chronic disease group was associated with a lower work ability. However, higher burnout complaints and a lower work engagement were only predicted by the group with mental chronic diseases and by the group with both physical and mental chronic disease(s). Furthermore, all four job resources predicted lower burnout complaints and higher work engagement, while higher work ability was only predicted by autonomy and a supportive leadership style. Some moderation effects were observed. Autonomy buffered the negative relationship between the chronic disease groups with mental conditions (with or without physical conditions) and work ability, and the positive relationship between the group with both physical and mental chronic disease(s) and burnout complaints. Furthermore, a supportive leadership style is of less benefit for occupational well-being among the employees with mental chronic diseases (with or without physical chronic diseases) compared to the group employees without chronic diseases. No buffering was demonstrated for social support by colleagues and an open and communicative organizational culture.

Conclusion. Autonomy offers opportunities to reinforce occupational well-being among employees with mental chronic diseases. A supportive leadership style needs more investigation to clarify why this job resource is less beneficial for employees with mental chronic diseases than for the employees without chronic diseases.

Introduction

A chronic disease is regarded as a disease with an episode of treatment that extends over a long period, although the condition or stage of the disease does not have to be serious (De Lepeleire & Heyrman, 2003). Examples of chronic diseases are musculoskeletal diseases, cardiovascular diseases, or depression. The labor market participation of the population with chronic diseases is lower than that of the population without chronic diseases. For the general population at working age with chronic diseases in the Netherlands, the labor market participation (for at least 12 hours a week) is lower than that of the population without one or more chronic diseases, namely, 25% and 67%, respectively, in 2010 (Maurits et al., 2013). Furthermore, the labor market participation of the group with chronic diseases in the Netherlands is comparable to the mean figure of the other member countries of the Organization for Economic Cooperation and Development (SER, 2016).

The need to find strategies and solutions for enhancing the employment of people with chronic diseases is widely acknowledged (Nazarov et al., 2019). However, a factor in the prevalence of chronic diseases among workers is age. The last decades, the expansion of the aging workforce is an important factor among others with regard to the preservation of productivity (Aiyar & Ebeke, 2016), job opportunities, careers, and social inclusion (Silvaggi et al., 2020). The prevalence of one or more chronic diseases in the Netherlands in the year 2018 was 20.7% among the group in the age category from 20 to 30 years old, up to 46.4% among the group in the age category from 55 to 65 years old (CBS, 2019). Furthermore, comorbidity and multimorbidity of various chronic diseases is expected to continue to increase (Boyd & Fortin, 2010; Uijen & Van de Lisdonk, 2008). As a consequence, the number of people at risk of experiencing difficulties with particular work activities or demands as a result of one or more chronic diseases will be even more substantial in the future. Therefore, it is increasingly important to focus on working people with chronic diseases and indicate possible targets to enhance their occupational well-being.

Occupational well-being can be regarded as a broad concept, including work ability, burnout complaints, and work engagement, which are the indicators in the present study. Work ability, the first indicator, refers to one's ability to function well at work or to be able to achieve expected work goals (Ilmarinen, 2007; Ilmarinen et al., 2005). Work ability is mostly measured by one or more items of the Work Ability Index (WAI) questionnaire (Ilmarinen, 2007). The level of work ability is regarded as a valid indicator for other work outcome measures. For instance, a moderate or poor work ability is found to be highly predictive for receiving a disability pension (Alavinia et al., 2009). Although higher age is associated with more chronic diseases, studies do report mixed results with regard to the association between age and work ability. Some studies report a decreased work ability with older age (Van den Berg et al., 2008; Vangelova et al., 2018); however, also high work ability among older workers is reported, for instance, in an Australian study among mature age working women (Austen et al., 2016). Burnout complaints, the second indicator, are regarded as a prolonged stress response to chronic stressors at work, which might be related to the onset of cognitive decline in elderly workers

(Giorgi et al., 2020). Burnout can be defined by three dimensions; exhaustion, cynicism, and inefficacy (Maslach et al., 2001), which distinction is in line with the subscales of the Utrecht Burnout Scale (UBOS) (Schaufeli & Van Dierendonck, 2000). Work engagement, the third indicator, is described as a positive, fulfilling, affective-motivational state of work-related well-being that is characterized by vigor, dedication, and absorption, in line with the subscales of the Utrecht Work Engagement Scale (UWES) (Bakker et al., 2008).

Furthermore, supporting factors in achieving work goals, so-called job resources within the Job Demands-Resources (JD-R) model (Demerouti et al., 2001), might play an important role. Job resources refer to aspects of the job that are functional in achieving work goals, or stimulate personal growth, learning and development or reduce job demands (Schaufeli & Bakker, 2004). In the JD-R model, job demands are regarded as the aspects of the job that require effort and it is possible that the effects of a chronic disease result in work demands being experienced as heavier. In general, the JD-R model and therefore the beneficial influence of job resources is well established in several work contexts. In addition, in some studies, job resources were reported to buffer the impact of job demands on burnout (Bakker et al., 2005; Xanthopoulou et al., 2007). So, job resources can show positive associations with higher occupational well-being, or job resources might even buffer a possible association between chronic diseases and occupational well-being. For that reason, job resources might be of importance for work functioning among workers with chronic diseases.

Research on associations among the three indicators of occupational well-being as used in this study is merely focused on associations between burnout complaints and work engagement. Studies indicate that these two indicators of occupational well-being cannot simply be regarded as opposite concepts. Burnout is mainly predicted by job demands and a lack of job resources. However, work engagement is specifically predicted by available job resources (Schaufeli & Bakker, 2004). Studies on relations between burnout complaints or work engagement on the one hand and work ability on the other hand are scarce. Nevertheless, there are some results. For instance, in a 6-month longitudinal study among employees of two manufacturers Rongen et al. (2014) demonstrated that low work engagement was related with low work ability beyond known health behaviors and work-related characteristics. These findings indicate that it is important to examine all three abovementioned indicators of occupational well-being within one study.

Hypotheses

The aim of the present study is to investigate (1) if chronic diseases are associated with lower occupational well-being (that is, lower work ability, higher burnout complaints, or lower work engagement), (2) the direct effect of four job resources on occupational well-being, and, most importantly, (3) the possible moderation of the presumed relationship between chronic diseases and occupational well-being by job resources. The approach to combine these concepts in one study is quite unique and of great relevance in finding

possible targets to enhance occupational well-being among employees with chronic diseases.

Chronic Diseases and Occupational Well-Being

Chronic diseases are normally categorized as mental or physical. Different chronic diseases can demonstrate various profiles with regard to the mean age at which the condition occurs in the population and the prevalence of the condition between age groups. Furthermore, a higher prevalence of multimorbidity is observed with higher age (Banerjee, 2015; Xu et al., 2017). Therefore, the present study will differentiate between physical chronic diseases, mental chronic diseases, and comorbidities of mental and physical chronic diseases, as these groups might differ with regard to the stage in the course of life and career in which the members of the group find themselves.

Regarding work ability, several studies have already investigated the association of chronic diseases with this indicator of occupational well-being. Workers with different chronic diseases are reported to be at a higher risk of a lower level of work ability than workers without these conditions (Koolhaas et al., 2014; Leijten et al., 2014; Van den Berg et al., 2017).

Furthermore, burnout complaints are found to occur more frequently in certain populations with specific chronic diseases, such as women with musculoskeletal diseases or men with cardiovascular diseases (Honkonen et al., 2006), women with coronary heart disease (Hallman et al., 2003) or women with depression (Soares et al., 2007). On the other hand, burnout is also reported to probably influence the development and course of certain disease processes by several biobehavioral pathways (Shirom et al., 2006), but this is only studied for some chronic diseases.

The available studies that assess the association between chronic diseases and work engagement do not directly present an unambiguous overview. Schaufeli et al. (2008) reported significant negative associations between perceived health and dimensions of work engagement. Furthermore, distress and depression were both negatively associated with vigor, and distress was negatively associated with dedication as well. However, in another study, high work engagement levels were observed among workers with musculoskeletal symptoms, but the role of the biomechanical demands of the work tasks of these workers needed further investigation (Nogueira et al., 2012). Furthermore, another study among cancer survivors (after they had returned to work) and their non-cancer referents (with or without other chronic diseases) demonstrated that the level of work engagement was high in both study groups, and only slightly higher among the referents than among the cancer survivors (Hakanen & Lindbohm, 2008). In general, vigor is positively related to mental and physical health (Bakker & Leiter, 2010). Furthermore, vigor is regarded as a physical indicator of vitality (Ryan & Frederick, 1997), and vitality is regarded to be related to the absence of chronic diseases (Strijk et al., 2009).

To summarize, employees with chronic diseases are expected to have lower work ability, higher burnout complaints, and lower work engagement than employees without chronic diseases. Hence, our first set of hypotheses is:

- H1a. Workers with chronic diseases (mental and/or physical chronic diseases) have a lower work ability than workers without chronic diseases.
- H1b. Workers with chronic diseases (mental and/or physical chronic diseases) have higher burnout complaints than workers without chronic diseases.
- H1c. Workers with chronic diseases (mental and/or physical chronic diseases) have lower work engagement than workers without chronic diseases.

Job Resources and Occupational Well-Being

Assuming that occupational well-being is less favorable in the case of chronic diseases as we expected, it is important to have more insight in possible specific ways to improve occupational well-being by promoting job resources for this population of workers. In the present study, four job resources are taken into account: autonomy, social support by colleagues, a supportive leadership style, and an open and communicative culture. Firstly, in this section, we will formulate our expectations with regard to the association of each of the four job resources with occupational well-being, and then in Section “Moderation by Job Resources,” we will present our expectations on the moderation by the four job resources of the presumed relationship between the chronic disease groups and occupational well-being.

The first job resource, autonomy, refers to the influence on one’s own work, for instance by autonomous decisions. Several studies have demonstrated that a lack of autonomy is associated with poor work ability, as defined by the WAI (Van den Berg et al., 2008). Associations of autonomy and burnout complaints were found as well, and a lack of autonomy is correlated with burnout risk (Kim et al., 2018; Maslach et al., 2001). Furthermore, a meta-analysis by Alarcon (2011) demonstrated that autonomy is negatively associated with all three burnout subscales. With regard to work engagement, a cross-national study in different work contexts within eight European countries by Taipale et al. (2011), demonstrated that autonomy was a strong predictor of the level of work engagement. Furthermore, job control is associated with work engagement among Finnish health care personnel in a longitudinal study by Mauno et al. (2007). Schaufeli et al. (2009) reported changes in autonomy to be predictive of changes in work engagement among telecom managers.

With regard to the second job resource, social support by colleagues, a positive association with work ability is demonstrated for instance among hospital nurses (Olsen et al., 2017). Furthermore, among female cancer survivors, co-workers’ support is related to a reduced risk of impaired work ability (Taskila et al., 2007). Concerning burnout complaints, there is a consistent and strong body of evidence that a lack of social support is linked to burnout (Maslach et al., 2001). Also, with regard to work engagement, a positive association of social support by work mates with work

engagement is for instance reported in the study in eight European countries in different work contexts (Taipale et al., 2011).

The third job resource, a supportive leadership style, is studied in relation to work ability in previous studies, but results vary. Among IT workers, supervisor support was demonstrated to predict work ability 1 year later (Sugimura & Thériault, 2010). However, in a study by Tuomi et al. (2004), an improvement of supervisory support did not predict an improvement of work ability, although improvement of supervisory support and improvement of work ability were significantly associated. In another study, conducted in several parts of the industrialized world by McGonagle et al. (2014), supervisor support was positively related to work ability in the Australian sample only, and not associated with work ability in the other samples (i.e., United States, United Kingdom, Brazil, Poland, and Croatia). The relation of a supportive leadership style with burnout is also far from straightforward. Kanste et al. (2007) indicate that this relationship is complex, as leadership style tends to be affected by situational factors. However, Maslach et al. (2001) concluded that a lack of support from supervisors is especially detrimental in relation to burnout complaints, even more so than a lack of support from co-workers. With respect to work engagement, a study demonstrated a higher contribution of transformational leadership to work engagement than transactional leadership (Li et al., 2018). As the latter style focuses on performance within existing boundaries, the transformational leadership is more change-oriented and might allow more use of job resources.

With regard to the fourth job resource, an open and communicative organizational culture, there are some studies that focus on concepts linked to organizational culture. For instance, associations with higher work ability were found for good organizational relationships among personnel of nursing homes (Kiss et al., 2014) and for a supportive organizational climate among managers (Feldt et al., 2009). Higher perceptions of ethical culture demonstrated to be associated with lower burnout and higher work engagement (Huhtala et al., 2015). Furthermore, in a review by Wollard and Shuck (2011) concerning the antecedents of work engagement, not only results with regard to local microcultures and management, like psychological climate (Shuck et al., 2011), were reported, but also antecedents at the organizational level, like corporate social responsibility (Davies & Crane, 2010). Furthermore, Van Dam et al. (2017) demonstrated that an age-supportive climate is especially important for older employees' work engagement and affective commitment.

To summarize, autonomy, social support by colleagues, a supportive leadership style, and an open and communicative culture are expected to be associated with a higher work ability, lower burnout complaints, and higher work engagement. Therefore, our second set of hypotheses is:

- H2a. Autonomy is associated with higher work ability, lower burnout complaints, and higher work engagement.

- H2b. Social support by colleagues is associated with higher work ability, lower burnout complaints, and higher work engagement.
- H2c. A supportive leadership style is associated with higher work ability, lower burnout complaints, and higher work engagement.
- H2d. An open and communicative organizational culture is associated with higher work ability, lower burnout complaints, and higher work engagement.

Moderation by Job Resources

The four job resources can be of importance for employees in the general population, and the focus in this study is on the possible interaction of the presumed relationship between the chronic disease groups and occupational well-being. The JD-R model distinguishes a strain process, related to the level of the job demands, and a motivational process, influenced by job resources. Job resources can buffer for demanding work conditions (Bakker & Demerouti, 2007). As workers with chronic diseases might experience their work as more demanding because of these chronic diseases, several job resources might also buffer the association between the chronic diseases and less favorable work ability, burnout complaints, or work engagement. However, to our knowledge, no study has been done to investigate this among employees with chronic diseases. Among the general population, studies with a focus on buffering effects of job resources do not concern work ability, but several studies concern burnout complaints or work engagement. These studies demonstrated the importance of job resources interacting with job demands predicting lower symptoms of burnout (Bakker et al., 2005; Xanthopoulou et al., 2007) or higher work engagement (Bakker et al., 2007). Because of the rationale of the JD-R model and the above presented results, we expect a moderating effect for the job resources, and our third set of hypotheses is:

- H3a. Autonomy buffers the presumed relationship of chronic diseases with lower work ability, higher burnout complaints, or lower work engagement.
- H3b. Social support by colleagues buffers the presumed relationship of chronic diseases with lower work ability, higher burnout complaints, or lower work engagement.
- H3c. A supportive leadership style buffers the presumed relationship of chronic diseases with lower work ability, higher burnout complaints, or lower work engagement.
- H3d. An open and communicative organizational culture buffers the presumed relationship of chronic diseases with lower work ability, higher burnout complaints, or lower work engagement.

Materials and Methods

Participants and Procedure

A cross-sectional employee survey was carried out between 2013 and 2017 in The Netherlands by Loyalis Knowledge & Consult among employees working in different primary schools and (semi) governmental organizations (i.e., municipality and regional water authorities) in accordance with relevant institutional and national guidelines. The aim was to offer the employees in the participating organizations information for improving their sustainable employability. The questionnaires of the present study included scales for four job resources (autonomy, social support by colleagues, supportive leadership style, and open and communicative culture). The questionnaires were distributed online, accompanied by an e-mail on behalf of the researchers, stating the relevance and purpose of the study. The respondents were informed that all data would be treated confidentially and that the participation was voluntary. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The participants were predominantly female (61.6%) and with a high educational level (73.1%). The mean age was 46.4 years (*SD* 11.12).

Measures

Information on chronic diseases was obtained based on the third question of the WAI questionnaire (Ilmarinen, 2007). This WAI question consists of a list of actual physical or mental conditions, for which the respondent can indicate if this is an actual health condition diagnosed by a physician. The possible physical conditions may be an injury caused by an accident, a condition of the musculoskeletal system, cardiovascular disease, respiratory disease, neurological and sensory disease, digestive disease, genitourinary disease, skin disease, metabolic disease, blood diseases, birth defects, or tumors. The possible mental conditions may be depressive complaints or a depressive disorder, tension, anxiety, and insomnia or other mental disorders. For the present study, the condition(s) are classified in three groups and indicated as chronic diseases. Chronic disease group 1 includes participants with one or more physical condition(s) ($N = 640$) which represents 32.8% of the sample. Among these participants, the most frequently reported chronic diseases are "medical condition of the musculoskeletal system" with 25.3% and "cardiovascular disease" with 11.9%. A number of two physical chronic diseases is reported by 9.8% of the respondents and 5.3% reported three or more physical chronic diseases. Chronic disease group 2 includes participants with one or more mental condition(s) ($N = 36$), which represents 1.8% of the sample. Chronic disease group 3 includes participants with one or more physical conditions and one or more mental conditions ($N = 120$). Chronic disease group 3 represents 6.2% of the sample. The remaining participants in the sample have no physical chronic disease, or a mental chronic disease ($N = 1155$, which represents 59.2% of the sample) (see Tables 1, 2).

Work ability was measured by a combination score of the first two questions from the WAI. The first question of the WAI indicates the current work ability compared with a person's lifetime best on a scale from 0 (completely unable to work) to 10 (work ability at its best). This item is reported to have a very strong association with the complete WAI (Ahlstrom et al., 2010). The second question consists of two items: current physical work

ability and current mental work ability in relation to physical and mental job demands on a scale from 0 (*very low*) to 5 (*very high*). For the present study, the three items were merged into one work ability scale from 0 (*very low*) to 5 (*very high*), whereby the scale of the first item was adjusted from 0 (*completely unable to work*) to 10 (*work ability at its best*) into a scale from 0 (*completely unable to work*) to 5 (*work ability at its best*) before merging. The Cronbach's α of the final work ability scale with three items is 0.74.

Burnout was measured using the UBOS (Schaufeli & Van Dierendonck, 2000), consisting of 15 items on a seven-point Likert scale from 1 (*never*) to 7 (*always*), covering three subscales, namely, exhaustion, cynicism, and professional inefficacy. In the present study, the total score of the three subscales was used. The Cronbach's α 's for the three subscales were respectively 0.89, 0.82, and 0.82 and the reliability of the total UBOS scale is 0.89.

Table 1. Groups with chronic diseases and numbers of chronic diseases ($N = 1951$).

Chronic diseases	Number reported	%
Groups		
Group 1—physical chronic disease(s)	640	32.8
Group 2—mental chronic disease(s)	36	1.8
Group 3—physical chronic disease(s) and mental chronic disease(s)	120	6.2
Medical condition of the musculoskeletal system		
Cardiovascular disease	232	11.9
Skin disease	189	9.7
Respiratory disease	183	9.4
Neurological and sensory disease	173	8.9
Metabolic disease	118	6.0
Digestive disease	114	5.8
Injury caused by an accident	110	5.6
Genitourinary disease	64	3.3
Tumors	43	2.2
Birth defects	31	1.6
Blood diseases	26	1.3
Other	70	3.6
Mental chronic diseases	156	8.0

Table 2. Numbers of physical chronic diseases.

Number of physical chronic diseases	Number of participants	%
1	364	18.7
2	192	9.8
3	81	4.2
4	20	1.0
5 or more	18	0.1

Work engagement was measured using the UWES (Bakker et al., 2008) consisting of nine items on a seven-point Likert scale from 1 (*never*) to 7 (*always*), covering three subscales,

namely, vigor, dedication, and absorption. In the present study, the total score of the three subscales was used. The Cronbach's α 's for these three subscales were respectively 0.90, 0.93, and 0.84 and the reliability of the total UWES scale is 0.95.

The four job resources (autonomy, social support by colleagues, a supportive leadership style, and an open and communicative organizational culture) were measured using one of the scales by Van Poppel and Kamphuis (2004), which were developed for the context of primary schools. All four job resources made use of a five-point scale of 1 (*strongly disagree*), 2 (*disagree*), 3 (*not agree, nor disagree*), 4 (*agree*), and 5 (*strongly agree*). The Cronbach's α 's were 0.80 for autonomy (four items), 0.74 for social support by colleagues (five items), 0.89 for supportive leadership style (four items), and 0.90 for open and communicative culture (eight items).

Control variable is calendar age, as reported by the respondents. Age is reported to show different relationships with various chronic diseases and also to be negatively associated with work ability in other studies (Van den Berg et al., 2008).

Analysis

The data were analyzed using SPSS software, version 25 (IBM Corporation, Armonk, NY, United States) for Windows®/Apple Mac®. Descriptives are reported for age, work ability, burnout complaints, work engagement, and the four job resources (autonomy, social support by colleagues, a supportive leadership style, and an open and communicative organizational culture). The scores on job resources were standardized by z scores. For the regression analyses, we used dummies for three categories of employees with chronic diseases (groups 1, 2, or 3), in order to establish the relationship with the type of chronic disease. In doing so, we used employees without chronic diseases (group 4) as the reference category. Hardy (1993) recommends to use a reference category that serves as a useful comparison to the other categories, and to use a large group as the reference category. The reference category is omitted from the regression analyses; the standardized coefficient (β) shows the extent to which the other group deviates from the reference group and is regarded as the indicator of the effect size (Ferguson, 2009). Standardized coefficients are more easily comparable, because the variables are standardized to have a mean of 0 and standard deviation of 1. In line with other common effect indices, a β coefficient of 0.2 is regarded as a small effect, a β coefficient of 0.5 is regarded as a medium effect, and a β coefficient of 0.8 is regarded as a large effect (Sullivan & Feinn, 2012).

Three separate multiple regression analyses were used to investigate the associations between the dummies and each of the job resources with respectively work ability, burnout complaints, and work engagement, also including age in each analysis. Furthermore, possible moderation by autonomy, social support by colleagues, a supportive leadership style, and an open and communicative culture were analyzed by interaction terms of each of the chronic disease groups and each of the four job resources. The dummies for the interaction terms of employees without chronic diseases and each of the four job resources are also omitted.

Results

Descriptives

The mean age of the group with physical chronic disease(s) was 47.9 years (*SD* 10.81), and significantly higher ($p < 0.05$) than the mean age of the group with mental chronic disease(s) with 42.1 years (*SD* 11.35) and also than the group without chronic diseases with 45.5 years (*SD* 11.25). The mean age of the group with physical and mental chronic disease(s) [with both physical and mental condition(s)] was 47.5 years (*SD* 10.37) (see Table 3).

Table 3 also shows that the mean level of work ability was significantly higher in the group without chronic diseases (4.0), than in the group with physical chronic disease(s) (3.9) ($p < 0.05$), the group with mental chronic disease(s) (3.6) ($p < 0.05$), and the group with both physical and mental condition(s) (3.4) ($p < 0.05$). Furthermore, the level of work ability in the group with physical chronic disease(s) was significantly higher than in the group with mental chronic disease(s) ($p < 0.05$) and the group with both physical and mental condition(s) ($p < 0.05$). The mean level of burnout complaints was significantly lower in the group without chronic diseases (2.3) than in the group with physical chronic disease(s) (2.4) ($p < 0.05$), the group with mental chronic disease(s) (3.0) ($p < 0.05$), and the group with both physical and mental condition(s) (3.2) ($p < 0.05$). Moreover, the level of burnout complaints in the group with physical chronic disease(s) was significantly lower than in the group with mental chronic disease(s) ($p < 0.05$) and the group with both physical and mental condition(s) ($p < 0.05$). The mean level of work engagement was significantly higher in employees without chronic diseases (5.1), than in the group with mental chronic disease(s) (4.2) ($p < 0.05$) and the group with both physical and mental condition(s) (4.3) ($p < 0.05$), but not different from the group with physical chronic disease(s) (5.1). Furthermore, the level of work engagement in the latter group was significantly higher than in the group with mental chronic disease(s) ($p < 0.05$) and the group with both physical and mental condition(s) ($p < 0.05$).

The level of each of the four job resources (autonomy, social support by colleagues, a supportive leadership style, or an open and communicative culture) in the group with physical chronic disease(s) and the group with mental chronic disease(s) was at the same level as in the group without chronic diseases. The level of each job resource was significantly lower in the group with physical and mental chronic disease(s) than in the group without chronic diseases ($p < 0.05$) (see Table 3).

As shown in Table 4, significant correlations ($p < 0.01$) between work ability, burnout complaints, work engagement, and each of the four job resources were observed in the expected directions.

Table 3. Health condition groups: age, work ability, burnout complaints, work engagement, and job resources (autonomy, social support by colleagues, a supportive leadership style, or an open and communicative culture).

Variable M (SD)	Missing	Group 1— physical chronic disease(s)	Group 2— mental chronic disease(s)	Group 3— physical chronic disease(s) and mental chronic disease(s)	Group 4— no chronic disease(s)	Complete study sample
N		640	36	120	1155	1951
Age in years ^μ	34	47.9 (10.81) [#]	42.1 (11.35)	47.5 (10.37)	45.5 (11.25)	46.4 (11.12)
Work ability ^{μλ} Five-point scale	–	3.9 (0.51) [#]	3.6 (0.67) [#]	3.4 (0.71) [#]	4.0 (0.50)	3.9 (0.55)
Burnout complaints ^{μλ} Seven-point scale	–	2.4 (0.72) [#]	3.0 (0.92) [#]	3.2 (0.94) [#]	2.3 (0.69)	2.4 (0.76)
Work engagement ^{μλ} Seven-point scale	–	5.1 (1.05)	4.2 (1.16) [#]	4.3 (1.11) [#]	5.1 (1.11)	5.0 (1.11)
Autonomy Five-point scale	6	3.6 (0.65)	3.5 (0.70)	3.5 (0.70) [#]	3.7 (0.65)	3.7 (0.65)
Social support by colleagues ^λ Five-point scale	6	4.0 (0.50)	3.9 (0.50)	3.9 (0.61) [#]	4.0 (0.52)	4.0 (0.52)
Supportive leadership style ^{λψ} Five-point scale	11	3.7 (0.76)	3.8 (0.71)	3.3 (0.93) [#]	3.7 (0.80)	3.7 (0.80)
Open and communicative culture ^ψ Five-point scale	8	3.4 (0.67)	3.4 (0.58)	3.0 (0.72) [#]	3.4 (0.67)	3.4 (0.68)

Notes. M, mean; SD, standard deviation; N, number of participants.

^μSignificant difference between group 1 and group 2 at the 0.05 level.

^λSignificant difference between group 1 and group 3 at the 0.05 level.

^ψSignificant difference between group 2 and group 3 at the 0.05 level.

[#]Significant difference from group 4 at the 0.05 level.

Table 4. Work ability, burnout complaints, work engagement, and job resources (autonomy, social support by colleagues, supportive leadership style, or open and communicative culture): correlations.

Variables	1	2	3	4	5	6	7
Work ability	(0.74)						
Burnout complaints	–0.579**	(0.89)					
Work engagement	0.434**	–0.781**	(0.95)				
Autonomy	0.312**	–0.362**	0.282**	(0.80)			
Social support by colleagues	0.161**	–0.322**	0.355**	0.171**	(0.74)		
Supportive leadership style	0.238**	–0.352**	0.343**	0.240**	0.351**	(0.89)	
Open and communicative culture	0.233**	–0.385**	0.380**	0.250**	0.356**	0.618**	(0.90)

Notes. Cronbach’s α’s are in parentheses. **Correlation is significant at the 0.01 level (two-tailed).



Table 5. Summary of multiple regression analyses for variables predicting work ability, burnout complaints, and work engagement (N = 1951).

Variable	Work ability			Burnout complaints			Work engagement		
	B	SEB	β	B	SEB	β	B	SEB	β
Age	-0.004	0.001	-0.091**	0.000	0.001	-0.003	-0.004	0.002	-0.040*
Group 1—physical chronic disease(s)	-0.097	0.024	-0.085**	0.046	0.031	0.028	0.053	0.048	0.022
Group 2—mental chronic disease(s)	-0.371	0.096	-0.092**	0.489	0.124	0.087**	-0.698	0.190	-0.084**
Group 3—physical chronic disease(s) and mental chronic disease(s)	-0.535	0.053	-0.235**	0.671	0.069	0.212**	-0.621	0.106	-0.133**
Autonomy	0.117	0.015	0.214**	-0.157	0.020	-0.207**	0.151	0.031	0.135**
Group 1 × Autonomy	-0.011	0.025	-0.012	-0.050	0.033	-0.038	0.078	0.050	0.040
Group 2 × Autonomy	0.254	0.098	0.069*	-0.212	0.127	-0.041	0.074	0.195	0.010
Group 3 × Autonomy	0.195	0.047	0.096**	-0.150	0.060	-0.053*	0.077	0.092	0.018
Social support by colleagues	0.018	0.016	0.034	-0.133	0.021	-0.177**	0.243	0.032	0.218**
Group 1 × Social support by colleagues	-0.027	0.027	-0.027	0.064	0.035	0.047	-0.060	0.053	-0.030
Group 2 × Social support by colleagues	-0.046	0.105	-0.011	-0.128	0.135	-0.021	0.064	0.207	0.007
Group 3 × Social support by colleagues	0.048	0.047	0.026	-0.091	0.061	-0.035	0.045	0.093	0.012
Supportive leadership style	0.071	0.019	0.130**	-0.100	0.025	-0.132**	0.159	0.038	0.143**
Group 1 × Supportive leadership style	-0.023	0.032	-0.023	-0.004	0.041	-0.003	-0.062	0.063	-0.031
Group 2 × Supportive leadership style	-0.319	0.150	-0.070*	0.180	0.195	0.028	-0.220	0.298	-0.024
Group 3 × Supportive leadership style	-0.051	0.055	-0.029	0.170	0.071	0.070*	-0.312	0.108	-0.087**
Open and communicative culture	0.020	0.020	0.038	-0.115	0.025	-0.152**	0.229	0.039	0.206**
Group 1 × Open and communicative culture	0.056	0.031	0.059	-0.027	0.040	-0.020	-0.049	0.061	-0.025
Group 2 × Open and communicative culture	0.052	0.130	0.011	-0.181	0.168	-0.028	0.204	0.258	0.021
Group 3 × Open and communicative culture	-0.076	0.056	-0.041	-0.006	0.073	-0.002	-0.083	0.111	-0.022
R ²		0.217			0.321			0.267	
F		26.159			44.535			34.292	

Notes. *Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed).

Hypothesis Testing

The explained variances of the regression models were 22% for work ability, 32% for burnout complaints, and 27% for work engagement. Age is a predictor with a small effect size for lower work ability ($\beta = -0.091, p < 0.01$) and lower work engagement ($\beta = -0.040, p < 0.05$); however, age is no predictor for the level of burnout complaints (see Table 5).

The first set of hypotheses was partly confirmed. All three chronic disease groups were associated with lower work ability (β 's $-0.085, -0.092$, and -0.235 , respectively; $p < 0.01$). However, groups 2 and 3 (both groups with mental conditions, with and without physical chronic diseases) were related to higher burnout complaints (β 's 0.087 and 0.212 , respectively; $p < 0.01$) and to lower work engagement (β 's -0.084 and -0.133 , respectively; $p < 0.01$), but this was not the case for the group with exclusively physical chronic diseases (see Table 5). In other words, H1a is completely supported and H1b and H1c are partly supported.

The analyses of the second set of hypotheses regarding the four job resources demonstrates that only autonomy and a supportive leadership style were associated in the expected directions with work ability, burnout complaints, and work engagement. Social support by colleagues and an open and communicative organizational culture were only associated with burnout complaints and work engagement as expected, but not associated with work ability (see Table 5). In other words, H2a and H2c are completely supported and H2b and H2d are partially supported.

The analyses of the third set of hypotheses regarding the possible moderation by the four job resources of the association between the chronic disease groups with the three indicators of occupational well-being resulted in some significant results for autonomy and for a supportive leadership style. However, no moderation was found for social support by colleagues, nor for an open and communicative organizational culture. Autonomy buffered the negative relationship of both the group with mental chronic disease(s) ($\beta = 0.069, p < 0.05$) and the group with both mental and physical chronic diseases ($\beta = 0.096, p < 0.01$) with work ability (see Figures 1, 2). Autonomy also buffered the positive relationship of the group with physical and mental chronic disease(s) ($\beta = -0.053, p < 0.05$) with burnout complaints (see Figure 3).

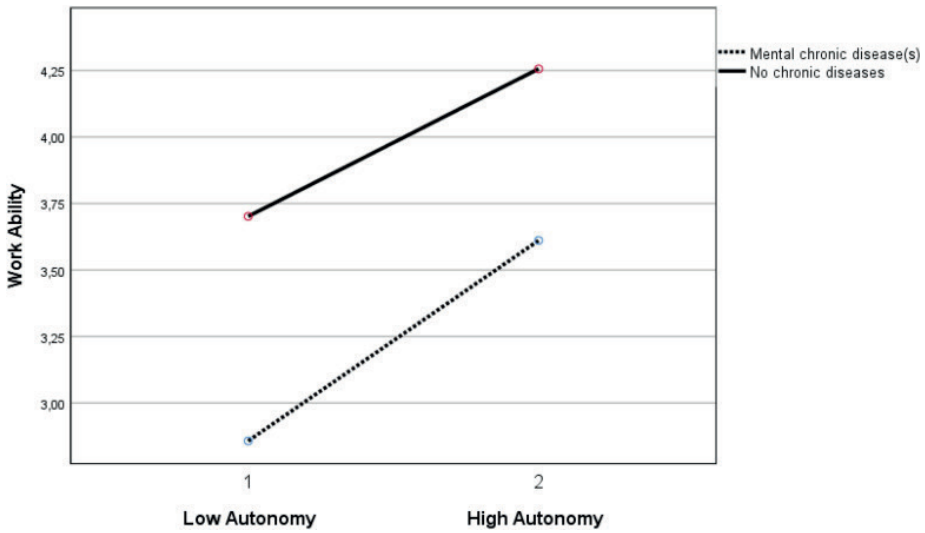


Figure 1. Moderation effect between autonomy and the group with mental chronic diseases versus the group without chronic diseases on work ability.

Note. Autonomy 1 is ≤ 1 standard deviation below mean. Autonomy 2 is ≥ 1 standard deviation above mean.

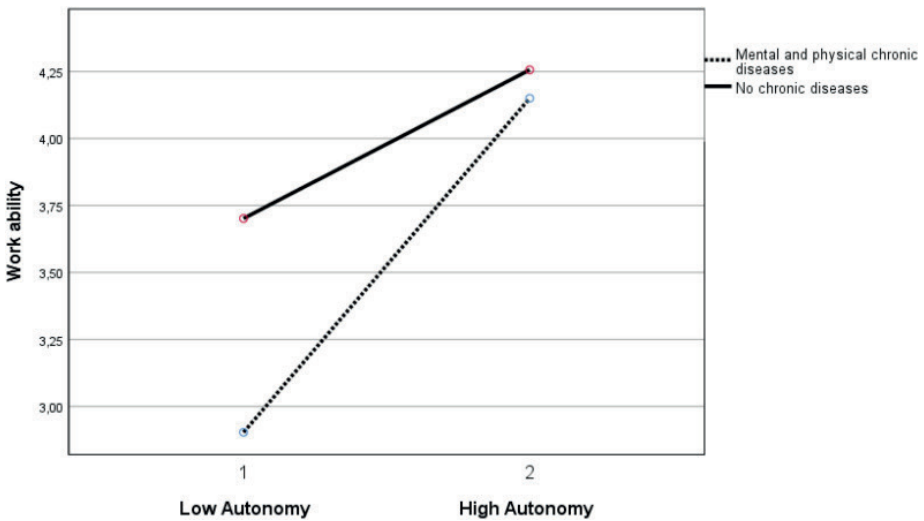


Figure 2. Moderation effect between autonomy and the group with mental and physical chronic diseases versus the group without chronic diseases on work ability.

Note. Autonomy 1 is ≤ 1 standard deviation below mean. Autonomy 2 is ≥ 1 standard deviation above mean.

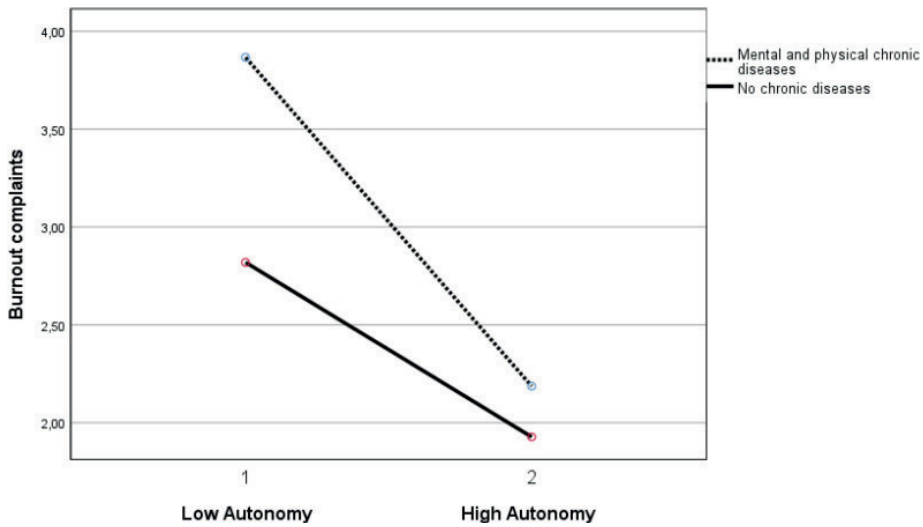


Figure 3. Moderation effect between autonomy and the group with mental and physical chronic diseases versus the group without chronic diseases on burnout complaints.

Note. Autonomy 1 is ≤ 1 standard deviation below mean. Autonomy 2 is ≥ 1 standard deviation above mean.

A supportive leadership style also demonstrates three significant moderation effects, namely in (1) the negative relationship between the group with mental chronic disease(s) with work ability ($\beta = -0.070, p < 0.05$), (2) the positive relationship between the group with physical and mental chronic disease(s) with burnout complaints ($\beta = 0.070, p < 0.05$), and (3) the negative relationship between the group with physical and mental chronic disease(s) with work engagement ($\beta = -0.087, p < 0.01$). The results indicate that a supportive leadership style is less beneficial for the employees with mental chronic diseases than for the employees without chronic diseases. In other words, the group without chronic diseases demonstrates an interaction effect by a supportive leadership style resulting in a larger increase in work ability and in work engagement and in a larger decrease of burnout complaints, than the abovementioned groups with chronic diseases (see Figures 4–6). See Table 5 for all results. In short, the results supported H3a and H3c partially, and H3b and H3d were not supported.

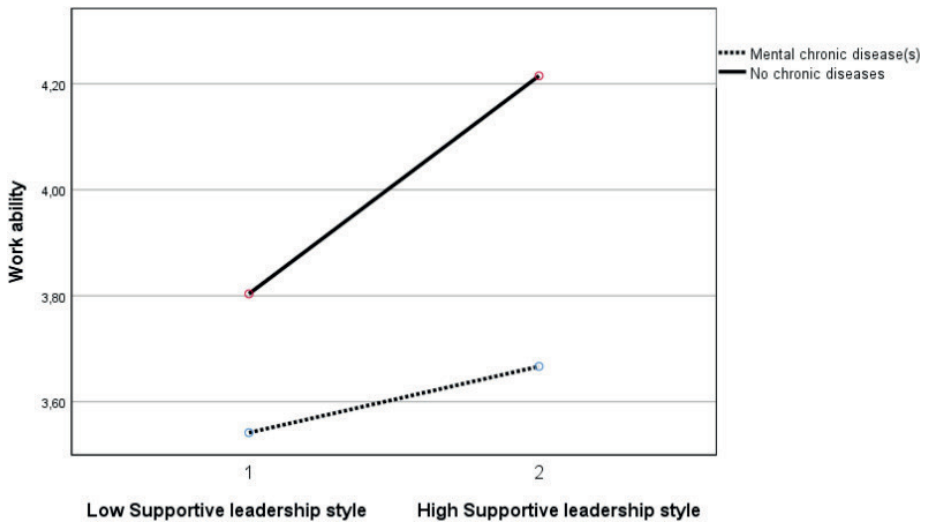


Figure 4. Moderation effect between supportive leadership style and the group with mental chronic diseases versus the group without chronic diseases on work ability.

Note. Supportive leadership style 1 is ≤ 1 standard deviation below mean. Supportive leadership style 2 is ≥ 1 standard deviation above mean.

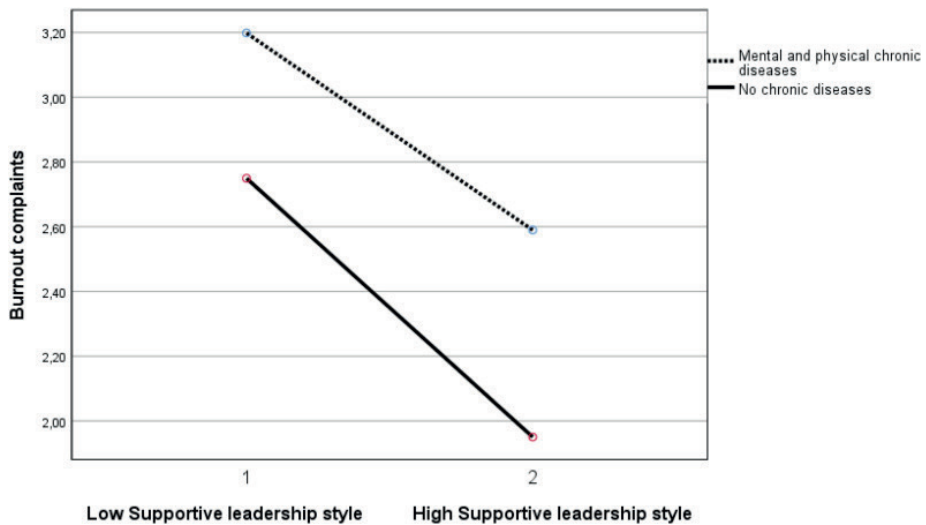


Figure 5. Moderation effect between supportive leadership style and the group with mental and physical chronic diseases versus the group without chronic diseases on burnout complaints.

Note. Supportive leadership style 1 is ≤ 1 standard deviation below mean. Supportive leadership style 2 is ≥ 1 standard deviation above mean.

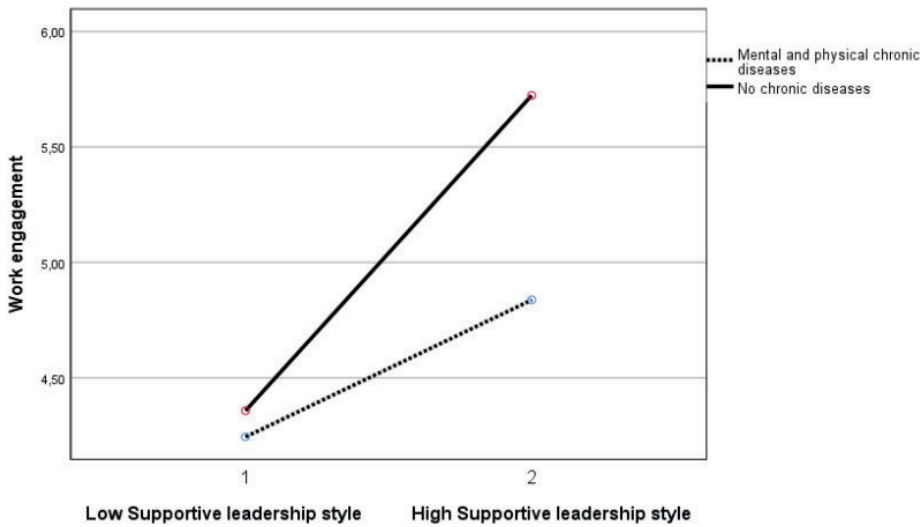


Figure 6. Moderation effect between supportive leadership style and the group with mental and physical chronic diseases versus the group without chronic diseases on work engagement.

Note. Supportive leadership style 1 is ≤ 1 standard deviation below mean. Supportive leadership style 2 is ≥ 1 standard deviation above mean.

Discussion and Conclusion

The expectation that the presence of one or more chronic diseases was associated with lower work ability is met. So, employees with a physical or a mental chronic disease, or both, are at risk of experiencing a lower work ability. This is in line with other studies (Kadijk et al., 2018; Koolhaas et al., 2014; Leijten et al., 2014). The group with mental and physical chronic diseases is the most vulnerable as the effect size for this group is at the highest level (between small and medium). Moreover, age is also negatively associated with work ability as demonstrated in other studies (Van den Berg et al., 2008); however, this association is small. The expectation that the presence of one or more chronic diseases was associated with higher burnout complaints and with a lower work engagement was partly met, as this was not the case when only physical chronic disease(s) were involved. In the case that mental chronic diseases are involved, higher burnout complaints and lower work engagement were present, as are also reported in other studies. Concerning burnout complaints, any possible relations with depression, a highly prevalent mental condition, sharing its etiology with burnout (Shirom et al., 2006), might play a role. This also might clarify that the group with exclusively physical chronic diseases demonstrates no association with higher burnout complaints. However, the latter is not in line with other studies, like in the Finnish nationwide population studies. Higher burnout was reported among women with coronary heart disease (Hallman et al., 2003), and among women with musculoskeletal diseases and men with cardiovascular

diseases (Honkonen et al., 2006). Possibly, the comparability between studies is affected because the study samples have different profiles with regard to the combination of various types of physical chronic diseases and also because the present study included a specific segment of the labor market. With regard to the absence of an association of physical chronic diseases with lower work engagement in the present study, there are very few studies to make comparisons with. Further, in the present study, the level of work engagement is a little lower with higher age, which is in contrast to several studies indicating workers are more engaged as they age (Kim & Kang, 2017). In short, the results demonstrate that the occupational well-being of the workers with mental chronic diseases is vulnerable, as their chronic disease is associated with a higher level of burnout complaints and a lower level of work engagement.

Not all associations of each of the four job resources with each of the three measures of occupational well-being are as expected. The associations of autonomy and a supportive leadership style with each of the three measures of occupational well-being are as expected, with the highest effect size for autonomy predicting higher work ability and lower burnout complaints. The associations of social support by colleagues and an open and communicative organizational culture with each of the three measures of occupational well-being are not as expected, as these two job resources are not associated with work ability. This is an important finding as studies on the association between these two job resources and work ability are scarce.

Regarding any possible moderation effects, only autonomy and a supportive leadership style demonstrate significant results in the associations between the groups that include participants with mental chronic diseases. However, the results for these two job resources point in different directions. The buffering effect of autonomy is in line with several previous studies and as we expected. So, autonomy is an important job resource to alleviate the associations of chronic diseases with less favorable occupational well-being. However, the moderation effects of a supportive leadership style are surprising, as these indicate a supportive leadership style to be of less benefit for occupational well-being among employees with mental chronic diseases (with or without physical chronic diseases) than among employees without chronic diseases. A supportive leadership style does only slightly buffer the negative relationship of a mental chronic disease with lower work ability, higher burnout complaints, or lower work engagement. Moreover, the total level of the experienced supportive leadership style in the group with physical and mental comorbidities (see Table 3) is significantly lower than in all the other groups. Because of the cross-sectional design, we can only guess about the causes, but an explanation might be that because of their poorer well-being, employees with more severe mental chronic diseases receive more support from their supervisor or manager than the employees with less severe mental chronic diseases. Employees with a mental disorder especially are faced with stigma (Brouwers, 2020; Brouwers et al., 2019; Van Vuuren et al., 2017), and perhaps more reluctant to share their chronic disease with their supervisor or manager. As not all employees tell their supervisor or manager about their mental chronic disease, it might as well be possible that for many employees their mental chronic disease is not known by the manager or supervisor as long it is not severe enough to interfere noticeably with work functioning. It is also possible that

in the case that a supervisor or manager does know about the mental chronic disease, he or she keeps more emotional distance than with the group without mental chronic diseases. Furthermore, employees with mental chronic diseases might experience less support from their supervisor or manager as long as their functioning is acceptable, up to the situation that problems with occupational well-being are shared with their supervisor or manager and become visible in the workplace, generating more support from their supervisor or manager.

The two other job resources, social support by colleagues and an open and communicative organizational culture, demonstrate no moderation at all. Unfortunately, studies into this subject are scarce. Studies among workers past cancer diagnosis reported the buffering effects of social support by colleagues, as well as a better social climate at work, with regard to work ability in the population of workers past cancer diagnosis (Taskila et al., 2007; Taskila & Lindbohm, 2007). However, this is a specific group and only concerns work ability.

Although the group with exclusively mental chronic diseases is relatively small ($N = 36$, 1.8%), their mean age (42.1 years) is significantly lower as the group with exclusively physical chronic diseases (47.9 years). The mean age of the group with comorbidity of physical and mental chronic diseases is 47.5 years. This implies that many employees with chronic diseases will have around two decades of employment ahead. As the level of all four job resources among this comorbidity group is experienced significantly lower than among the group without chronic diseases, the group with physical and mental chronic disease(s) needs particular attention with respect to the experienced level of the job resources.

In general, the research field concerning chronic diseases, the experience of job resources, and the association with work ability, burnout complaints, and work engagement still seems to be a niche. Nevertheless, the present results raise concerns with regard to the occupational well-being of the employees with mental chronic diseases, with or without physical chronic diseases. In addition, there might be a potential to increase their occupational well-being by offering job resources, especially more autonomy.

Limitations

It is important to notice that the population of the present study, consisted of a specific sub-group of Dutch employees, namely, employees in educational and (semi) governmental organizations. These employees might have a specific profile compared to the Dutch nationwide employed population. However, a comparison with the general employed population was not the aim, and the focus was on the associations within the group of participants. Furthermore, self-reported measures might be biased, and hence offer an inadequate indication of the level of the job resources offered in the workplace. However, one's own interpretation of the job resources causes the action, as formulated in the Thomas theorem (Thomas & Thomas, 1928, p. 572): "If men define situations as

real, they are real in their consequences.” In other words, self-reported measures are necessary to find out how employees experience their own situation. Additionally, no causal inferences can be made because of the cross-sectional nature of the study.

Practical Implications

This study demonstrated that autonomy is an important target for interventions to enhance work ability and work engagement and to reduce burnout complaints among employees with mental chronic diseases. As autonomy covers many possibilities in the context of work and can range from making decisions about one’s own work breaks, to making decisions on work procedures, this job resource offers many opportunities. These possibilities should be elaborated between an employer and the employee as much as possible. However, this probably also requires a supportive leadership style, and the results in the present study regarding this job resource are unexpectedly less favorable. So, to imbed more autonomy, the experience of a supportive leadership style also needs attention.

Furthermore, the choice of workers not to disclose chronic diseases can be understandable (Brouwers, 2020; Brouwers et al., 2019); however, as a consequence, this prevents extra attention and effort by the supervisor or manager in managing more autonomy for these employees. Nevertheless, in work situations where an employee experiences a low level of autonomy, especially in the case that chronic diseases are disclosed, a very important question is what possibilities might be present to enhance the level of autonomy.

Also, supervisors, line managers, and human resource management should work together in this process, as the perspectives on the role of specific job resources have demonstrated to be different between certain positions (Haafkens et al., 2011) and a collaboration will present a broader perspective on options in the context of the work situation.

Furthermore, involving the employees in exploring possibilities can also generate important workable solutions and will be an opportunity for more autonomy and experiencing more support in the context of work. It is important to make use of experiential experts of all the parties involved.

To conclude, interventions focusing on autonomy offer opportunities to reinforce work ability and work engagement and to reduce burnout complaints among employees with mental chronic diseases, with or without physical chronic diseases.

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CHAPTER 4



Work ability among employees 2–10 years beyond breast cancer diagnosis: Late treatment effects and job resources. A longitudinal study

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Abstract

Background. The number of workers who have previously undergone a cancer treatment is increasing, and possible late treatment effects (fatigue, physical and cognitive complaints) may affect work ability.

Objective. The aim of the study was to investigate the impact of late treatment effects and of job resources (autonomy, supportive leadership style, and colleagues' social support) on the future work ability of employees living 2–10 years beyond a breast cancer diagnosis.

Methods. Data at T1 (baseline questionnaire) and at T2 (9 months later) were collected in 2018 and 2019 ($N = 287$) among Dutch-speaking workers with a breast cancer diagnosis 2–10 years ago. Longitudinal regression analyses, controlling for years since diagnosis, living with cancer (recurrence or metastasis), other chronic or severe diseases, and work ability at baseline were executed.

Results. Higher levels of fatigue and cognitive complaints at baseline predicted lower future work ability. The three job resources did not predict higher future work ability, but did relate cross-sectionally with higher work ability at baseline. Autonomy negatively moderated the association between physical complaints and future work ability.

Conclusions. Fatigue and cognitive complaints among employees 2–10 years past breast cancer diagnosis need awareness and interventions to prevent lower future work ability. Among participants with average or high levels of physical complaints, there was no difference in future work ability between medium and high autonomy. However, future work ability was remarkably lower when autonomy was low.

Introduction

The percentage of workers living with or beyond cancer within the working population in the Netherlands is estimated to be considerable (Kuijpers, 2008). The most commonly diagnosed cancer is female breast cancer (Ferlay et al., 2021) and, the incidence is still rising (IKNL, 2021a). Furthermore, because of improved survival rates the 5- and 10-year prevalence has almost doubled over the previous 20 years (IKNL, 2021b). Moreover, the return-to-work rates have increased (Paltrinieri et al., 2018) for several reasons, such as a greater focus on returning to work. As a result, the percentage of working people who have had a breast cancer diagnosis in the past will continue to rise. Work is important for this population of workers as, 5 years following diagnosis, the quality of life of the employed is greater than that of the unemployed, although it is also possible that a decline in health triggers changes in employment status (Tamminga et al., 2020).

Breast cancer is not a single disease. It has many manifestations, with major differences in treatment options and prognoses. Since cancer is a life-threatening disease, possibly even in the short term, both the diagnosis and the undergoing of treatment can be regarded as a serious life event. This represents a difference from many chronic conditions, such as diabetes, or problems with the musculoskeletal system. The period after a cancer diagnosis is often unpredictable and uncertain. Nevertheless, given the high survival rates of various types of breast cancer, it is also important to realize that, for many, there is a working life after diagnosis.

However, post-cancer-diagnosis workers may experience problems, and their work ability requires attention. Several cross-sectional studies among workers more than 2 years beyond their cancer diagnoses have reported that work ability was lower for these workers compared to that of a reference group or a norm group (Carlsen et al., 2013; Gudbergsson et al., 2008b, 2011; Lee et al., 2008; Lindbohm et al., 2012), although not all studies indicated this result (Taskila et al., 2007). An important question remains, therefore, which factors influence the work ability of this population of workers.

As workers beyond a breast cancer diagnosis may experience complaints because of the various late effects of cancer treatments (Silver et al., 2013), it is conceivable that their work ability may be affected by these complaints. A qualitative study reported the late effects of cancer treatment to be a known potential problem in the guidance by managers or by professionals offered to employees who were working more than 2 years beyond their cancer diagnoses (Boelhouver et al., 2021a), but this issue has not been quantitatively investigated to date with a longitudinal design. As work ability is reported to be negatively related to sickness-related absences, future disability status, and withdrawal behaviors (Cadiz et al., 2019), it is important to preserve and enhance work ability among all working populations, and specifically among those experiencing late effects of cancer treatments.

During the reintegration process, which, in the Netherlands, normally takes place in the first 2 years after a cancer diagnosis, any necessary concrete facilities in the workplace (such as, different equipment or working in a quiet environment) are expected to

have already received attention. However, less visible resources, for instance, the level of autonomy offered to an employee, may also be important and offer targets for interventions. An interview study reported that managers and professionals differ in their opinion on whether autonomy is more important for workers who experience late effects after cancer treatments than for the healthy population (Boelhouwer et al., 2021a). Across studies among general populations, however, resources within the job and the work situation are positively related to work ability (Brady et al., 2019), and this is also expected to hold true for post-cancer-diagnosis workers. Therefore, these resources are the focus of the present study in order to identify possible targets for intervention.

In summary, this longitudinal study concerns salaried female employees diagnosed with breast cancer 2–10 years ago and focuses on the impact of cancer treatment's late effects on future work ability. Furthermore, in order to identify possible targets for intervention resources that may be available within the job and the work situation are studied. The aim is to preserve or enhance the work ability of employees confronted with the late effects of breast cancer treatments.

Late effects of cancer treatment and work ability

The acute side effects of cancer treatments are well known, but less known is that several effects can last much longer or even develop after the first 2 years (Silver et al., 2013). These late effects include 1) physical complaints (Ho et al., 2018), 2) fatigue (Meunier et al., 2007; Prue et al., 2006; Reinertsen et al., 2010), and 3) cognitive complaints (Wefel et al., 2015). These late effects may affect occupational functioning, such as work ability. However, studies concerning the association of the effects of cancer treatment with work ability beyond these first 2 years after cancer diagnosis are scarce and cross-sectional in nature (Boelhouwer et al., 2021b).

First, regarding the physical condition of workers who have returned to work beyond or with cancer, several studies report associations with a lower work ability in relation to somatic symptoms (Gudbergsson et al., 2011), functional limitations (Moskowitz et al., 2014), or poor self-rated health status (Torp et al., 2017b). Moreover, those with low work ability have reported a reduced level of self-rated health (Dahl et al., 2019). Among workers beyond breast cancer diagnosis, more breast and arm symptoms have been observed among respondents with a suboptimal work ability than among those with a good or excellent work ability (Ho et al., 2018). The results among populations working with or beyond cancer can, to a certain extent, only be compared with populations who have chronic conditions or with healthy populations who have specific complaints. A lower or decreased work ability has been observed among various populations with physical chronic conditions (Gould et al., 2000; Leijten et al., 2014). However, few studies on work ability concern specific complaints, and those types of physical complaints may not match the possible late effects of cancer treatments. Nevertheless, a study into, for instance, menopausal complaints and work ability may be relevant, as these complaints are also experienced by those who have been treated with, as in cases of hormone-sensitive breast cancer, endocrine therapy. Concerning these symptoms, a cross-sectional study among an otherwise healthy population reported lower work ability for higher levels of menopausal complaints (Geukes et al., 2012). Another example is a study

reporting a positive association with work ability of self-perceived health among female Norwegian workers (Gamperiene et al., 2008).

Second, regarding fatigue, a negative cross-sectional relationship of fatigue with work ability has been reported among workers more than 2 years past cancer diagnosis (Carlsen et al., 2013; Dahl et al., 2019; Ho et al., 2018). Additionally, several studies have reported on the relationship between fatigue and work ability among healthy populations or specific populations with chronic diseases. Examples are two cross-sectional studies that demonstrate a negative association between fatigue and work ability among nursing workers (Da Silva et al., 2016) or among a population with systemic sclerosis (Sandqvist et al., 2010). Moreover, a prospective cohort study of hospital nurses reported that the level of fatigue at baseline was a predictor of an unfavorable course of self-reported general work ability over 2 years (Boschman et al., 2015).

Third, regarding cognitive complaints, a negative cross-sectional relationship with work ability has been reported among workers more than 2 years past a cancer diagnosis (Hansen et al., 2008; Ho et al., 2018; Von Ah et al., 2017, 2018). These studies indicate that cognitive complaints can be associated with lower work ability among working cancer survivors. However, longitudinal studies among this population on this issue are lacking (Boelhouwer et al., 2021b). Studies regarding self-reported cognitive complaints and the longitudinal relationship with work ability among other populations with specific conditions are unknown to the authors. However, the need to investigate the effect of cognitive complaints on work ability within the working population beyond cancer diagnosis have been indicated before (Duijts et al., 2017), and the cross-sectional associations of cognitive complaints with work ability among post-cancer-diagnosis populations provide an extra impetus to include this late effect in the present longitudinal study.

Overall, a higher level of fatigue or physical or cognitive complaints is expected to have a lowering effect on work ability beyond the first 2 years after a breast cancer diagnosis. Therefore, our first hypothesis (H1) is as follows:

- H1: A higher level of physical complaints (H1a), fatigue (H1b), or cognitive complaints (H1c) at baseline (T1) is associated with lower future work ability.

Job resources and work ability with or beyond cancer

The late effects experienced by those working with or beyond cancer treatments can be viewed as additional demands on those attempting to fulfill job requirements. It is therefore important to consider factors within the work environment that possibly preserve or even enhance work ability. These so-called job resources are part of the well-established job demands-resources (JD-R) model (Bakker & Demerouti, 2007). This model comprises the idea that job resources have a positive influence on health and motivational processes. Job resources may refer to aspects of the job that may be functional in achieving work goals, reducing job demands or stimulating personal growth, learning, and development. Job resources may be psychological, social, or organizational in nature (Bakker & Demerouti, 2007).

The present study focuses on job resources in which adjustments can be made relatively quickly within the organization at the executive level. This means that the resources located at the organizational level (e.g., organizational culture or career opportunities) are not included, but job resources at the interpersonal level (e.g., supervisor and co-worker support or team climate), the organization of work (e.g., role clarity or participation in decision making), and at the level of the task (e.g., autonomy) were potential candidates for inclusion in the present study. However, a recent literature review has reported that the current knowledge regarding the associations of job resources with work ability among workers 2-10 years after cancer diagnosis and possibly experiencing the late effects of treatment, is only based on cross-sectional data. Furthermore, no information concerning the potential moderation by job resources of the possible associations between the late cancer treatment effects and work ability is available (Boelhouwer et al., 2021b). Therefore, the review could only report on the results regarding cross-sectional relationships between higher work ability and a limited set of job resources. These results concerned higher autonomy (Torp et al., 2012, 2017a), more social support by the supervisor (Carlsen et al., 2013; Lindbohm et al., 2012; Musti et al., 2018; Torp et al., 2012), and more social support by colleagues (Carlsen et al., 2013; Gudbergsson et al., 2008a; Lindbohm et al., 2012; Musti et al., 2018; Taskila et al., 2007; Torp et al., 2012). As a result, the choice in the present study is to focus on autonomy, a supportive leadership style, and social support by colleagues, to investigate the influence of these job resources on work ability. Furthermore, the possible moderation by these job resources of the presumed relationship between physical complaints, fatigue, and cognitive complaints on the one side and lower work ability on the other will be examined.

First, autonomy can be described as the possibility to influence one's work by, for instance, making autonomous decisions. Autonomy is addressed in several cross-sectional studies among workers living beyond or with cancer using related concepts, such as decision latitude (Torp et al., 2012, 2017a), or job control (Cheung et al., 2017), both reported to be positively related with higher work ability. A lack of autonomy is associated with poor work ability among both general populations (Van den Berg et al., 2008) and employees with chronic diseases (Boelhouwer et al., 2020). In addition, job control has been stated to be important in enabling workers with decreased work ability to remain productive at work (Van den Berg et al., 2011).

Second, as far as the authors are aware, the leadership style of the supervisor or manager has not been studied in relation to the work ability of those working more than 2 years after being diagnosed. However, related concepts, such as social support by supervisors and their avoidance behavior, were studied within this population of workers, indicating that male workers with a cancer diagnosis experienced lower work ability when supervisors' avoidance behavior was higher (Lindbohm et al., 2012). In healthy populations, a supportive leadership style is reported to be associated with higher work ability. For instance, a supportive leadership style among others predicted higher work ability 1 year later among IT workers (Sugimura & Thériault, 2010), and supervisor support has been reported to be particularly important to work ability in a cross-national examination of health care workers (McGonagle et al., 2014). Moreover, among

employees with chronic diseases, a supportive leadership style has been reported to be cross-sectionally associated with higher work ability (Boelhouwer et al., 2020).

Third, social support by colleagues has been investigated in several studies among workers more than 2 years past their cancer diagnoses. Both case-control (Carlsen et al., 2013; Lindbohm et al., 2012; Taskila et al., 2007) and cross-sectional studies (Gudbergsson et al., 2008a; Musti et al., 2018; Torp et al., 2012) have indicated positive associations with work ability. Longitudinal studies are unavailable. Furthermore, female workers with a cancer diagnosis in their past experienced lower work ability if perceived avoidance behavior by colleagues was higher (Lindbohm et al., 2012). Social support by colleagues has also demonstrated positive associations with work ability among several healthy occupational populations of employees, such as hospital nurses (Olsen et al., 2017).

To summarize, although longitudinal research data among workers more than 2 years past cancer diagnosis are scarce, a higher level of autonomy, a supportive leadership style, or social support by colleagues are expected to be associated with higher future work ability among employees 2–10 years past a breast cancer diagnosis. Hence, our second hypothesis (H2) is as follows:

- H2: A higher level of autonomy (H2a), a supportive leadership style (H2b), or social support by colleagues (H2c) at baseline (T1) is associated with higher future work ability (at T2).

Moderation by job resources of the association between late effects and work ability

Advice regarding the management of the late effects of cancer treatments is available among professionals involved in rehabilitation. Examples of such advice include using cognitive compensatory interventions (Feuerstein, 2009) or opportunities to withdraw (Boelhouwer et al., 2021a) in the case of cognitive complaints. However, the effect of job resources in a situation of higher levels of late effects of cancer treatment possibly affecting work ability is unknown. No quantitative studies are known to the authors concerning the possible moderating effects of job resources on the relationships of complaints (neither physically, nor mentally or cognitive) with work ability among workers past cancer diagnosis. Nevertheless, job resources are relevant factors in the guidance of workers confronted with the late effects of cancer treatments (Boelhouwer et al., 2021a). Certain job resources possibly reduce the negative impact of the late effects of cancer treatment on work ability. All in all, we expect positive moderating effects by the three aforementioned job resources of the presumed negative relationships of the late effects with work ability. In other words, we expect the job resources to have a more favorable effect on work ability with higher levels of the late effects so that the negative influence of the late effects is reduced. Hence, our third hypothesis is as follows:

- H3: The relationship between physical complaints, fatigue, or cognitive complaints (late effects) at baseline (T1) and future work ability (at T2) are moderated by autonomy, a supportive leadership style or social support by colleagues at T1, such that when the job resource is high, the negative influence of the late effects on work ability is less than when the job resource is low.

Four covariates are included in the analyses. Years since diagnosis, living with cancer (recurrence or metastasis), and other chronic or severe diseases are taken into account as covariates, as these factors may influence the relationships because of differences in physical and mental burden. However, comparable studies are not known. The level of work ability level at baseline (T1) is controlled for, as it is expected that the individual level of work ability will be within a range that depends on other factors, such as age. In a recent literature review, age has been reported to demonstrate a significant (negative) relationship with work ability in the vast majority of underlying studies (Osagie et al., 2019). Because of the use of baseline work ability as a control variable, the age factor is not considered as a separate covariate.

All in all, the present study contributes to research in the field of work and cancer, being the first longitudinal study into the late effects of cancer treatment and job resources on work ability among employees who have returned to work after experiencing a breast cancer diagnosis 2 to 10 years ago. Longitudinal designs are necessary to investigate possible targets for interventions to help retain occupational life (Wells et al., 2014) and to therefore preserve or enhance work ability within this population. The present study addresses this need.

Methods

The recruitment of the participants, the procedure used, the measuring instruments and the method to analyse the data of the participants are described below.

Procedure

A survey study was carried out between June 2018 and December 2019 and included two questionnaires. The study was reviewed and approved by the Research Ethics Committee (cETO) of the Open Universiteit in the Netherlands who assessed the ethical acceptability of the study and agreed with the study design and method (reference cETO: U2018/03891/MQF).

The invitation for the first questionnaire (baseline, at T1) was addressed to workers 2 to 10 years after cancer diagnosis. Various methods and channels were used to inform (potential) participants about the study such as social media, a short video clip and a website (including the information letter with details regarding storage of the data and confidentiality). It was communicated that the questionnaire was expected to take 20 minutes to complete. No reward was promised. On the first page, before the questionnaire started, it was stated that by clicking on "Next" the respondent indicated to have read the information, to know that participation was voluntarily, that informed consent was given to collect the data during this study for scientific research and that the respondent was older than 18 years. Those who had completed this first questionnaire were approached 9 months later with the request to also complete a second questionnaire. This request was sent out by e-mail, with a reminder one month later, if necessary.

Data from workers with a past breast cancer diagnosis and with exclusively salaried employment at T1 (baseline) and at T2 (nine months after T1) were used in the present study ($N = 287$).

Measures

The questionnaires included questions concerning demographics and information about health, treatment, and work. For the present study the data to be used were 1) physical complaints, fatigue, cognitive complaints at T1, 2) work ability at T1, and at T2, 3) autonomy, supportive leadership style, and social support by colleagues at T1, 4) years since diagnosis at T1, and living with cancer (recurrence or metastasis), and other chronic or severe diseases at T1 and at T2.

Physical complaints were measured by a question about complaints caused by ten possible conditions (no, some or many complaints, respectively 0, 1 or 2 points). These conditions were neuropathy, hormonal complaints, hot flushes, osteoporosis, heart complaints (due to cancer treatment), scar adhesions, joint pain, lymphedema, lung problems, and bowel and / or bladder problems. For the level of physical complaints, the total score (0 to 20) is used. The scale was constructed by the researchers because there was no adequate scale available to measure possible late physical effects of cancer treatments. Information from the IPSO (Centres Psychosocial Oncology in the Netherlands) and the NFK (Dutch Federation of Cancer Patient Organizations) was used to justify the choices.

Fatigue was measured by the subjective fatigue subscale (eight items, seven-point Likert scale, 1 to 7) of the Checklist Individual Strength (CIS) (Vercoulen et al., 1999; Vercoulen et al., 1994). Examples of items are: “I feel tired”, “Physically I feel exhausted” and “I get tired quickly/soon”. The possible total score for fatigue was 8 to 56. The Cronbach’s α was 0.91.

Cognitive complaints were measured by the Cognitive Failure Questionnaire (CFQ) for subjective cognitive functioning (25 items, five-point Likert scale, 0 to 4) about the frequency of everyday cognitive errors (Ponds et al., 2006). The items are about small, everyday mistakes that everyone makes from time to time. The respondent could indicate whether this occurs or ‘never’, ‘rarely’, ‘occasionally’, ‘often’ or ‘very often’. Items are, for example: 1) reading something and shortly afterwards not remembering what you have read so that you have to read it again, 2) forgetting which street to take if you choose a route that you know well, but that you rarely used, 3) forgot appointments, 4) forgot people’s names, or 5) forgot what you came to buy in a store. The possible total score was 0 to 100. The Cronbach’s α was 0.93. In this study, the score on this scale will be referred to as cognitive complaints.

Work ability was measured by an item derived from the first item from the Work Ability Index (WAI) (Ilmarinen et al., 2005; Ilmarinen & von Bonsdorff, 2015). The vast majority of the cross-sectional studies focusing on work ability among workers experiencing late effects of cancer treatments measure work ability using the first item of the WAI. The reason for this is that the complete WAI is an extensive questionnaire, while the first item is reported to have a strong correlation with the complete WAI (Ahlstrom et al., 2010).

The item used in the present study is as follows: "Work ability is the extent to which you are physically and mentally able to perform your current and future work. On a scale of 0 to 10, how many points would you rate your work ability right now? ("0" means you are currently completely unable to work)".

Autonomy, supportive leadership style, and social support by colleagues were measured using one of the scales by Van Poppel and Kamphuis (2004). The Cronbach's α 's at T1 for autonomy (four items, five-point Likert scale) was 0.86, for supportive leadership style (four items, five-point Likert scale) 0.93, and for social support by colleagues (five items, five-point Likert scale) 0.71. Examples of items regarding autonomy are "I can decide for myself how I approach my work" and "I can regulate my work pace myself". Examples of items regarding a supportive leadership style are: "For questions and advice I can always contact my direct supervisor" and "In my work I receive sufficient support, advice and feedback from my direct supervisor". Examples of items regarding social support by colleagues are: "I can ask my colleagues for advice if I can't figure it out myself" and "I experience the mutual contact between me and my colleagues as pleasant".

The year of diagnosis was collected using the first questionnaire, on the basis of which the number of years after cancer diagnosis was determined. In both questionnaires, the respondents indicated whether they were living with cancer (recurrence or metastasis) and whether they had other chronic or severe diseases.

Participants

The numbers of employees with a breast cancer diagnosis were 461 at T1 and 287 at T2. Dropouts between T1 and T2 therefore concerned 174 of the participants at T1.

Analysis

The data were analysed using SPSS software, version 25 (IBM Corporation, Armonk NY, USA) for Windows®/Apple Mac®.

Descriptives were analysed for the study sample at T2 (N=287) and for the dropouts between T1 and T2 (N=174). Descriptives were demographics (age, gender, and educational level) and years since diagnosis (at T1), living with cancer (recurrence or metastasis) and other chronic diseases (at T1 and at T2), physical complaints, fatigue, cognitive complaints (at T1), work ability (at T1 and at T2), type of tasks (at T2), average weekly work hours and workdays (at T2), autonomy, supportive leadership style, and social support by colleagues (at T1).

All hypotheses were analyzed by multivariate regression analyses, controlling for years past cancer diagnosis, living with cancer (recurrence or metastasis), other chronic or severe diseases (at T2), and baseline work ability (at T1). Missings were not imputed, which could result in lower numbers of respondents to be used in analyses. Physical complaints, fatigue, cognitive complaints, autonomy, supportive leadership style and social support by colleagues were centered at their means, as unstandardized coefficient estimates will be biased particularly in moderation analyses (Aguinis et al., 2017). The hypotheses were tested in seven steps; each of the four covariates in one of the first

four steps, then the late effects together in the fifth step, the three job resources in the sixth step, and the interaction terms to test for moderation in the seventh step. Positive moderation by the job resources of the presumed negative relationships between the late effects and future work ability was expected. This means that the outcome of the multivariate regression concerns a significant, positive β for the interaction terms moderating these associations. In other words, we expected that the negative slope of the relationship between a late effect and future work ability across higher levels of each of the job resources will be decreased, and therefore a positive moderation effect (Holland et al., 2017) resulting in better work ability outcomes.

Results

First, the descriptive data are presented below, followed by the results of testing the hypotheses.

Descriptives

At T1 the mean age of the study sample ($N=287$) was 49.7 years (SD 7.72) and the mean number of years since diagnosis was 4.5 years (SD 2.39). At T2 6% ($N=17$) was living with cancer (recurrence or metastasis) and 44% ($N=125$) had other chronic or severe diseases. The type of tasks performed in the current job of the study sample ($N=287$) at T2 was 64% ($N=183$) mainly mentally (psychologically) demanding, 8% ($N=22$) mainly physically demanding and 29% ($N=82$) both mentally (psychologically) and physically demanding (rounded, therefore not adding up to 100%). The participants worked an average of 27.9 hours per week spread over an average of 4.4 days.

Dropouts between T1 and T2 ($N=174$) were significant younger (at .05 level) and reported a significant higher level of cognitive complaints (at .01 level). The detailed results of the analysis can be found in Table 1.

Among the covariates the only significant bivariate correlation was observed for a higher educational level with less other chronic or severe diseases. Work ability at T1 was correlated with work ability at T2 ($r = .558, p \leq .01$). A paired sample test resulted in no significant difference between work ability at T1 and work ability at T2. The three late effects showed low mutual correlations, and the same was observed for the job resources. The late effects were significantly correlated negatively (at the 0.01 level) with both work ability at T1, and with work ability at T2. The three job resources were significantly correlated positively (also at the 0.01 level) with both work ability at T1, and with work ability at T2. The detailed results of the analysis can be found in Table 2.

Hypothesis testing

The stepwise multivariate regression analyses excluded cases with missing data and resulted in $N=236$. The final model explained 44% of the observed variance.

Each of the four covariates was tested in one of the first four steps. Two covariates showed a significant association with work ability at T2, namely baseline work ability at

T1 ($\beta = .328, p \leq .001$) and other chronic or severe diseases at T2 ($\beta = -.141, p \leq .05$). Years since diagnosis and living with cancer (recurrence or metastasis) were not associated with work ability at T2. The detailed results of the analysis can be found in Table 3.

Table 1. Characteristics of participants at T2 (N=287) and dropouts between T1 and T2 (N=174).

Variables at T1	Participants at T2 N=287	Dropouts between T1 and T2 N=174
Age M (SD) ^λ	49.7 (7.72)	48.1 (7.30)
Female gender (N, %)	287 (100%)	174 (100%)
Educational level:		
Elementary and secondary education	77 (27%)	42(24%)
Vocational secondary education	52 (18%)	46 (27%)
Higher education	153 (53%)	84 (48%)
Other or missing	5 (2%)	2 (1%)
Years since diagnosis (M, SD)	4.5 (2.39)	4.6 (2.40)
Living with cancer (recurrence or metastasis) (N, %)	15 (5%)	6 (3%)
Other chronic or severe diseases (N, %)	121 (43%)	67 (39%)
Physical complaints, M (SD) (0 – 20)	5.2 (3.82)	5.5 (4.29)
Fatigue, M (SD) (8 – 56)	34.1 (12.01)	35.9 (12.14)
Cognitive complaints, M (SD) ^μ (0 – 100)	39.7 (15.71)	43.9 (16.10)
Autonomy, M (SD) (4 – 20)	15.2 (3.47)	14.9 (3.78)
Supportive leadership style, M (SD) (4 – 20)	13.9 (4.23)	14.4 (4.39)
Social support by colleagues, M (SD) (5 – 25)	20.6 (2.75)	20.6 (3.26)
Work ability, M (SD) (0 – 10)	7.4 (1.66)	7.4 (1.74)
Variables at T2	Participants at T2 N=287	
Living with cancer (recurrence or metastasis) (N, %)	17 (6%)	
Other chronic or severe diseases (N, %)	125 (44%)	
Type of tasks:		
Mentally (psychologically) demanding	183 (64%)	
Physically demanding	22 (8%)	
Both mentally and physically demanding	82 (29%) [#]	
Average work hours per week, M (SD)	27.9 (9.04)	
Average work days per week, M (SD)	4.4 (3.70)	
Work ability, M (SD) (0 – 10)	7.3 (1.77)	

Notes. M = mean, SD = standard deviation, N = number of participants.

^μ = significant difference between participants at T2 and the dropouts (between T1 and T2) at .01 level.

^λ = significant difference between participants at T2 and the dropouts (between T1 and T2) at .05 level.

[#] = numbers do not add up to 100%, due to rounding.

Table 2. Correlations of demographics (age, educational level), control variables (years since cancer diagnosis, living with cancer (recurrence or metastasis), other chronic or severe diseases, work ability at T1), dependent variable (work ability at T2), independent variables (physical complaints, fatigue, and cognitive complaints at T1), and autonomy, supportive leadership style or social support by colleagues at T1.

Variables (questionnaire T1 or T2)	N	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age (T1)	287	1												
2. Educational level (T1)	287	-.113	1											
3. Years since cancer diagnosis (T1)	287	.212**	.066	1										
4. Living with cancer (recurrence or metastasis) (T2)	287	-.050	.001	.088	1									
5. Other chronic or severe diseases (T2)	284	.133*	-.126*	-.029	-.036	1								
6. Work ability (T1)	287	.021	.073	-.009	.112	-.210**	1							
7. Work ability (T2)	287	-.105	.108	.004	.104	-.303**	.558**	1						
8. Physical complaints (T1)	287	.101	-.065	-.003	-.001	.239**	-.277**	-.280**	1					
9. Fatigue (T1)	287	-.050	-.196**	-.007	.006	.215**	-.530**	-.445**	.350**	1				
10. Cognitive complaints (T1)	278	-.139*	-.093	.020	-.064	.143*	-.332**	-.343**	.369**	.428**	1			
11. Autonomy (T1)	280	.029	.135	-.029	.020	-.042	.306**	.245**	-.082	-.210**	-.143*	1		
12. Supportive leadership style (T1)	270	-.001	.011	-.053	.043	-.077	.359**	.262**	-.104	-.215**	-.188**	.291**	1	
13. Social support by colleagues (T1)	265	-.038	.005	-.141*	.144*	-.024	.337**	.239**	-.066	-.224**	-.147*	.232**	.367**	1

Notes. *Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed)

Table 3. Multivariate regression analyses for moderation by autonomy, supportive leadership style or social support by colleagues (at T1) of the association of physical complaints, fatigue, or cognitive complaints (at T1) with future work ability (at T2), controlled by years since diagnosis (at T1), living with cancer (recurrence or metastasis) (at T2), other chronic or severe diseases (at T2) and work ability (at T1).

Step/Variable	F	R ²	Δ R ²	β	β	β	β	β	β
Step 1	.103	.000	.000						
Years since diagnosis at T1				-.021	-.029	-.013	-.014	-.004	.010
Step 2	1.908	.016	.016						
Living with cancer (recurrence or metastasis) at T2				.125	.016	.032	.026	.026	.011
Step 3	7.795	.092	.075						
Other chronic or severe diseases at T2				-.171**	-.151**	-.158**	-.158**	-.158**	-.141*
Step 4	30.440	.345	.254						
Work ability at T1				.525***	.383***	.349***	.349***	.328***	.328***
Step 5 / late effects at T1	22.386	.407	.062						
Physical complaints						-.050	-.049	-.041	-.041
Fatigue						-.127	-.127	-.131*	-.131*
Cognitive complaints						-.183**	-.181**	-.202***	-.202***
Step 6 / job resources at T1	15.801	.413	.005						
Autonomy							.035	.049	.049
Supportive leadership style							.012	.049	.049
Social support by colleagues							.061	.063	.063
Step 7 / interaction terms	8.818	.437	.024						
Physical complaints x Autonomy									-.151*
Physical complaints x Supportive leadership style									.005
Physical complaints x Social support by colleagues									.073
Fatigue x Autonomy									.076
Fatigue x Supportive leadership style									.012
Fatigue x Social support by colleagues									-.073
Cognitive complaints x Autonomy									-.031
Cognitive complaints x Supportive leadership style									-.020
Cognitive complaints x Social support by colleagues									-.014

Notes.

Physical complaints, fatigue, cognitive complaints, autonomy, supportive leadership style and social support by colleagues were centered at their means. *Significant at the ≤ 0.05 level. **Significant at the ≤ 0.01 level. ***Significant at the ≤ 0.001 level.

Thereafter hypothesis H1 was tested with physical complaints, fatigue, and cognitive complaints at T1, together in the fifth step of the multivariate regression analyses, as predictors. The degree of the number of physical complaints did not predict lower work ability at T2 in this analysis, however, a higher level of fatigue and a higher level of cognitive complaints did (respectively $\beta = -.131, p \leq .05$ and $\beta = -.202, p \leq .001$). Therefore, hypotheses H1b and H1c were confirmed, but hypothesis H1a was not. See Table 3.

Hypothesis H2 was tested in the sixth step of the above-described multivariate regression analyses, with the three job resources (autonomy, supportive leadership style, social support by colleagues) at T1 as predictors, and work ability at T2 as dependent variable. The hypotheses H2a, H2b, and H2c were not confirmed. The three job resources did not predict the level of future work ability at T2. See Table 3. An additional analysis demonstrated that all three job resources at T1 did significantly predict work ability at T1 (baseline).

Hypotheses H3 concerned the expected moderation of the job resources (autonomy, a supportive leadership style or social support by colleagues) at T1 of the presumed negative relationships between physical complaints, fatigue, or cognitive complaints (late effects) at T1 and work ability at T2 resulting in better work ability outcomes. This was tested in the seventh step of the multivariate regression analyses. The negative relationships of fatigue and cognitive complaints with work ability were not moderated by job resources, so our expectations were not met. However, there was one case of moderation, as autonomy negatively moderated the association of physical complaints with work ability at T2 ($\beta = -.151, p \leq .05$), which means a deterioration of work ability outcomes for people with physical complaints. See Table 3. A visual representation shows the different slopes of three lines representing three levels of autonomy for different levels of physical complaints and the associated future work ability. See Figure 1.

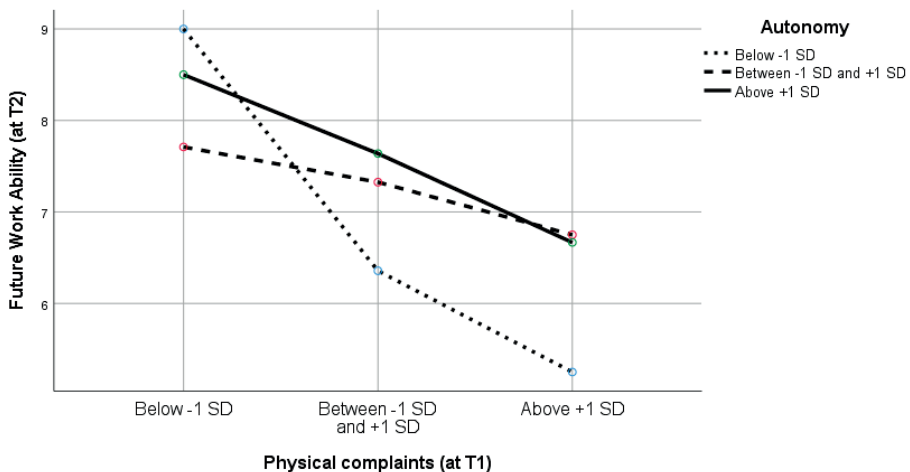


Figure 1. Moderation by autonomy (at T1) of the association of physical complaints (at T1) with future work ability (at T2) among workers 2-10 years beyond breast cancer diagnosis ($N=280$).

Discussion

We found that higher levels of fatigue or cognitive complaints have a longitudinal lowering effect on future work ability among workers more than 2 years beyond breast cancer diagnosis. As far as known, this has not been previously demonstrated. Cross-sectional associations between these late effects and work ability have been reported before (Boelhouwer et al., 2021b), in addition to associations between cognitive complaints and fatigue (Ponds et al., 2006). However, the results of the present study cannot be compared with other longitudinal studies, as none are available. The level of physical complaints correlated significantly with lower future work ability, but less strongly than fatigue or cognitive complaints did. Moreover, the three late effects are strongly interrelated and, in this sample, cognitive complaints and fatigue are slightly more strongly related to work ability than physical complaints. This explains why physical complaints showed no significant effect in the regression analyses.

The level of individuals' work ability was reasonably stable over time, and baseline work ability was predictive of the level of future work ability. Cross-sectionally the three job resources (autonomy, supportive leadership style, and social support by colleagues) at T1 were associated with higher current (baseline) work ability at T1, however the job resources were not predictive of future work ability at T2 (see Table 3). Nor was found that the relationships between late effects and future work ability were moderated by job resources resulting in a change for the better, that is higher future work ability (see Table 3). A possible cause of the latter could be that the factors (that is, the late effects, the job resources and the outcome measure) in the model did not completely match on a cognitive, emotional, or physical level (De Jonge & Dormann, 2006). Up to now, relatively little studies are known about vocational interventions specifically for workers who have had cancer. Other resources, such as within-shift breaks that were found to be beneficial among various employed populations (Wendsche et al., 2016) or a modified workstation or schedule especially suggested for workers beyond cancer diagnosis (Alleaume et al., 2020) may be important to study as possible moderating resources as well. Generic strategies and elements of the interventions for workers with chronic conditions may be suitable for the post-cancer-diagnosis group, but it is advised to offer working cancer survivors tailored interventions (Stapelfeldt et al., 2019).

Although longitudinal research on this issue among workers more than 2 years past a cancer diagnosis is lacking, the available cross-sectional studies among this population have revealed positive correlations of social support of colleagues (Gudbergsson et al., 2008a; Musti et al., 2018; Torp et al., 2012) and concepts related to autonomy (Cheung et al., 2017; Torp et al., 2012, 2017a) with work ability. Furthermore, cross-sectional associations between a supportive leadership style and higher work ability were also observed among employees with chronic diseases (Boelhouwer et al., 2020). However, in the present study, future work ability (at T2) is not predicted by the level of the job resources at T1, but by baseline work ability and by the late effects fatigue and cognitive complaints at T1. Nevertheless, an additional cross-sectional regression analysis demonstrated that the job resources at T1 did predict work ability at T1, suggesting these job resources may need continual attention.

Furthermore, against expectations, the multivariate regression analyses (controlling for years past cancer diagnosis, living with cancer, other chronic or severe diseases and baseline work ability) resulted in a negative moderation by autonomy in the case of physical complaints. Participants with average and high levels of physical complaints and low autonomy experienced a level of future work ability that was much lower than when autonomy was at a medium level. So, a lack of autonomy in the case of average and high physical complaints is not recommended because the lowest level of work ability was experienced in that situation. Furthermore, participants with average and high levels of physical complaints and high autonomy experienced a level of future work ability similar to when autonomy was at medium level. This seems to be in line with the findings that the type and the scope of demands also determine the effect of job control, which even at a high level may not prove to be sufficient to prevent overburdening (Gonzalez-Mulé et al., 2021). Employees with higher levels of physical complaints possibly experience negative effects with too much autonomy and may require less autonomy and different kinds of support when experiencing high levels of physical complaints. It could also be that these workers, as they experience more physical complaints, proceed too far beyond their limits when experiencing more autonomy. This means that, particularly in the case of physical complaints, it is necessary to carefully monitor a balance between physical complaints and the autonomy offered. Autonomy is important, but tailor-made advice is particularly necessary in these situations, as the notion that more autonomy will always result in higher work ability may be a misconception.

Strengths and limitations

To begin with, it is important to note that this issue has not been studied before. Longitudinal studies of workers who have been diagnosed with cancer more than 2 years ago are rare and have not addressed the impact of late effects of cancer treatments on future work ability at all, as far as the authors of the present study are aware. Furthermore, it is remarkable that large numbers of working participants who fell under the criteria were willing to complete an extensive questionnaire on two occasions. Moreover, professionals indicate that this subject is considered extremely important and that knowledge is lacking in this area (Boelhouwer et al., 2021a).

Of course, we must also consider that the study results may have been influenced by certain limitations in the design of the study. First, this study was limited to salaried employees who experienced a breast cancer diagnosis. It is difficult to assess to what extent this may have influenced the results, but it should be mentioned that women with a breast cancer diagnosis in the past have been reported to have a lower work ability than men with testicular cancer and a higher work ability than men with prostate cancer (Torp et al., 2012). The late effects of cancer treatment between these populations may be substantially dissimilar and affect work ability differently. Furthermore, cross-sectional studies among workers more than 2 years past cancer diagnosis have reported higher work ability scores among females with a previous breast cancer diagnosis than in the present study. In the present study, work ability was 7.3 at T2, while other studies reported 8.0 (controls 8.6) (Gudbergsson et al., 2011), 8.4 (referents 8.6) (Lindbohm et

al., 2012), 8.7 (controls 9.0) (Carlsen et al., 2013) and 8.2 (Taskila et al., 2007). However, it is unclear to what extent these other studies concerned salaried workers. For example, the latter study also included freelancers and entrepreneurs, and this may have influenced the results. Overall, it is not possible in the present study to make clear inferences regarding the work ability of the entire population of employed women in the Netherlands who were confronted with a breast cancer diagnosis 2-10 years ago. Second, this study did not consider possible differences between the perceived late effects by the worker and the way in which these are perceived by colleagues or professionals. It is particularly important to mention that cognitive complaints were self-reported and not estimated by professionals using neuropsychological testing, while subjective and objective cognitive impairment is known to show little correlation (Poppelreuter et al., 2004). Furthermore, the results on a self-report scale may show associations with psychosocial factors (Boscher et al., 2020; Feuerstein, 2009; Pullens et al., 2010). Therefore, in future studies on this topic, it would be wise not only to collect data on self-reported cognitive complaints, but also to conduct neuropsychological tests. Third, self-reporting by using a questionnaire may lead to various sources of common method bias (Podsakoff et al., 2003). However, we took this into account by using existing, validated scales as much as possible and by carefully determining the order of the scales and other questions to prevent interference. Fourth, profiles are conceivable with specific combinations of certain levels in physical complaints, fatigue and cognitive complaints. These profiles may have different effects. This has not been investigated in this study. Fifth, a moderation analysis requires a number of conditions (Aguinis et al., 2017). One assumption is that distributions include the full range of possible values. This was not always completely the case for the raw scores, however the variables were centered around their means.

This study was conducted with the data of those who wanted to participate and were willing and able to complete two extensive questionnaires within a period of 1 year. Another point in this regard is therefore that the dropouts between questionnaires had significantly more cognitive complaints, and may have caused a so-called healthy worker effect that influenced the results as the selection bias caused a more favorable clinical profile (Chowdhury et al., 2017). However, this even further accentuates the results. In addition, nothing is known about the group that did not participate. For these reasons, it is doubtful whether the survey sample is representative of all workers who returned to work and are now 2-10 years past breast cancer diagnosis.

The Covid-19 pandemic started after the data-collection phase of this study. Opportunities for autonomy may have changed during the lockdowns, given the increased prevalence of working at home without a manager or supervisor being physically present. Furthermore, spontaneity in contact with colleagues will have probably diminished during this period, also changing social support. Moreover, job demands may have changed. It is interesting what the effects of these changes may have been among these employees, and future research into these effects is important.

Conclusions

To conclude, the present study clearly indicates that cognitive complaints and fatigue may affect future work ability among employees 2–10 years past breast cancer diagnosis. This requires awareness among those who guide employees who were diagnosed with cancer, and among these employees themselves. Interventions by professionals specialized in oncology or psycho-oncology may be preferable. Complaints may be reduced, or compensation mechanisms may be enhanced. Furthermore autonomy, a supportive leadership style, or social support by colleagues may need attention continually as these resources are associated with higher current work ability, but not with future work ability.

The number of workers who have had cancer will continue to increase, and awareness that this is the case and can be associated with the late effects of treatments is important. This is not widely known in the workplace. It is therefore extremely important for professionals and managers or supervisors to be alert and to ask further questions in the case of problems. All in all, the present study is an interesting step toward more awareness about cognitive complaints and fatigue that may affect future work ability. Further research should be conducted into other job resources, such as job crafting or specialized guidance by professionals, as evidence-based targets for interventions available in the workplace are urgently needed.

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CHAPTER 5



Late effects of cancer treatment, job resources, and burnout complaints among employees with a breast cancer diagnosis 2 -10 years ago: A longitudinal study

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Abstract

Purpose. The aim of this study was to investigate the effect of possible late effects of cancer treatment (physical complaints, fatigue, and cognitive complaints) and of two job resources (autonomy and supportive leadership style) on future burnout complaints, among employees living 2 – 10 years beyond breast cancer diagnosis.

Methods. Data at T1 (baseline questionnaire) and at T2 (9 months later) were collected in 2018 and 2019 ($N = 287$). These data were part of a longitudinal study among Dutch speaking workers with a cancer diagnosis 2 – 10 years ago. All complaints and job resources were self-reported. Longitudinal multivariate regression analyses were executed, controlling for years since diagnosis, living with cancer (recurrence or metastasis), and other chronic or severe diseases. Mediation by baseline burnout complaints was considered.

Results. A higher level of fatigue and cognitive complaints at baseline (T1) resulted in higher future burnout complaints (at T2), with partial mediation by baseline burnout complaints. No effect of physical complaints at T1 was observed. Higher levels of autonomy or a supportive leadership style resulted in lower burnout complaints, with full mediation by baseline burnout complaints. Buffering was observed by autonomy in the relationship of cognitive complaints with future burnout complaints. No moderation was observed by supportive leadership.

Conclusions. The level of burnout complaints among employees 2 -10 years beyond breast cancer diagnosis may be an effect of fatigue or cognitive complaints, and awareness of this effect is necessary. Interventions to stimulate supportive leadership and autonomy are advisable, the latter especially in the case of cognitive complaints.

Introduction

Burnout complaints receive a lot of attention, both in the media, within companies and organizations, among occupational physicians and within the area of work and organizational psychology. The number of research studies into burnout complaints has increased enormously in recent decades (Maslach et al., 2001; Taris et al., 2013). The conceptualization of (clinical) burnout and burnout complaints varies (Demerouti et al., 2021), also depending on the assessment method that even differs between psychological disciplines (Van Dam, 2021). However, in the media burnout complaints are often incorrectly referred to as burnout, causing confusion about the intensity and the scope of the phenomenon. It is therefore important to mention that research data show that only a fraction of employees reporting burnout complaints develop a burnout. Nevertheless, in 2018 the percentage of employees in the Netherlands that reported to experience burnout complaints several times a month was 16.4% of the male employees and 18.1% of female employees (RIVM, 2018). Furthermore, data show that 30% of the mental disorders diagnosed by occupational physicians in the Netherlands concerned burnout (Kerncijfers beroepsziekten 2021 | Beroepsziekten.nl, 2021).

To the question how burnout complaints can be prevented or reduced, several answers have been given by means of research based on the well-established Job-Demands Resources (JD-R) model (Schaufeli and Bakker, 2004). Within this model the job demands are the factors that require effort in the performance of work, possibly resulting in overload. In general, higher demands are associated with burnout (Alarcon, 2011). However, the so-called job resources have a supporting effect, and may reduce burnout complaints and buffer the impact of job demands on burnout complaints (Demerouti et al., 2001; Schaufeli & Bakker, 2004; Bakker et al., 2005, 2014; Xanthopoulou et al., 2007; Bakker & Demerouti, 2017). Two possible job resources are autonomy and a supportive leadership style. In short, autonomy can be described as the possibility to influence one's work and make decisions, and a supportive leadership style as the degree to which one feels supported by the manager or supervisor. The results of cross-sectional and longitudinal studies indicate that an increase in job demands and a decrease in job resources, predict higher future burnout scores (Schaufeli et al., 2009). Moreover, the two processes are intertwined (Schaufeli & Taris, 2013). In general, it can be said that by balancing job demands and job resources, burnout complaints may be reduced or even prevented.

The World Health Organization recently defined burnout as an occupational phenomenon, characterized by exhaustion, mental distance and decreased personal effectiveness (World Health Organization, 2019). These characteristics are in line with the subscales of the Utrecht Burnout Scale (UBOS) (Schaufeli & Van Dierendonck, 2000). Burnout complaints have been studied in relation to various other work-related variables, such as performance (Taris, 2006) or work ability (Ruitenburg et al., 2012). Furthermore, several specific subpopulations within the labor force have been studied, such as nurses (Woo et al., 2020), teachers (Hakanen et al., 2006) or employees with chronic diseases (Boelhouwer et al., 2020). However, workers who have had a cancer diagnosis have not been specifically studied before, while the prevalence of workers

living beyond or with cancer is considerable. The prevalence of cancer among the working population in the Netherlands was estimated at a few per cent already more than a decade ago (Kuijpers, 2008). Furthermore, this percentage is expected to continue to rise as a result of the increasing cancer incidence, higher survival rates for several types of cancer, increasing return to work rates and a higher retirement age. As breast cancer is the most common type of cancer at working age, workers beyond cancer diagnosis mostly concern women who were confronted with a breast cancer diagnosis (Ferlay et al., 2021),

Workers beyond cancer diagnosis may experience late effects of cancer treatments, like physical complaints (Ho et al., 2018), fatigue (Prue et al., 2006; Meunier et al., 2007; Reinertsen et al., 2010) or cognitive problems (Wefel et al., 2015). There are cross-sectional research findings showing that these late effects may be associated with impaired occupational functioning, for instance lower work ability, even on the longer term (Boelhouwer et al., 2021b). However, studies on associations of late effects of cancer treatment and burnout complaints are not known to the authors.

It is conceivable that the late effects of cancer treatments aggravate the job demands, as the effort it takes to perform certain tasks may increase. Furthermore, professionals (from human resource management, occupational health care and physiotherapy) that guide this subpopulation of workers have mentioned that it may be unclear if and how the late effects of cancer treatments and burnout complaints are related to each other (Boelhouwer et al., 2021a). This implies that there is a risk that a burnout diagnosis is established, while the cause of the burnout complaints can be found directly or indirectly in the late effects of the cancer treatments. Therefore, the association of late effects of cancer treatments and burnout complaints should be investigated also quantitatively. Furthermore, the relevance of job resources available in the workplace should be investigated to indicate possible targets for intervention possibly especially important for this population, to start with autonomy and a supportive leadership style in the present study.

Therefore, the aim of this study is to investigate 1) if and to what extent possible late effects of cancer treatments (physical complaints, fatigue, and cognitive complaints) affect the level of future burnout complaints, and 2) to identify a possible direct effect of autonomy or a supportive leadership style on future burnout complaints, as well as buffering of the presumed association of late effects with future burnout complaints, among female salaried employees diagnosed with breast cancer 2 – 10 years ago.

Late effects of cancer treatment and burnout complaints

Possible late effects of cancer treatments can last for more than decades or even develop many years after treatment (Silver et al., 2013). As previously mentioned, these late effects include among others 1) physical complaints (Ho et al., 2018), 2) fatigue (Prue et al., 2006; Meunier et al., 2007; Reinertsen et al., 2010), and 3) cognitive complaints (Wefel et al., 2015). No quantitative studies are known to the authors about these late effects affecting the level of burnout complaints within the population of workers beyond

cancer diagnosis, but data on these problems in relation with burnout complaints among other populations were found.

First, regarding physical problems the available studies tend to be focused on the effect of burnout complaints on physical health, however also the reverse effect has been investigated. A one-year follow-up study among a sample of Air Force personnel ($N = 1,009$) reported perceived health to predict a decrease in job burnout and the predicted effect of perceived health on job burnout to be significantly larger than the effect of burnout on health (Vinokur et al., 2009). Furthermore, burnout complaints occur more frequently among populations with specific chronic diseases, such as women with musculoskeletal diseases or men with cardiovascular diseases (Honkonen et al., 2006) or women with coronary heart disease (Hallman et al., 2003). However, a cross-sectional study reported that physical chronic diseases (without comorbid mental chronic diseases) were not related to higher burnout complaints (Boelhouwer et al., 2020).

Second, one of the symptoms of burnout is exhaustion (World Health Organization, 2019), which may be similar to extreme fatigue. Several studies have established a relationship between fatigue and burnout complaints, for example a strong positive correlation between compassion fatigue and burnout (Zhang et al., 2018). Acute fatigue was also reported to be more strongly associated with exhaustion than with disengagement among police officers (Basinska et al., 2014). Also, although chronic fatigue syndrome and burnout are reported to have similarities in symptoms, different diagnoses may emerge depending on a perceived cause that may be in the psychological or in the medical direction (Leone et al., 2011).

Third, cognitive deficits are reported to be associated with burnout complaints when cognitive functioning is assessed objectively (by psychometric tests) (Van der Linden et al., 2005; Deligkaris et al., 2014), as well as subjectively by self-report (Van Dijk et al., 2020). Furthermore, individuals with nonclinical burnout report less cognitive complaints than the clinical burnout patients, but more cognitive problems than healthy controls (Oosterholt et al., 2014).

All in all, a higher level of physical complaints, fatigue or cognitive complaints is expected to have an increasing effect on future burnout complaints beyond the first two years after breast cancer diagnosis among employees. Therefore, our first hypothesis (H1) is as follows:

- H1: A higher level of physical complaints, fatigue, or cognitive complaints at T1 (baseline) is associated with higher burnout complaints at T2.

Job resources and burnout complaints

Various job resources that are important for the work ability of workers who experience late effects after cancer treatments have emerged in qualitative studies (Boelhouwer et al., 2021a), as well as in cross-sectional quantitative studies focusing on work ability (Boelhouwer et al., 2021b). However, no results with a focus on the impact of job resources on burnout complaints among the working population beyond cancer

diagnosis are known to the authors. Nevertheless, because of the relevance of job resources for preventing burnout complaints among other populations, the expectation in the present study is that these results also apply to employees beyond cancer diagnosis. Although any necessary change processes within organizations can take a long time, there are several job resources for which a clear advice can be given in a relatively simple and reasonably practical way in the workplace, namely autonomy and a supportive leadership style.

First, a lack of autonomy is reported to be correlated with burnout risk (Maslach et al., 2001; Kim et al., 2018). Furthermore, a meta-analysis demonstrated negatively associations of autonomy with all three burnout subscales (Alarcon, 2011). Second, leadership style tends to be affected by situational factors and therefore the association of a supportive leadership style with burnout is reported to be complex (Kanste et al., 2007). However, a lack of support from supervisors is regarded as detrimental in relation to burnout complaints, even more so than a lack of support from co-workers (Maslach et al., 2001).

All in all, although research data among workers more than 2 years beyond breast cancer diagnosis are lacking, a higher level of autonomy or a supportive leadership style are expected to be associated with lower burnout complaints among employees 2 – 10 years beyond breast cancer diagnosis. Hence, our second hypothesis (H2) is as follows:

- H2: Higher levels of autonomy or of supportive leadership style at T1 (baseline) are associated with lower burnout complaints at T2.

Buffering by job resources of the association of late effects and burnout complaints

No quantitative studies among workers beyond cancer diagnosis concerning buffering effects by autonomy or by a supportive leadership style of an association of physical complaints, fatigue or cognitive complaints with burnout complaints are available. However, qualitative studies indicate that these job resources are experienced as relevant factors when workers are confronted with late effects of cancer treatments (Van Maarschalkerweerd et al., 2019). Furthermore, studies among other populations demonstrated the importance of job resources interacting with job demands predicting lower symptoms of burnout (Bakker et al., 2005; Xanthopoulou et al., 2007). Therefore, we expect buffering effects of the above mentioned two job resources in the present study. Hence, our third hypothesis is as follows:

- H3: The relationships between physical complaints, fatigue, or cognitive complaints (late effects) at T1 and burnout complaints at T2 are moderated by autonomy or by a supportive leadership style at T1 such that when the job resource is high, the burnout complaints are lower than when the job resource is low (in other words, we expect buffering by the job resources).

In addition, three covariates are included in the analyses, namely years since diagnosis, living with cancer (recurrent or metastasis), and the presence of comorbid chronic conditions, as these factors may influence the relationships mentioned because of

differences in physical and mental burden. The level of burnout complaints at baseline (T1) will be studied as a possible mediator, as it is expected that burnout complaints will have associations with individual factors as well (Alarcon et al., 2009).

All in all, the present study is quite unique in focusing on burnout complaints among workers beyond cancer diagnosis and the first to investigate the influence of late effects after cancer treatments on future burnout complaints. It is important for professionals to know whether late effects contribute to a possible diagnosis of burnout complaints and whether autonomy or a supportive leadership style require additional attention among workers confronted with late effects of cancer treatment in preventing burnout complaints.

Materials and methods

Procedure

A survey study was carried out (between June 2018 and December 2019) among workers 2 – 10 years beyond cancer diagnosis. Data from workers beyond breast cancer diagnosis and with exclusively salaried employment at T1 (baseline) and at T2 ($N = 287$) were used in the present study. Various methods and channels were used to inform (potential) participants about the study and the first (online) questionnaire such as social media, a short video clip and a website (including the information letter with details regarding storage of the data and confidentiality). An invitation (and a reminder one month later) for the second questionnaire was sent out by e-mail to the participants of the first questionnaire. Before the online questionnaire started, the respondent gave informed consent. The Research Ethics Committee (cETO) of the Open Universiteit in the Netherlands assessed the ethical acceptability of the study and agreed with the study design and method (reference cETO: U2018/03891/MQF).

Measures

The questionnaires included questions concerning demographics and information about health, treatment, and work. For the present study the data to be used were 1) physical complaints, fatigue, cognitive complaints at T1, 2) burnout complaints at T1 and at T2, 3) autonomy and supportive leadership style at T1, and 4) years since diagnosis, living with cancer (recurrence or metastasis), and other chronic or severe diseases at T2.

Physical complaints were measured by a question about complaints caused by ten possible conditions (no, some or many complaints, respectively 0, 1 or 2 points). These conditions were neuropathy, hormonal complaints, hot flushes, osteoporosis, heart complaints (due to treatment), scar adhesions, joint pain, lymphedema, lung problems, and bowel and / or bladder problems. For the level of physical complaints, the total score (0 to 20) is used. Fatigue was measured by the subjective fatigue subscale (eight items, seven-point Likert scale, 1 to 7) of the Checklist Individual Strength (CIS) (Vercoulen et al., 1994, 1999). The possible total score for fatigue was 8 to 56. The Cronbach's α was 0.91. Cognitive complaints were measured by the Cognitive Failure Questionnaire (CFQ) for subjective cognitive functioning (25 items, five-point Likert scale, 0 to 4) about the

frequency of everyday cognitive errors (Ponds et al., 2006). The possible total score was 0 to 100. The Cronbach's α was 0.93. In this study, the score on this scale will be referred to as cognitive complaints.

The general version of the Utrecht Burnout Scale (UBOS-A) was used to measure burnout complaints (Schaufeli & Van Dierendonck, 2000). The UBOS-A consists of 15 statements on which the respondent scores on a seven-point scale, ranging from 'never' (0) to 'daily/always' (6). The items concern complaints on three scales: exhaustion (5 items), cynicism or mental distance (4 items) and competence (6 items). The scores on the latter scale were reversed, so that higher scores correspond to higher burnout complaints. Cronbach's α were respectively .88, .84 and .83. After administration, the total UBOS-A score is calculated by adding up the scores on all items and indicated as burnout complaints, although only the higher scores will concern clinical complaints.

Autonomy and supportive leadership style, were measured using one of the scales by Van Poppel and Kamphuis (2004). The Cronbach's α 's at T1 for autonomy (four items, five-point Likert scale) was 0.86, and for supportive leadership style (four items, five-point Likert scale) 0.93.

The year of diagnosis was collected in the first questionnaire, from which the number of years after cancer diagnosis was determined. In the second questionnaire, the respondents indicated whether they were living with cancer (recurrence or metastasis) and whether they had other chronic or severe diseases.

Participants

The numbers of respondents with a breast cancer diagnosis and exclusively salaried employment at T1 and at T2 was 287.

Analysis

The data were analyzed using SPSS software, version 25 (IBM Corporation, Armonk NY, USA) for Windows®/Apple Mac®.

Descriptives were analyzed for the study sample at T2 ($N=287$) and for the dropouts between T1 and T2 ($N=174$). Descriptives were demographics (age, gender, and educational level), years since diagnosis (at T1), living with cancer (recurrence or metastasis), and other chronic diseases (at T1 and at T2), late effects (physical complaints, fatigue, cognitive complaints) at T1, burnout complaints (at T1 and at T2), autonomy and supportive leadership style (at T1).

All hypotheses were analyzed by regression analyses, controlling for years since diagnosis, living with cancer (recurrence or metastasis), and other chronic or severe diseases at T2. Missing data were not imputed, and this could result in lower numbers of respondents to be used in analyses. Physical complaints, fatigue, cognitive complaints, autonomy, and supportive leadership style were centered at their means. The hypotheses were tested by regression analyses in six steps; first one step for each of the three covariates, then the late effects together in the fourth step, the two job resources

in the fifth step, and the interaction terms to test possible buffering by the job resources of the association of late effects and burnout complaints at T2 in the sixth step. If this regression showed that the late effects significantly predicted burnout complaints at T2, possible mediation by baseline burnout complaints at T1 was analyzed.

To be able to establish if the variable burnout complaints at T1 (baseline) is functioning as a mediator, three assumptions should be met (Baron and Kenny, 1986). First, as already described above, the independent variables should significantly relate to the dependent variable (burnout complaints at T2). Second, the independent variables should significantly relate to the mediator (burnout complaints at T1). Third, when the possible mediator variable (burnout complaints at T1) is added in an additional step of the regression analyses used to verify the first assumption, any significant associations found there are no longer present or reduced (respectively called full mediation or partial mediation by burnout complaints at T1). The testing of these assumptions described above was analyzed and presented in the Tables 3A-C. As described earlier, in these analyses the interaction terms (to test possible buffering by the job resources) were also included.

Results

Descriptives

At T1 the mean age of the study sample ($N = 287$) was 49.7 years ($SD 7.72$) and the mean number of years since diagnosis was 4.5 years ($SD 2.39$). At T2 6% ($N=17$) was living with cancer (recurrence or metastasis), and 44% ($N=125$) had other chronic or severe diseases. Dropouts between T1 and T2 ($N=174$) were younger and reported a higher level of cognitive complaints. See Table 1.

Burnout complaints at T1 were strongly correlated with burnout complaints at T2 ($r = .753, p < .001$). A paired sample test resulted in no significant difference between burnout complaints at T1 and burnout complaints at T2. The three late effects showed low mutual correlations, and the same was observed for the job resources. The late effects were correlated positively ($p < .01$) both with burnout complaints at T1, and with burnout complaints at T2. The two job resources were correlated negatively ($p < .01$) both with burnout complaints at T1, and with burnout complaints at T2. See Table 2.

Hypothesis testing

The stepwise multivariate regression analyses excluded cases with missing values and resulted in $N=253$. The final model explained 46% of the observed variance.

One of the three covariates showed a significant association with burnout complaints at T2, namely other chronic or severe diseases ($\beta = .108, p < .05$). Years since diagnosis and living with cancer (recurrence or metastasis) and were not associated with burnout complaints at T2. See Table 3a.

Thereafter hypothesis H1 was tested in step 4 of the multivariate regression analyses, with physical complaints, fatigue, and cognitive complaints at T1 as possible predictors of burnout complaints at T2. A higher degree of the number of physical complaints did not predict higher burnout complaints at T2 ($\beta = .030, p = .582$), however, a higher level of fatigue and a higher level of cognitive complaints did (respectively $\beta = .297, p < .001$ and $\beta = .292, p < .001$). See Table 3a. Additionally, mediation analyses were executed.

Table 1. Characteristics of participants at T2 ($N=287$) and dropouts between T1 and T2 ($N=174$).

Variables at T1	Participants at T2 $N = 287$	Dropouts between T1 and T2 $N = 174$
Age M (SD) ^λ	49.7 (7.72)	48.1 (7.30)
Female gender (N, %)	287 (100%)	174 (100%)
Educational level:		
Elementary and secondary education	77 (27%)	42(24%)
Vocational secondary education	52 (18%)	46 (27%)
Higher education	153 (53%)	84 (48%)
Other or missing	5 (2%)	2 (1%)
Years since diagnosis (M, SD)	4.5 (2.39)	4.6 (2.40)
Living with cancer (recurrence or metastasis) (N, %)	15 (5%)	6 (3%)
Other chronic or severe diseases (N, %)	121 (43%)	67 (39%)
Physical complaints, M (SD) (0 – 20)	5.2 (3.82)	5.5 (4.29)
Fatigue, M (SD) (8 – 56)	34.1 (12.01)	35.9 (12.14)
Cognitive complaints, M (SD) ^μ (0 – 100)	39.7 (15.71)	43.9 (16.10)
Autonomy, M (SD) (4 – 20)	15.2 (3.47)	14.9 (3.78)
Supportive leadership style, M (SD) (4 – 20)	13.9 (4.23)	14.4 (4.39)
Burnout complaints score, M (SD) (15 – 105)	46.5 (13.95)	47.5 (14.15)
Variables at T2	Participants at T2 $N=287$	
Living with cancer (recurrence or metastasis) (N, %)	17 (6%)	
Other chronic or severe diseases (N, %)	125 (44%)	
Burnout complaints score, M (SD) (15 – 105)	47.1 (13.99)	

Notes. M = mean, SD = standard deviation, N = number of participants.

^μ = significant difference between participants at T2 and the dropouts (between T1 and T2) at .01 level.

^λ = significant difference between participants at T2 and the dropouts (between T1 and T2) at .05 level.

Table 2. Correlations of demographics (age, educational level), control variables (years since cancer diagnosis, living with cancer (recurrence or metastasis), other chronic or severe diseases, burnout complaints at T1), dependent variable (burnout complaints at T2), independent variables (physical complaints, fatigue, and cognitive complaints at T1), and possible moderators (autonomy or supportive leadership style at T1) (N=278).

Variables (questionnaire T1 or T2)	1	2	3	4	5	6	7	8	9	10	11	12
1. Age (T1)	1											
2. Educational level (T1)	-.113	1										
3. Years since cancer diagnosis (T1)	.212**	.066	1									
4. Living with cancer (recurrence or metastasis) (T2)	-.050	.001	.088	1								
5. Other chronic or severe diseases (T2)	.133*	-.126*	-.029	-.036	1							
6. Burnout complaints (T1)	.003	-.108	.003	-.055	.196**	1						
7. Burnout complaints (T2)	-.023	-.106	.029	-.039	.250**	.753**	1					
8. Physical complaints (T1)	.101	-.065	-.003	-.001	.239**	.282**	.278**	1				
9. Fatigue (T1)	-.050	-.196**	-.007	.006	.215**	.513**	.496**	.350**	1			
10. Cognitive complaints (T1)	-.139*	-.093	.020	-.064	.143*	.482**	.443**	.369**	.428**	1		
11. Autonomy (T1)	.029	.135*	-.029	.020	-.042	-.285**	-.282**	-.082	-.210**	-.143*	1	
12. Supportive leadership style (T1)	-.001	.011	-.053	.043	-.077	-.433**	-.305**	-.104	-.215**	-.188**	.291**	1

Notes. *Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed)

The results showed partial mediation by burnout complaints at T1 in the relationship of fatigue and cognitive complaints with burnout complaints at T2. This can be deduced from the fact that all three assumptions for mediation were met for fatigue and for cognitive complaints, as these variables showed significant associations with the dependent variables in all required analyses. In the additional step in the regression analysis (introducing burnout complaints at T1 as a possible mediator), the associations were $\beta = .116, p < .05$ for fatigue and $\beta = .121, p < .05$ for cognitive complaints. As the associations were significant to a lesser extent, this means the mediation by burnout complaints at T1 was partial. See Tables 3A-C.

Hypothesis H2 was tested in step 5 of the above-described multivariate regression analyses, with the job resources (autonomy and supportive leadership style) at T1 as possible predictors, and burnout complaints at T2 as dependent variable. Our hypothesis was confirmed. A higher level of autonomy or a supportive leadership style predicted lower burnout complaints at T2 (respectively $\beta = -.119, p < .05$ and $\beta = -.216, p < .001$). See Table 3a. The results showed full mediation by burnout complaints at T1 in the relationship of the job resources with burnout complaints at T2. This can be deduced from the fact that all three assumptions for mediation were met. In the additional step in the regression analysis (introducing burnout complaints at T1 as a possible mediator), the associations were $\beta = -.054, p = .223$ for autonomy and $\beta = -.060, p = .179$ for supportive leadership style. As the associations were not significant anymore, this means burnout complaints at T1 fully mediated the association between the job resources and burnout complaints at T2. See Tables 3A-C.

Hypotheses H3 concerned the expected buffering of the job resources (autonomy and supportive leadership style) at T1 of the relationships between physical complaints, fatigue, or cognitive complaints at T1 and burnout complaints at T2. Buffering was observed by autonomy of the association of cognitive complaints at T1 with burnout complaints at T2 ($\beta = -0.165, p < .01$). Furthermore, there was one other case of moderation (no buffering, but a worsening) by autonomy of the association of physical complaints with burnout complaints at T2 ($\beta = 0.208, p < .01$). In the analysis of H3, no mediation by burnout complaints at T1 was observed as the regression analysis with burnout complaints at T1 as dependent variable did not show any significant result for the interaction terms. See Tables 3A-C.

Table 3A. Multivariate regression analyses for moderation by autonomy or supportive leadership style (at T1) of the association of physical complaints, fatigue, or cognitive complaints (at T1) with future burnout complaints (at T2), controlled by years since diagnosis, living with cancer (recurrence or metastasis) and other chronic or severe diseases.

Step/Variable	F	R ²	Δ R ²	β	β	β	β	β	β
Step 1	.070	.000	.000						
Years since diagnosis at T1				.017	.021	.028	.028	.014	.007
Step 2	.571	.005	.004						
Living with cancer (recurrence or metastasis) at T2				-.065	-.064	-.044	-.032	-.007	
Step 3	5.622	.063	.059						
Other chronic or severe diseases at T2				.243***	.132*	.129*	.129*	.108*	
Step 4 / late effects at T1	24.376	.373	.309						
Physical complaints						.036	.032	.030	
Fatigue						.346***	.300***	.297***	
Cognitive complaints						.300***	.268***	.292***	
Step 5 / resources at T1	22.307	.422	.050						
Autonomy							-.107*	-.119*	
Supportive leadership style								-.216***	
Step 6 / interaction terms	14.400	.459	.036						
Physical complaints x Autonomy								.208**	
Physical complaints x Supportive leadership style								-.055	
Fatigue x Autonomy								-.025	
Fatigue x Supportive leadership style								.072	
Cognitive complaints x Autonomy								-.165**	
Cognitive complaints x Supportive leadership style								-.042	

Notes. Physical complaints, fatigue, cognitive complaints, autonomy, and supportive leadership style were centered at their means.

*Significant at the < 0.05 level. **Significant at the < 0.01 level. *** Significant at the < 0.001 level.

Table 3B. Multivariate regression analyses for moderation by autonomy or supportive leadership style (at T1) of the association of physical complaints, fatigue, or cognitive complaints (at T1) with burnout complaints (at T1), controlled by years since diagnosis, living with cancer (recurrence or metastasis), and other chronic or severe diseases.

Step/Variable	F	R ²	Δ R ²	β	β	β	β	β	β
Step 1	.225	.001	.001						
Years since diagnosis at T1				-.030	-.022	-.017	-.017	-.035	-.043
Step 2	1.803	.014	.013						
Living with cancer (recurrence or metastasis) at T2				-.116	-.115	-.094	-.077	-.077	-.082
Step 3	4.398	.050	.036						
Other chronic or severe diseases at T2				.190**	.074	.069	.069	.069	.074
Step 4 / late effects at T1	25.282	.382	.332						
Physical complaints						.046	.041	.041	.040
Fatigue						.351***	.291***	.291***	.301***
Cognitive complaints						.314***	.272***	.272***	.285***
Step 5 / resources at T1	26.775	.467	.085						
Autonomy								-.123*	-.109*
Supportive leadership style								-.247***	-.260***
Step 6 / interaction terms	15.605	.479	.011						
Physical complaints x Autonomy									.049
Physical complaints x Supportive leadership style									-.044
Fatigue x Autonomy									-.039
Fatigue x Supportive leadership style									.050
Cognitive complaints x Autonomy									-.076
Cognitive complaints x Supportive leadership style									.066

Notes. Physical complaints, fatigue, cognitive complaints, autonomy and supportive leadership style were centered at their means.

*Significant at the < 0.05 level. **Significant at the < 0.01 level. ***Significant at the < 0.001 level.

Table 3C. Multivariate regression analyses for moderation by autonomy or supportive leadership style (at T1) of the association of physical complaints, fatigue, or cognitive complaints (at T1) with future burnout complaints (at T2), controlled by years since diagnosis, living with cancer (recurrence or metastasis), other chronic or severe diseases and burnout complaints at T1.

Step/Variable	F	R ²	Δ R ²	β	β	β	β	β	β
Step 1	.070	.000	.000						
Years since diagnosis at T1				.017	.021	.028	.028	.014	.007
Step 2	.571	.005	.004						
Living with cancer (recurrence or metastasis) at T2				-.065	-.064	-.044	-.032	-.007	-.043
Step 3	5.622	.063	.059						
Other chronic or severe diseases at T2				.243***	.132*	.129*	.108*	.108*	.064
Step 4 / late effects at T1	24.376	.373	.309						
Physical complaints						.036	.032	.030	.006
Fatigue						.346***	.300***	.297***	.116*
Cognitive complaints						.300***	.260***	.292***	.121*
Step 5 / resources at T1	22.307	.422	.050						
Autonomy						-.107*	-.119*	-.119*	-.054
Supportive leadership style						-.179**	-.216***	-.216***	-.060
Step 6 / interaction terms	14.400	.459	.036						
Physical complaints x Autonomy							.208**	.178**	.178**
Physical complaints x Supportive leadership style							-.055	-.029	-.029
Fatigue x Autonomy							-.025	-.002	-.002
Fatigue x Supportive leadership style							.072	.042	.042
Cognitive complaints x Autonomy							-.165**	-.119*	-.119*
Cognitive complaints x Supportive leadership style							-.042	-.082	-.082
Step 7 / mediator									
Burnout complaints at T1	28.952	.647	.118						.601***

Notes. Physical complaints, fatigue, cognitive complaints, autonomy, and supportive leadership style were centered at their means. *Significant at the < 0.05 level. **Significant at the < 0.01 level. ***Significant at the < 0.001 level.

Discussion

The result that higher levels of fatigue and cognitive complaints cause higher future burnout complaints (measured with the UBOS-A, a validated measurement tool) among a population of employees with a breast cancer diagnosis 2 – 10 years ago is remarkable. Burnout complaints appeared to be quite stable in time, and further analyses showed that baseline burnout complaints partially mediated the relation between fatigue and cognitive complaints at T1, and burnout complaints at T2. This causal relationship between fatigue and cognitive complaints on one side and future burnout complaints on the other side among employees more than 2 years beyond breast cancer diagnosis is not reported before. Studies among other populations did report negative cross-sectional associations of self-reported fatigue (Zhang et al., 2018) or of cognitive complaints (Van Dijk et al., 2020) with self-reported burnout complaints. Furthermore, also cross-sectional associations between cognitive complaints and fatigue have been reported among cancer survivors in several other studies (Todd et al., 2011; Dorland et al., 2016), as well in the present study (see Table 2). However, no comparisons can be made with other longitudinal studies among workers more than 2 years beyond cancer diagnosis as these are not available.

It was already mentioned that it may be difficult to distinguish burnout complaints from the late effects as a result of cancer treatments (Boelhouwer et al., 2021a). This possibility was also brought forward in a focus group study among cancer survivors and professionals (Klaver et al., 2020). Also, a cross-sectional association between fatigue or cognitive late effects and burnout complaints may increase the risk to mistakenly interpret a late effect of cancer treatment as an aspect of burn-out symptomatology. In any case, a correct diagnosis among workers confronted with late effects of cancer treatments requires an examination by a professional with the appropriate background who is allowed to make such a diagnosis and, not just by filling in a questionnaire, even if this is a validated measuring instrument. Furthermore, as self-reported cognitive complaints do not have to go together with objectively established complaints (Poppelreuter et al., 2004), it can also be a consideration to perform a neuropsychological examination.

As expected, the level of autonomy and supportive leadership style did predict lower future burnout complaints in the present longitudinal study, however this effect changed into non-significant when controlled for burnout complaints at baseline, as burnout complaints at baseline have a fully mediating effect. Cross-sectional studies among this population also reported associations with burnout complaints for these job resources (Kanste et al., 2007; Alarcon, 2011; Kim et al., 2018). The results can be explained by the high degree of stability of the burnout symptoms. Buffering was observed by autonomy in the relation of cognitive complaints and higher future burnout complaints, if controlled for burnout complaints at baseline. As no research into interventions for burnout complaints among employees more than 2 years beyond cancer diagnosis are known, this is an interesting finding.

Physical complaints did not affect the level of burnout complaints in the current analyses, which is unexpected as we took note of some other studies where this was the case (Hallman et al., 2003; Honkonen et al., 2006; Vinokur et al., 2009). Against expectations a positive moderation caused by autonomy in the case of physical complaints was found. This result indicates that more autonomy may worsen burnout complaints with an increase of physical complaints, so it may be necessary to carefully monitor how much autonomy is desirable and favorable in the case of more physical complaints. It is possible that workers with many physical late effects receive so much support that at the same time this reduces their autonomy or maybe more autonomy in the case of physical complaints increases work demands even more. In short, in a situation in which the employee has many physical complaints, it is necessary to consciously adjust how much autonomy is experienced as positive by the employee.

Of course, we have to take into account that this study result may be influenced by certain limitations in the design of this study. An important limitation is the possibility that the experienced complaints are not (completely) caused by the cancer treatments, but that other causes also play a role. Only in studies with very large cohorts that are followed for many years is it possible to also make measurements before an occurring cancer diagnoses and to compare these measurements on the same factors in the years after the cancer diagnosis and treatment. Furthermore, hindering late effects may cause stress. Elevated levels of stress affecting burnout measures are reported among individuals experiencing short-term stress (Van Dam, 2021). Moreover, all data were self-reported and this may have led to various sources of common method bias (Podsakoff et al., 2003). However, existing, validated scales were used as much as possible. In this regard, it is important to note that burnout complaints were assessed by the UBOS-A, while more recently a new assessment tool, the Burnout Assessment Tool (BAT), is also available. The BAT is based on other core dimensions, namely exhaustion, mental distance, and impaired emotional and cognitive impairment (Schaufeli et al., 2020a, 2020b). It could be that the use of the BAT makes it even more urgent to be aware of the possibility of cognitive complaints in workers who have undergone cancer treatments in the past. Furthermore, cognitive complaints in the present study were not assessed by neuropsychological testing, while results on these objective data and self-reported, subjective data are known to show little correlation (Poppelreuter et al., 2004). Moreover, the results on a self-report scale may be associated with psychosocial factors (Pullens et al., 2010; Feuerstein, 2009; Boscher et al., 2020). Also, the dropouts between the two questionnaires had significantly more cognitive complaints at baseline, and a healthy worker effect may have influenced the results, with not exactly known effects. Finally, it is important to emphasize we cannot report about the occurrence of burnout complaints among this population in general.

To summarize, the present study indicates that fatigue and cognitive complaints increase future burnout complaints among employees 2 – 10 years beyond breast cancer diagnosis, which is a novel finding. Furthermore, a supportive leadership style and autonomy are regarded as important, the latter especially if cognitive complaints are at higher levels. It is important to also investigate other job resources (like job crafting of coaching) for their positive effect among these workers. In other words, it is very

important to conduct more studies into effective job resources specifically to protect workers beyond cancer diagnosis at risk of higher burnout complaints in the future.

Finally, it is important for managers and human resource management within companies and organizations and for other professionals guiding these employees, to realize which late effects of cancer treatments may present an extra risk to show and develop higher levels of the self-reported burnout complaints and to know what can be done in the workplace to reduce or even prevent increasing burnout complaints. Therefore, it is important to always be alert if it is known that an employee has been treated for cancer and therefore possibly experiences late effects of the treatments, in order to include this information in the choice of interventions. Possibly, for employees who are known to have undergone cancer treatments, an additional focus on the treatment of possible fatigue or cognitive complaints from the psycho-oncological perspective may be considered, apart from the attention for factors in the work situation.

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CHAPTER 6

Late effects of cancer (treatment) and work ability: Guidance by managers and professionals

Boelhouwer, I. G., Vermeer, W., & Van Vuuren, T. (2021)

Abstract

Background. The prevalence of the group of workers that had a cancer diagnosis in the past is growing. These workers may still be confronted with late effects of cancer (treatment) possibly affecting their work ability. As little is known about the guidance of this group, the aim of this study was to explore the experiences and ideas of managers and professionals about the guidance of these workers in the case of late effects of cancer (treatment). Given the positive associations with work ability of the job resources autonomy, social support by colleagues and an open organisational culture found in several quantitative studies, these job resources were also discussed. Further ideas about the influences of other factors and points of attention in the guidance of this group of workers were explored.

Methods. Semi-structured interviews were conducted with managers ($n = 11$) and professionals ($n = 47$). Data-collection was from November 2019 to June 2020. The data were coded and analysed using directed content analyses.

Results. The late effects of cancer or cancer treatment discussed were physical problems, fatigue, cognitive problems, anxiety for cancer recurrence, and a different view of life. The self-employed have less options for guidance but may struggle with late effects affecting work ability in the same way as the salaried. Late effects may affect work ability and various approaches have been described. Autonomy, social support of colleagues and an open organisational culture were regarded as beneficial. It was indicated that interventions need to be tailor-made and created in dialogue with the worker.

Conclusions. Especially with respect to cognitive problems and fatigue, guidance sometimes turned out to be complicated. In general, the importance of psychological safety to be open about late effects that affect work ability was emphasized. Moreover, it is important to take the perspective of the worker as the starting point and explore the possibilities together with the worker. Autonomy is an important factor in general, and a factor that must always be monitored when adjustments in work are considered. There is a lot of experience, but there are still gaps in knowledge and opportunities for more knowledge sharing.

Background

A vast majority of the working population diagnosed with cancer returns to work. Return to work rates range from 60 to 92% (with a median interval of 2 years) in a review study on data from Mediterranean and Central European countries (Paltrinieri et al., 2018). Mean rates for return to work in other reviews are 62% (Spelten et al., 2002), 64% (Mehnert, 2011), and 73% (De Boer et al., 2020). The long-term survival for common cancers of working age, such as breast cancer, is still increasing and the retirement age is rising in several countries in Europe, resulting in a faster growing prevalence of the group of workers that have had a cancer diagnosis in the past. The first 2 years after cancer diagnosis is an important period in many countries because of legal rules regarding the reintegration process. Therefore, studies among workers with a past cancer diagnosis are mainly focussed on return to work and guidance of these workers in the first 2 years after cancer diagnosis (Greidanus et al., 2018; Tamminga et al., 2019; Tiedtke et al., 2017). Studies concerning guidance by the employer during these first 2 years describe return to work processes as difficult to manage (Tiedtke et al., 2014) and offer interventions focussed at communication to enhance return to work (Greidanus et al., 2020). Furthermore, in recent years more attention is paid to guidance by health care workers shortly after diagnosis, regarding work as one of the treatment goals (Fit for Work, 2020), and focus rehabilitation efforts also on employment as an outcome (Alfano et al., 2017).

However, after return to work, workers with a past cancer diagnosis may still be confronted with a range of physical and psychological changes. These changes may be present since the treatment was given and persist on the long term, or changes may appear months or years later at first (Stein et al., 2008) and continue to influence the lives of those concerned (Silver et al., 2013). As a clear distinction between long-term and late effects is not always possible, all these changes in the present study are indicated as late effects in line with the definition of the Dutch Federation of Cancer Patient Organisations (NFK, 2017). Late effects include, for instance, physical problems (Ho et al., 2018), fatigue (Meunier et al., 2007; Prue et al., 2006; Reinertsen et al., 2010), or cognitive problems (e.g. problems with concentration, learning and memory) (Wefel et al., 2015).

Late effects of cancer or cancer treatment may affect work ability (Carlsen et al., 2013; Gudbergsson et al., 2011; Von Ah et al., 2017). Work ability refers to one's ability to be able to achieve expected work goals (Ilmarinen, 2007; Ilmarinen et al., 2005). When used in qualitative studies work ability may be described as the extent to which the worker physically, as well as mentally, is able to work, now and in the near future. In studies with a quantitative design one or more items of the Work Ability Index (WAI) questionnaire (Ilmarinen, 2007) are frequently used to measure work ability (Boelhouver et al., 2021). Quantitative studies report that the level of work ability is an indicator for other work outcome measures, for instance for receiving a disability pension (Alavinia et al., 2009), absenteeism or early retirement (Ilmarinen & Tuomi, 2004) among healthy populations. As the focus of the present study is on experiences and opinions of managers and professionals regarding workers experiencing late effects of cancer (treatment) and

their work ability, and the actual and possible guidance offered by the managers and professionals, a qualitative design is used.

Furthermore, the well-established Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2007) is used to explore and analyse the guidance offered and explore any further ideas to preserve and enhance the work ability of workers confronted with late effects. In the JD-R model the so-called job demands are regarded as the aspects of the job that require effort. Late effects of cancer and cancer treatment may result in work demands being experienced as heavier. However, on the other hand supporting factors, the so-called job resources, may have a relieving effect. Among healthy populations job resources are positively related to work ability (Brady et al., 2019), as well as among workers with chronic diseases (Boelhouwer et al., 2020) and among workers with a past cancer diagnosis (Boelhouwer et al., 2021). Therefore, it is important to explore job resources as targets of interventions in the guidance of workers confronted with late effects of cancer (treatment).

Of course, the possibilities to make use of guidance are not equal across all workers. Salaried workers can make use of guidance within and outside their organisation that is offered by the employer, while the non-salaried, like the self-employed, are in a less favourable situation as they lack these opportunities and they, for instance, cannot consult an occupational physician for free. Besides this, the non-salaried already more often continue working during treatment (Torp et al., 2019), suggesting their situation in general offers less possibilities to recover. Therefore, this study focuses on the salaried, as well as the non-salaried.

Several studies on the support of workers with chronic conditions focus on multi- and interdisciplinary guidance (Varekamp et al., 2006, 2013; Varekamp & Van Dijk, 2010), while this is rarely the case for workers shortly past cancer diagnosis and not at all if the cancer diagnosis is more than 2 years ago, as far as the authors are aware of. However, various professionals do offer guidance to this group of workers because of late effects affecting work ability. In short, the guidance of workers that returned to work, experiencing late effects of cancer (treatment), is an important aspect of the tasks of some managers and many professionals, but a neglected research area.

To summarize, the aim of this study is: 1) to explore the roles, experiences, possibilities and ideas that managers and professionals have regarding the guidance of workers confronted with late effects of cancer (treatment), 2) to explore the role of job resources in reducing the possible impact of late effects on work ability, and 3) the ideas about other opportunities in the guidance of this group of workers. This knowledge can contribute to an understanding of what is possible in the context of work to preserve work ability and to prevent relapse among workers experiencing late effects of cancer or cancer treatment that may affect work ability.

The structure of the article is as follows. First our methodology will be described. Second, the results section of this study starts with the information regarding the characteristics of the group of interviewees, that is managers and professionals. Then follows the

description of the information provided regarding their experience with workers confronted with late effects of cancer (treatment) and general information about the possible guidance given. Then, the results on the role of job resources as targets of intervention will be addressed. Further, additional ideas related to the guidance of this group of workers will be reported. Finally, our conclusions and discussion will offer some important points of discussion of relevance regarding the guidance of workers confronted with late effects of cancer (treatment) affecting work ability.

Methods

Participants and recruitment procedures

Semi-structured interviews were conducted with managers and professionals active in the field of guidance and support of the working population. Managers could be active at different organisational levels. Professionals were active in human resource management, in case management, or as an occupational physician (with or without a specialist additional training as a consultant oncology, in Dutch a so-called BACO), an occupational health expert, nurse specialized in cancer working in an organisational context, reintegration consultant, or coach. During the recruitment process, it was decided to also include occupational therapists, an artistic therapist, a music therapist, and oncological physiotherapists, because these professionals also guide workers more than 2 years after cancer diagnosis regarding their occupational functioning.

Recruitment was done by e-mail. Several professional associations, non-profit and profit companies, stakeholders, managers, and professionals in the researchers' networks were approached to see whether there was interest in participating. A letter with information was used to inform the participants about the aim of the study, the data collection, data storage and analyses. It was explained that questions would be asked about their experience with workers who have had a cancer diagnosis in the past and who have been treated for cancer. Furthermore, it was stated the interviews concerned their ideas about the possibilities in the approach and advice in practice. No reward was promised. A form was used to ask the participants for their informed consent.

The Research Ethics Committee (cETO) of the Open University of the Netherlands assessed the ethical acceptability of the study and agreed with the study design and method (reference cETO: U/2019/07620/MQF).

Interview topics and data collection

The interview guide was developed for this study and has not been published previously elsewhere. An English language version of the interview guide is available as a supplementary file. See Additional file 1, Interview Guide.

Draft versions of the interview guide were pre-tested by the first author and the research assistants. The topics (and related open questions) of the interview guide can roughly be grouped as follows: 1) late effects of cancer or cancer treatment, 2) impact of late effects on work ability, 3) possibilities in the context of work to alleviate the possible

impact of late effects, with an a priori focus on autonomy, social support by colleagues, and the role of the organisational culture. The questioning offered the freedom for the interviewees to decide the extent to which they could address the topics.

The interviews were face-to-face, remotely by video calling or by telephone. The data collection took place from November 2019 up to June 2020. In the middle of this period, in March 2020, measures were taken because of the COVID-19 pandemic. From then on, all interviews were conducted remotely. The interviews took 30 to 60 min. All interviews were audio taped. A draft of the interview report was sent to the interviewee by e-mail by the first author and any deletions or adjustments could be made by the interviewee and sent to the researcher by a reply. After the interview report was approved by the interviewee, it was made anonymous and given a unique code. The final interview reports were imported into MAXQDA 2020. See Additional file 2, Flow Chart Research Methodology.

Data analyses

The data were coded and analysed using directed content analyses (Hsieh & Shannon, 2005), as this method allows to use existing theory or prior research to develop a coding scheme before the start and to revise and refine the code scheme during coding. Furthermore, it was taken into account that in addition to the a priori themes, additional themes within the objective of the study may emerge. Consequently, each of the three research assistants coded three interviews of a sample of nine interviews covering all occupational interviewee roles. The coding was discussed with the first author and the other research assistants to make sure all relevant information was coded. New codes that emerged from the data were discussed and, if relevant, added. Any discrepancies were resolved through negotiated consensus. Subsequently, the remaining 49 interviews were divided between the three research assistants for a first coding. To support reliability, the first coding was done by a research assistant that was not present at the interview in question. The first author checked all coded interviews and brought forward any discrepant coding to be able to resolve these by negotiated consensus. On all coding agreement was reached.

Results

Results: participants and their professional contact with workers more than 2 years past cancer diagnosis

An overview of all participants, offering information regarding their characteristics (gender, professional roles, and organisational context) is presented in Table 1. Also, the individual codes are presented, with the letter indicating the (primary) professional role. See Table 1, Participating managers ($n = 11$) and professionals ($n = 47$): codes, organizational context, any other professional role(s) and gender.

Table 1. Participating managers ($n = 11$) and professionals ($n = 47$): codes, organizational context, any other professional role(s) and gender

Code participant	Managers ($n = 11$)	Organizational context	Other professional role(s)	Gender
M1	Manager and professor	University of applied sciences		F
M2	Manager	Information and Communication Technology company		M
M3	Manager	Information and Communication Technology company		M
M4	Manager	Governmental organization		F
M5	Manager	University of applied sciences		F
M6	Manager	Municipal service	Previous: human resource management	M
M7	CEO	Commercial company		F
M8	Manager	Centre of physiotherapy	Additional: physiotherapist	M
M9	Manager	University of applied sciences	Self-employed coach	F
M10	Manager and coach	Welfare organization		F
M11	Manager	Municipal service	Self-employed coach	F
Code participant	Professionals ($n = 47$)	Organizational context	Other professional role(s)	Gender
AT1	Art therapist	One-person bureau		F
CO1	Coach	University of applied sciences		F
CO2	Coach	University		F
CO3	Coach	Coaching bureau (specialised in major life events)		F
CO4	Coach	Coaching bureau (specialised in major life events)		F
CO5	Coach	Coaching bureau	Previous: physiotherapist	F
CO6	Coach	Coaching bureau (specialised among others in cancer)		M
CO7	Coach and trainer	One-person coaching bureau (specialised in cancer)		F
CM1	Case manager sickness absence and employability	Telecommunication company		F
CM2	Case manager sickness absence and employability	Telecommunication company		F
CM3	Case manager	Non-profit psycho-oncological drop-in-centre		F
HR1	Human resource management	University of applied sciences		F

Code participant	Professionals (n = 47)	Organizational context	Other professional role(s)	Gender
HR2	Human resource management	Bureau for human resource management		F
HR3	Human resource management	University of applied sciences		F
HR4	Human resource management	University of applied sciences		F
HR5	Human resource management	University of applied sciences		F
HR6	Human resource management	Health insurance company	Additional: career coach and trainer	F
HR7	Human resource management, specialized in reintegration and career counselling	Hospital		F
MT1	Music therapist	One-person bureau		F
N1	Nurse specialized in cancer	Transport company (health and safety service department)		F
OH1	Occupational health expert	One-person bureau	Additional: coach and therapist	F
OH2	Occupational health expert	Social security organization		F
OH3	Occupational health expert	One-person bureau		F
OH4	Occupational health expert	One-person bureau		F
OH5	Occupational health expert	Police organization and self-employed		F
OH6	Occupational health expert	Police organization		F
OH7	Occupational health expert	One-person bureau	Additional: coach and trainer	F
OP1	Occupational physician	University and academic hospital (health and safety service department)		F
OP2	Occupational physician	University (health and safety service department)		F
OP3	Occupational physician	Transport company (health and safety service department)		M
OP4	Occupational physician	Financial company (health and safety service department)		F
OPB1	Occupational physician consultant oncology (BACO)	Organizational consultancy company	Additional: coach, mediator, trainer	M
OPB2	Occupational physician consultant oncology (BACO)	Organization of occupational consultancy		F
OPB3	Occupational physician consultant oncology (BACO)	Hospital and independent health and safety service company		F

Code participant	Professionals (n = 47)	Organizational context	Other professional role(s)	Gender
OPB4	Occupational physician consultant oncology (BACO)	University (health and safety service department)		F
OPB5	Occupational physician consultant oncology (BACO)	Academic hospital (health and safety service department)		F
OPT1	Oncological physiotherapist	Centre of physiotherapy		F
OPT2	Oncological physiotherapist	Hospital (rehabilitation department)		F
OT1	Occupational therapist and coach	Reintegration bureau		F
OT2	Occupational therapist and coach	Reintegration bureau		F
OT3	Occupational therapist	Organization for occupational therapy		M
OT4	Occupational therapist	One-person bureau		F
RB1	Reintegration consultant	Reintegration bureau (specialised in cancer)	Self-employed career counsellor	F
RB2	Reintegration consultant	Reintegration bureau (specialised in cancer)		F
RB3	Coach and managing director	Reintegration bureau (specialised in cancer and serious diseases)		F
RB4	Coach	Reintegration bureau (specialised in cancer and serious diseases)		F
RB5	Coach and managing director	Reintegration bureau (specialised in cancer and chronic diseases)		M

Note. F female, M male

Of the 58 interviewees 19% ($n = 11$) had a managerial role and 81% ($n = 47$) had a professional role at the time of the interview. The majority (84%) of the 58 interviewees was female; this concerned 64% ($n = 7$) of the managers and 89% ($n = 42$) of the professionals. Not mentioned in the table, is the fact that of those interviewed 26% ($n = 15$) spontaneously mentioned a personal cancer diagnosis in the past during the interview.

Thirty-six per cent ($n = 4$) of the managers also had experience with one of the professionals roles, for instance as self-employed coach (M9, M11) or as psychotherapist (M8). Eleven per cent ($n = 5$) of the 47 professionals had more than one professional role at the time of the interview, for instance an occupational health expert also working as a trainer (OH7). Furthermore, 17% ($n = 8$) of the professionals worked their full working time as self-employed in their one-person business (AT1, CO7, MT1, OH1, OH3, OH4, OH7, OT4).

Almost all interviewees had (to various degrees) professional experience with workers more than 2 years after cancer diagnosis. During the interview, two of the occupational therapists (OH1, OH2) reported that their professional experience was focused on the first 2 years after cancer diagnosis, but they did also have experience with the group more than 2 years past cancer diagnosis, for instance because of voluntary work in a walk-in-centre. Furthermore, one manager and one coach did not have the professional experience with workers more than 2 years past cancer diagnosis, but a strong affinity with the issue because of experience with the issue outside the professional role (M4) or experience with workers with complaints due to chronic diseases (CO1). One case manager (CM3) worked for a large non-profit psycho-oncological walk-in-centre. This case manager offers advice and guidance on absenteeism and reintegration for workers with a cancer diagnosis that visit the walk-in-centre, and also has contact with workers more than 2 years after diagnosis. One manager (M7) had extensive managerial experience, and now was CEO. To summarize, not all interviewees had (recent) experience with workers more than 2 years past cancer diagnosis in the workplace but these interviewees were included in the data-analyses because of their relevant experience in previous or other (work) contexts with this issue.

Within organisations, the managers, and within some companies a specialized case manager (CM1 and CM2) or a specialized human resource manager (HR7), had the role to guide the workers with a past cancer diagnosis during the reintegration process and thereafter. The two specialized case managers were part of the human resource management department. However, in general, those active in human resource management in most companies and organisations acted on distance from the workplace by advising the managers, and the manager was regarded as responsible for the contact with the employees, while human resource management was only to be involved in the case of a complex situation. Consequently, the direct contact of human resource management with workers with a past cancer diagnosis was reported to be limited.

However, workers confronted with late effects of cancer or cancer treatment also contact various professionals of their own choice for help or guidance. The contact with professionals not related to the organisation or company of their employer may primarily concern work related issues, but the primary reason for consultation may also be the coping with one of the many other aspects of cancer and cancer diagnosis affecting the person. However, also in the case of the latter, functioning in work may be addressed as well. An example was offered by a physiotherapist, not only focusing on movement therapy regarding the physical late effects of cancer treatment, but also focusing on work issues and mental aspects of recovery (OPT1).

During the interviews, it appeared that some professionals tend to work together regularly. This concerns predominantly occupational physicians working together with occupational health experts and occupational therapists. An occupational health expert (OH7) told that it differs per assignment with whom will be worked together and sometimes contact is made with the occupational physician, so that they do not get in each other's way but strengthen each other. Occupational physicians reported to have

also direct contact with managers and human resource management depending on the situation. Also, several times it was mentioned by different professionals that advice regarding the adjustment in working hours is the responsibility of the occupational physician. Furthermore, the occupational physicians with a specialist additional training as a consultant oncology (BACO), can also be available to be consulted by the occupational physicians without this additional training. The situation regarding collaboration between different professionals other than the above-mentioned concerning workers with late effects after cancer or cancer treatment seems less obvious.

To summarize, the professional field regarding the guidance of workers with late effects of cancer (treatment) appears to be very broad and varied, with a collaboration between certain professionals within certain networks related to work organisations, however no clear view on collaboration with professionals outside these networks can be offered from the present study.

Results: experience regarding late effects of cancer or cancer treatment and ideas concerning guidance

Various late effects of cancer or cancer treatment were discussed. The prepared interview questions were a priori about possible experiences with physical late effects, fatigue, cognitive problems, and there was an open question to ask for other late effects experienced by workers past cancer diagnosis. As a result, two other late effects emerged during several interviews, namely the fear of cancer recurrence and a different approach to life.

Physical problems

In 36% ($n = 21$) of the interviews, physical late effects were discussed as something experienced among workers. Examples of physical late effects are the effects of surgery (such as lymphedema and difficulty with arm movements), neuropathy caused by chemotherapy, pain in the joints because of treatment with endocrine effects, heart problems, and a decreased resistance to common diseases was also mentioned. Physical problems may impair the ability to keep the job or to preserve work ability. The extent to which this is the case depends on the degree to which the work is physically demanding.

Possible solutions depend highly on the situation and examples were given about solutions targeting at the effects of the specific physical late effect and resulting in practical adjustments in the work task, work processes and the work environment, for instance working in a couple with someone else who can handle certain too heavy physical tasks.

Fatigue

In 79% ($n = 46$) of the interviews, fatigue was discussed as a late effect experienced among workers. Ideas about causes and ways of coping with this problem were discussed in a number of these interviews. Fatigue is indicated as a common late effect of cancer treatment. This late effect is reported as a possible cause of relapse after the worker had already been reintegrated into work (OPB4). By several interviewees

fatigue is also indicated differently, for instance in terms of problems with energy or lack of vitality. Workers may say: "I don't know why, but I can't." (OPB1). The interviewees presented various examples of this late effect among workers past cancer diagnosis. Fatigue after cancer treatment is also described as unpredictable and uncontrollable (HR6, RB1), causing a lot of frustration in the worker, of a chronic nature in many cases (OPT2), and as something that takes time to recover from (OH5). It is stated that those with a cancer history can lose energy quite suddenly (HR6). An occupational health expert (OH1) considers its clinical presentation comparable with fatigue after non-congenital brain injury. Also, some interviewees distinguish physical and mental or emotional fatigue (M9, OH1, OT3, OPT1).

Furthermore, it is reported that fatigue may have various causes, like the processing of getting cancer, mentally fighting with the situation, cognitive problems, not being used to activation anymore, stimulus sensitivity and a working environment that has not yet been adjusted. Furthermore, the late effect fatigue is not always understood by others (OPB1). After cancer treatments fatigue may manifest at all ages, also at younger age (OPB5). It is also brought forward that with advancing age it is difficult to be certain that the fatigue is due to the cancer treatments, and not to normal aging (HR4, OH3, RB2) or normal menopausal complaints (RB2, RB4). In addition, one of the occupational physicians indicates that the clinical presentation of fatigue in workers past cancer diagnosis is not different from fatigue in the elderly workers with chronic diseases (OP2). However, workers with a chronic disease are also said to be able to more easily trace back the cause of the fatigue (OP4). The group of cancer patients is also reported to be different in the extent to which they lose energy and at the same time want to be optimistic. Furthermore, it is underestimated how much recovery time is required (OPB2).

Workers with a cancer history are mentioned to be a group with a high motivation for work by several of the interviewees, and therefore at risk for running up against their own limits (OH6). Several interviewees explicitly mention that fatigue affects job performance or work ability, and it is also stated that this group of workers often gives job performance a higher priority than activities outside work. It is a process of nibbling on the social life of the person in question and give work a higher priority than the home situation or family (CO7, OPB1, OPB4, OH3). So, then work succeeds, but at home the worker is exhausted and unable to socialize, exercise or go shopping. "Life is more than work alone", and the different components should get attention in combination (OT3, RB1, RB3). One of the coaches indicates that these people need more time to use their "default mode network" to create the right balance between "doing" and "being" (CO2).

It is also mentioned that some workers past cancer diagnosis develop burnout complaints (HR6, OPB1, OPB4), and then it can be difficult to distinguish burnout complaints from fatigue as a result of cancer treatment, and it is unclear how these problems are possibly related to each other (OPT2). Furthermore, fatigue or a lack of energy is explicitly regarded as associated with cognitive problems by various professionals (OH6, OH7, OPB1, OPT2, OT3, RB5), and some interviewees formulated ideas about reciprocal causality, in other words, the idea that fatigue causes cognitive

problems and that cognitive problems cause fatigue. A more implicit remark concerning this issue is that reduced vitality is also expressed in a loss of sharpness and overview (CO5).

Regarding fatigue, guidance is given by professionals by mapping out what type of fatigue it concerns, what maintains the fatigue, and how personal limits and the needed recovery time can be monitored, and how a good work-life balance can be achieved.

Cognitive problems

In 60% ($n = 35$) of the interviews cognitive problems were discussed in depth, as this topic had been raised in the contacts between the worker and the interviewee. The interviewees described cognitive problems as being unable to concentrate or switch attention. Also, problems with multi-tasking, memory problems, problems with working memory, sensitivity to stimuli and to disruptions during a task are reported. Examples are workers having trouble reading long e-mails, having difficulty maintaining concentration during a meeting or while working in an open space office, or having difficulty with further education. Important differences between workers were reported as well. For example, some of them experience hardly any or no cognitive problems, especially when no radiation or chemotherapy has taken place (RB1). However, the cognitive problems may not be visible at first glance but can be observed in practical functioning (OT2), or even only during neuropsychological testing. This invisibility of cognitive problems can be quite dangerous, for example, if people are no longer fast enough to press an emergency button (N1). Some tasks are kept away from workers with cognitive problems, such as distributing medication among patients in health care settings (HR7). In this regard, one interviewee said that a rule within the organisation is as follows: "We work safely, or we don't work" (CM1). Over time, cognitive problems may decrease (OPB2, OPT2), but it is also possible that people can no longer cope with the work tasks or the job (OPB4).

It is also stated that it is important that the employee tells the manager about any cognitive problems (M1). One interviewee indicates that a certain organisational culture that offers the freedom to share these problems is essential (M10). Human resource managers in general do not hear about cognitive problems from the employees in concern themselves, but from the managers. However, it is mentioned by a human resource manager that it is important to know that there is a problem that is regarded as medical in nature because that knowledge affects the content of the discussion with the employee (HR1).

In a number of these interviews also ideas about ways of coping with cognitive problems are discussed. Some of the interviewees bring up that they know of online cognitive training programs. However, an occupational physician indicates that the effect of cognitive training is reported to be limited in the practice of work. Furthermore, a coach indicates that their reintegration bureau offers a training to improve working memory, and that the clients report improvement. Cognitive rehabilitation can also be offered as a part of occupational therapy. Practical solutions found within the workplace are reported as well, for instance offering the opportunity to withdraw of advising to do tasks one by

one (OP1). However, one of the case managers expresses the need for knowledge about how to adapt specific work tasks to a less demanding cognitive level.

Fear of cancer recurrence

This additional topic was brought up during 22% ($n = 13$) of the interviews. This fear may concern the fear of getting another cancer diagnosis or the fear of getting metastases of the cancer diagnosed and treated in the past. Managers, as well as different professionals, have observed this late effect among workers past cancer diagnosis. "This fear is very tiring", a manager indicates (M10). Some of the interviewees stated that every person that is curatively treated for cancer and hopefully has survived cancer, may experience some level of fear of cancer recurrence, although there are individual differences in vulnerability (CO4, OH7, RB5). Fear of cancer recurrence can be triggered for instance by severe life events (M9), hearing somebody else had a recurrence of cancer or metastases (AT1, RB5), medical checks (HR1, RB5), minor physical problems (OPB3), a new threat like COVID-19 (CO7), or talking about cancer in general (HR1). How one will act out of fear also depends strongly on how one was guided shortly after diagnosis (CO3, CO4). One interviewee expresses the possibility, that the fear of cancer recurrence indirectly affects mental resilience, which may lead to other complaints that are not directly linked to the diagnosis of cancer (M11).

It is mentioned to be important to be aware this fear may be a problem sometimes, so some supporting attention could be given in the work environment.

A different view to life

Another long-lasting effect of a past cancer diagnosis that is brought forward by some interviewees concerns a different view of the future and rethinking the approach to life. This additional topic is discussed in 9% ($n = 5$) of the interviews in depth, and in another 5% ($n = 3$) of the interviews it is indicated that people can feel changed on a personal level. Several interviewees have a strong impression that cancer makes people think more consciously about work. Because of what they experienced people make different choices. They can look at the future differently (CM1). With cancer, the question arises "What am I doing, and do I really want that?" (AT1). A salaried person, in a high position, started to reflect on his work situation after the diagnosis, as he felt confronted with the finiteness of life. Another example is a manager, who started to experience a higher appreciation of activities other than work. Past cancer diagnoses, workers place much more demands on their work, and they want their work to be meaningful (HR7). They may make the choice to do a training or to look for other work in the organisation or to work less hours (OP4). Workers may also experience they changed as a person. "Becoming the old "I" again is not possible." (RB3). Two coaches, specialised in major life events (CO3, CO4), also indicated that after a period of suffering people can experience 'post-traumatic growth' (Tedeschi & Calhoun, 2004), and that this also can be seen among workers that had a cancer diagnosis. Changes on a personal level may affect the experience of work and choices regarding work. One interviewee more generally stated that it is important to focus on someone's motivations and needs (CO5), and a cancer diagnosis is brought forward as a cause resulting in the need to do this.

Guidance in the case of fear of cancer recurrence or when the worker is rethinking his or her approach to life, mainly lies with professionals who are not affiliated with an employer. This guidance takes place outside the context of the work.

To summarize, the late effects discussed were physical problems, fatigue, cognitive problems, anxiety for cancer recurrence, and a different approach to life. Both managers and professionals report that late effects may affect work ability. Also, during the interviews, some professionals indicate that it is not always known or accepted that certain complaints are late effects of cancer treatments. Furthermore, it is also suggested that in the case a worker is aware of late effects, this may not always be shared with others in the context of work (HR4). It may be a taboo to tell about late effects (OT1) or the worker may even deny the complaints. As a result, it is possible an employee calls in sick due to late effects, which are not known in the work environment (HR6).

Results: experience and ideas regarding the role of job resources in the guidance of workers

As late effects of cancer treatment may still play a role in the long run, it is important to know what managers and professionals think about the influence of certain job resources on the work ability of this population workers. In this study the focus is a priori on the job resources 1) autonomy, 2) social support by colleagues, and 3) an open organisational culture.

Autonomy

In 48% ($n=28$) of the interviews autonomy is discussed in depth and it is stated many times that autonomy is important to enhance work ability among all workers. It is also stated that autonomy is important not only for the work ability of workers who experienced cancer diagnosis and treatments, but for all people who have experienced a serious situation (OP3). However, an occupational therapist indicates that autonomy can be decreased because of the cancer treatments (OT1), and a personal difficulty with taking autonomy is one of the reasons of searching professional support (MT1). When someone does not have an understanding manager, the feeling of impairment of autonomy and competence persists (OH1). Furthermore, when people feel that they have little to say in a company, they also take less autonomy (OT4). It is noted several times that the degree of possible autonomy in the work situation depends on the assignment and the extent to which the work content allows for variation (M2, M3, M11, N1, OH1). The self-employed have more possibilities regarding autonomy (OH7), as well as the employed in a higher position (OH4, OPB4). However, this can also work against someone, because these workers often prioritize work over their own capabilities and needs (OH4).

There are different opinions on the issue regarding any possible difference on the importance of autonomy for work ability between workers with and workers without a past cancer diagnosis; some think autonomy is more important among workers past cancer diagnosis and others think autonomy is equally important among both populations. Several examples are brought forward how autonomy can be stimulated to cope with late effects of cancer treatment, like workers themselves deciding to

start working at a later time, schedule the working hours, change the work planning, take more breaks if needed, adjust tasks, have possibilities to choose a different work environment (quiet and no open space office), having an opportunity to meditate, or decide to work from home. In large companies, precedent action may be feared if one person is offered something and another is not. Furthermore, possibly the COVID-19 pandemic is a trigger for more autonomy as working from home is more accepted (HR4).

Also, it is important to consider what the worker can handle at work (HR7) and the worker needs to know his or her limits (HR6). However, some warn that a worker should not have a job below their intellectual level, as this takes a lot of energy (CM3), causes under-stimulation (CO5) and the new job may also have fewer job control options (M10). Therefore, switching to a job at a lower function level can be a pitfall (CO5, M10).

In several interviews it is stated that work adjustments must be tailor-made, and the result of a dialogue between the worker and the employer. It is important not to talk about the employee, but talk with the employee, otherwise the employee loses control (HR7). The workers are stimulated to think and communicate about directions for solutions (OPT1, OT3) and their needs (CM1). Finding solutions may require flexibility and creativity from both sides (OPB5). Several managers and professionals pointed out that self-leadership can be important. However, self-leadership may be difficult for some (OP2) and to come up with solutions is difficult for a worker in a such a situation (OT1). Managers indicate that managers should take the lead (M8) and be sensitive in order to estimate the extent to which an employee can take self-leadership. If necessary, a manager should offer external coaching for this (M1). Furthermore, self-leadership can also mean that a worker does not want to talk about late effects (HR7). Also, a therapist indicates that difficulties with autonomy can be a reason for therapy (OT1). Moreover, an occupational physician indicated that with the current so-called 'self-leadership approach' the various responsibilities or actions need to be clear and this is not always the case (OPB3). Furthermore, the organisational system itself also must facilitate self-leadership, otherwise it is too easy to point to the employee (M7).

Social support by colleagues

In 55% ($n = 32$) of the interviews social support by colleagues is discussed in depth. Colleagues often do not realize that there may be late effects of the treatments for a longer time after a cancer diagnosis, nor that these effects can sometimes occur quite suddenly after many years. Immediately after diagnosis there is a lot of support from colleagues, however several interviewees report that this support decreases after returning to work; the longer it has been, the less understanding (HR2). Late effects are often no longer a topic of discussion, while colleagues can support a worker confronted with late effects enormously by thinking about possibilities to cope with these problems in the context of work, with a positive effect for work ability. That is why it was noted by two occupational physicians (OPB1, OPB2) to be important that colleagues know about certain late effects that are not observable, such as a low energy level. It is important that the work environment knows what it means to have a colleague with or after cancer (CO6). Colleagues should also know how someone is feeling mentally. Several interviewees indicate, that when something happens, the support one gets from

colleagues depends on the extent to which the relationship between the worker and the colleagues was already good before the cancer diagnosis. An interviewee stresses the importance of a feeling of inclusion of workers (CO6). Furthermore, it is brought forward that the behaviour of a manager works as an example behaviour. The moment a manager 'ignores' or 'writes off' someone, the team does the same (HR1).

Open organisational culture

In 28% ($n = 16$) of the interviews the organisational culture is discussed in relation to the issue of possible late effects and work ability. Several interviewees indicate that openness between the manager and the employee is important and therefore the psychological safety to be able to share issues. This is perceived to be connected to the organisational culture in general, and hence also experienced to be reflected in the approach of human resource management. Examples of organisations with less openness to discuss late effects are organisations with more men than women (M6, OH2). A kind of family culture within an organisation works positively and gives more openness (M9, M11). Furthermore, a more competitive culture is regarded as less psychologically safe (M7). Especially in the commercial business there may be judgments about workers with cancer. Some people with cancer choose not to tell because of the judgments they may encounter in the workplace (CO2). Workers may not share that they cannot cope with the workload anymore because they fear to lose their job (HR2, OH4) or managerial position (HR2). However, in some organisations psychological safety and the freedom to share problems is an explicit goal to focus on (CM1).

Results: important general points regarding the guidance of workers more than 2 years after cancer diagnosis

Apart from the ideas regarding guidance specifically in the situation of a particular late effect of cancer or cancer treatment or in relation to a specific job resource, several topics emerged that are relevant in various situations. These topics concern 1) the communication with employees, 2) the monitoring of employees beyond 2 years after cancer diagnosis and return to work, 3) the special position of human resource management within organisations, and 4) experiential knowledge with cancer.

First, several interviewees emphasize that contact with workers confronted with a cancer diagnosis starts as short as possible after diagnosis. Then immediate attention and guidance is needed and contact at a later stage builds on that. The ideas of the interviewees about the division of roles in the initiative regarding the communication in the workplace 2 years or more after diagnosis differ somewhat. For instance, some interviewees indicate that a manager should not have to make inquiries with a certain regularity, because in the regular contact between a manager and an employee any matters should come up naturally. Good contact therefore is stated to be essential. However, it is also suggested that a manager should occasionally check how someone is doing (HR6), however it is difficult to determine the correct level of attention (HR5). The latter is certainly difficult, when late effects are not visible, and an employee may not like too much attention (HR5). Also, several of the interviewed coaches indicate that it is very important that a manager keeps checking how things are going (especially if there is a medical check-up scheduled), shows empathy and also takes into account what

someone needs or does not need, does not fill in anything for the employee and listens well and open to the need of the worker in concern. Several occupational physicians consultant oncology (BACO) indicate that it is important that managers stay on top, plan with the employee, including, for example, who is taking the initiative. However, when a new manager is appointed, things can go wrong. He or she has not experienced the illness period of the employee in concern and sees the employee without visible illness (OPB1). One interviewee indicates that employees also have a role in this and could inform their employer about their cancer history (HR2). However, the remark is also made, that even the worker may not know that the complaints affecting work are the late effect of the cancer treatment.

The second issue is related to communication and is about the possible more systematic monitoring of employees with a past cancer diagnosis. Some interviewees indicate that it is important to always keep a finger on the pulse also on the longer term. It is also suggested that it could be important that occupational physicians see a worker after cancer once a year or 2 years if the employee needs this. Workers could be monitored in the context of relapse prevention (OPB4). However, for privacy reasons, the initiative for this must lie with the employee (M10). Furthermore, an occupational physician indicates that a manager does not remain responsible. For the long term, it is better to see how employees become stronger and that they are aware of their own limits, balance, motives, and goals (OPB2). Furthermore, one of the specialised case managers working for human resource management within a large company, points out that, for example, a follow-up path within organisations could be created. This follow-up-path ensures that workers who have had cancer remain under the attention, they can always ask for help and the organisation knows how they are doing (CM2). Beside all this, one should not forget that there are also employees who do not experience late effects or do not want to discuss their cancer history.

The third issue is the special position of human resource management within organisations. The role of human resource management is to offer help in bridging a possible gap between the manager and the employee (HR3). This can be about communication, but also can concern thorough investigation of the situation: "What is the question behind the question?" (HR1). So, the position of human resource management is regarded as important, however some remarks were made. Several professionals said that human resource management is somewhat more distant and (too much) aimed at regulations. It is also noted by several interviewees that it would be good if human resource management, as well as managers, knew more about cancer and work in general and about the possible late effects after cancer treatment in specific. It is mentioned also that managers seem to have trouble with linking the problems with work to a previous cancer diagnosis (HR3). However, on the other hand, it is also said that it is important that a manager should take on a managerial role and not have a medical conversation. The latter is a pitfall that can occur in medical settings, for example in hospitals, because the managers are often physicians or nurses (OP2). Human resource management is in the position to detect points for improvement in the communication or a need for more information and take action. Two interviewees working in a large company within the human resources department as case managers sickness absence and employability

(namely CM1 and CM2) describe how they guide workers with late effects of cancer treatments and their managers. They indicate that, although the knowledge about cancer and late effects is crucial, the guidance should be focussed on the work situation. Therefore, these case managers actively build up knowledge and experience with employees that had a cancer diagnosis in the past. "When a manager and an employee engage in a discussion, much more is possible than you think. This must be stimulated and driven by human resource management", a manager also states (M7).

Fourth, another factor that is brought forward is the personal experience with cancer. An occupational physician with a personal experience with cancer treatments explicitly reported that she understood the experience of cognitive effects shortly after treatment much better since having these treatments herself. Therefore, it is important to realize that at least 26% of interviewees had cancer themselves. However, the effect of experiential knowledge in general is unknown and was no explicit part of the interview topics. Nevertheless, the results of this study indicate that experiential knowledge of managers or professionals may be an additional source of knowledge that can influence the guidance of workers.

Discussion

This qualitative study among managers and professionals regarding their experiences with and ideas regarding the guidance of workers with possible late-effects of cancer treatments made clear that late effects still may affect work ability of these workers. Studies on this issue are scarce, but similar results have been reported before.

Several previous studies quantitatively indicated that physical complaints after cancer treatment continue to show associations with lower work ability beyond the first 2 years after cancer diagnosis (Dahl et al., 2019; Dahl et al., 2016; Fosså & Dahl, 2015; Gudbergsson et al., 2008, 2011; Ho et al., 2018). Interviewees in our study described that the impact of physical late effects depend on the type of physical complaint and the type of work tasks. Therefore, the guidance in case of physical problems was always seen as tailor-made, to be developed in consultation with the worker.

Fatigue was a late effect that many of the interviewees had observed impairing work ability among workers past cancer diagnosis and treatment. The association of fatigue with lower work ability has also been established in several quantitative studies (Carlsen et al., 2013; Dahl et al., 2019; Ho et al., 2018). The interviewed professionals in the present study reported that fatigue as a late effect of cancer (treatment) may be a complicated issue to handle, among other things due to the unpredictability and because different forms and causes can be identified. It is reported before that fatigue may be caused and sustained by a variety of factors from different angles, not only by treatment side effects and psychosocial factors, but also by direct effects of cancer and tumour burden, comorbid medical conditions, and exacerbating comorbid symptoms (Wagner & Cella, 2004). The options for guidance by managers can be limited here, but professionals can provide guidance to the employee and advice to the manager.

Cognitive problems were regarded as a potential effect on the performance of work tasks needing for concentration and divided attention. This is in line with other qualitative studies (Boykoff et al., 2009) and quantitative studies, that report negative associations of cognitive complaints among workers past cancer diagnosis with work ability (Ho et al., 2018; Von Ah et al., 2017, 2018). An important point that was mentioned in the interviews was that the invisibility of this late effect makes it extremely important that a worker can be open about this and that there is adequate communication to explore possible solutions. The concrete ideas regarding the guidance of workers with cognitive complaints were predominantly focused on the need to clearly identify whether someone could still perform certain (risky) tasks, have the possibility to work in environments with fewer stimuli and plan work schedules to have moments to rest. However, it was also expressed that there is a need for more knowledge about possible adjustments at task level in the case of cognitive complaints. Cognitive strategy training is a focus of research in the area of rehabilitation (Cicerone et al., 2019), but was not brought up in the interviews within companies and organisations. Possibly, cognitive strategy training only reaches the workplace of workers with late cognitive problems if they receive guidance from a specialized professional.

In the interviews it also emerged that cognitive problems, fatigue, problems with energy and vitality, and possibly also burnout complaints, are regarded to be related and part of complex interrelations. The relationship of fatigue and cognitive problems has emerged in several studies, such as in a longitudinal study among working cancer patients during 18 months after return to work (Dorland et al., 2018). Furthermore, exhaustion is part of the construct of burnout complaints (Schaufeli et al., 2009) and during the interviews it was indicated that burnout complaints can be difficult to distinguish from a lack of vitality or fatigue. The possibility that cancer-related cognitive problems may be mistakenly interpreted as burnout symptoms was also reported in a recent study using focus groups with survivors and professionals (Klaver et al., 2020). To our knowledge no quantitative studies on possible interrelations of fatigue with burnout complaints are available yet, however we think it is conceivable that late effects of cancer (treatment) can maintain fatigue and trigger burnout complaints. Regarding solutions to such interrelated complaints that affect work ability, it is therefore important to properly unravel causes and consequences, urging an interdisciplinary approach using both work and organisational psychology, and psycho-oncology.

Furthermore, two additional late effects emerged as topics during some of the interviews and were also discussed in depth in those interviews. First, the fear of cancer recurrence was not believed to affect work ability by the interviewees but was considered important as it could impair mental resilience. Other studies reported that the fear of cancer recurrence can affect the quality of life (Custers et al., 2014), however, these studies were not focussed on work ability. Second, a different view of life was regarded as possibly influencing important choices regarding work. This change in the emotional meaning of work will likely be a result of a change in the perception of future time, as reported to occur in people of very different ages when experiencing illness, for instance (Carstensen, 2006). Also attention was asked for post-traumatic growth (Tedeschi & Calhoun, 2004), as cancer can also be regarded as a profound experience

after which people may feel stronger mentally. However, for both late effects, no connection was seen with a lower work ability by the interviewees. So, guidance may be very important, but more from an approach that goes further than the effect on work ability now and in the near future.

In several healthy populations the lack of social support by colleagues is associated with feeling overwhelmed in the case of work problems (Hämmig, 2017). Also the association of less social support by colleagues with lower work ability are reported (Olsen et al., 2017). As in healthy populations, also among workers past cancer diagnosis positive associations with work ability are reported in quantitative studies for social support by colleagues (Carlsen et al., 2013; Gudbergsson et al., 2008; Lindbohm et al., 2012; Musti et al., 2018; Taskila & Lindbohm, 2007; Torp et al., 2012) or autonomy (Cheung et al., 2017; Torp et al., 2012, 2017). The interviewees in the present study regard a supporting role of colleagues as important for work ability and the exemplary behaviour of the manager in offering support as well. Furthermore, it is important to give the worker the opportunity to use as much autonomy as possible. However, it was reported that autonomy and self-leadership may be impaired because of the experience of getting cancer. In the case of an impaired ability of autonomous behaviour, it is possible to advise coaching or another form of guidance in personal development. Furthermore, there are individual differences between workers in the capability in self-leadership, and also companies differ significantly in the extent to which employees themselves can take control of their health (Van Vuuren et al., 2016). In this respect, however, it was pointed out that certain interventions regarding for instance work load in the case of fatigue (for example, working fewer hours or another job with less demanding tasks), autonomy can be affected because the other tasks or job allows less autonomy. So different targets for interventions may work against each other, and the guidance therefore always should be a comprehensive package discussed between the worker, manager and professionals taking into account not only late effects but also the desired level of job resources. This means it is important not to focus only on a late effect, but also on other perspectives, especially concerning the available job resources.

Moreover, for this group of workers, an open culture or climate is a precondition for daring to come to the necessary communication to be able to ask for or receive guidance at all. It was raised that it is not always known in the work environment that a worker is confronted with late effects of cancer treatment. It may even be that it is completely unknown that the worker has had cancer. This can be for various reasons, but it can also be because people are afraid to tell, while in the case of late effects affecting work ability this would be the first step to be able to find solutions. Also, stigma may prevent the employee to talk openly about the work problems caused by disease or treatments, as is reported in the case of mental diseases (Brouwers, 2020; Brouwers et al., 2019). It is therefore very important for organizations to fight stigma and strive for a climate in which this openness does exist and is not dangerous. Moreover, a felt psychological safety is even of broader importance, as it has been shown to correlate with performance in general (Edmondson & Lei, 2014). Unfortunately, the topic of organisational culture has not been studied previously in relation to workers coping with late effects of cancer treatments, to our knowledge. However, concerning organisational climate, which is a

related concept (Ehrhart & Schneider, 2016), a positive relation of a better social climate at work with work ability was reported (Taskila et al., 2007). Regarding the guidance of workers past cancer diagnosis who experience late effects, the culture within an organization therefore may determine the possibilities to discuss a need for guidance. In general, it was emphasized that good communication with a worker who developed cancer a long time ago does not begin when late effects arise or appear to affect work ability. At the time of the diagnosis, open communication must already be possible and in fact it must even be present in the organization before that moment. In addition, of newly hired employees it may be completely unknown that they have had cancer in the past.

Finally, managers are not confronted with this population on a regular basis and their experience therefore is limited to a few specific cases at most. Consequently, although occupational physicians have knowledge and experience with this issue, in large organisations human resource management may build more expertise on this issue. However, in medium or small organisations this may be difficult and need more external input and resources. Therefore, other ways to share knowledge and ideas between organisations, for instance by human resource management associations or networks, can be of great importance. As far as rehabilitation is concerned, it is already clear that a multidisciplinary approach is needed (Silver et al., 2013), however the sharing of expertise and knowledge concerning the possible late effects of cancer (treatment) could be organised in a more interdisciplinary way. Also, interesting to hear during several interviews was, that certain professionals were also experts by experience. This had added an extra dimension to their professional guidance; knowledge and experience that may also be shared. Possibly there are specific ways to integrate these experiences into basic professional training as well, like suggested before by others regarding medical training and the experiences of illness and patienthood among general practitioners (Fox et al., 2009).

Limitations

The interdisciplinary approach of this study, including not only health issues and clinical psychology, but also work psychology and organisational sciences, is a quite unique in studies regarding the long-term consequences of cancer (treatment) among workers. This study has highlighted therefore several important issues, however there are some limitations that should be noted.

First, it is important to emphasize that it is not clear to what extent the results are representative for all managers and within professional groups. Those who wanted to be interviewed for this study considered the topic important and furthermore relatively many had cancer themselves. It is not implausible that at least those who do not wish to pay attention to this topic did not participate. Hence, the positive attitude and the thinking in possibilities that emerged during the interviews therefore does not have to be the attitude among all other managers and professionals. However, since the aim was to explore ideas and possibilities, this is not a major problem. Furthermore, it is also

essential to realize that the managers can have different levels of managerial experience, and the managers interviewed may differ from the average level of experience. Moreover, in everyday working life managers may also have a managerial position on a temporarily basis. Furthermore, certain professionals have not been interviewed at all. For example, no (applied) psychologists have been interviewed, while some of these professionals doubtless also discuss work with workers past cancer diagnosis coping with late effects of cancer or cancer treatment.

Second, we did not explicitly question the types of cancer and the time since diagnosis of the workers that the managers or professionals had experience discussing late effects with as we focused on the possible type of late effects with which they were confronted among workers. However, late effects may differ depending for instance on whether the cancer is within or outside the central nervous system, or because of surgery or radiation therapy affecting different sites. On the other hand, systemic therapies such as chemotherapy and endocrine therapy can be given in different types of cancer in different variants and may cause similar late effects across types of cancer. We can report that the experience of the managers and professionals involved many cases of workers with a past breast cancer diagnosis (a common cancer at working age with a high incidence and a high survival). However, we did not explicitly question the types of cancer and the time since diagnosis of the workers that the managers or professionals had experience with regarding any late effects affecting work ability. We focused on the possible type of late effects with which they were confronted among workers. However, it is possible that if a worker is many years after cancer diagnosis and experiences certain late effects for many years, the responses of the work environment or the possible solutions being considered may differ from the situations in which the period after cancer diagnosis is shorter.

Third, two specific groups of workers have been much less of a subject of discussion in this study, namely the self-employed and those who cope with recurrent or metastatic disease. Regarding the self-employed it is important to indicate that their situation is very different and more vulnerable in comparison with the salaried in several ways, financially and non-financially. As the self-employed do not have a manager and organisation that they can rely on for help and support, their options are limited. Nevertheless, in the present study mainly certain therapists, reintegration consultants and coaches reported also to guide non-salaried workers. Furthermore, the self-employed are a very diverse group of workers with different occupations and therefore different possibilities to generate solutions in the case of impairments or problems associated with late effects of cancer treatments. Nevertheless, studies report that the self-employed have a lot of worries, including concerns that the late effects of the treatments may continue to result in low work ability in the future (Torp et al., 2020). Furthermore, in the present study no explicit attention was paid to those who have recurrent cancer or metastatic disease. However, workers who are affected by this are also among the workers who have had a cancer diagnosis in the past, but this subgroup obviously faces different challenges than those who assume or hope that they have been cured.

Conclusions

This research entered a field about which little is known, namely late effects of cancer (treatment) among workers more than 2 years beyond cancer diagnosis and work ability. Completely new is the focus on the guidance of these workers by managers and professionals, in which both the late effects and the use of job resources play a role.

It has become clear that the interviewed managers and professionals observed a negative effect on work ability for the possible late physical effects, fatigue, or cognitive problems among this group of workers. In the case of physical late effects, the tailor-made solutions depend on the exact physical impairment(s) and the work tasks. Furthermore, in the case of fatigue guidance focuses on guarding boundaries, sufficient recovery time and guarding a good work-life balance. However, fatigue can be a complex problem, requiring in-depth examination and professional guidance. In view of the possible interrelations of fatigue with cognitive problems and possible confusion with burnout complaints, there are also many questions that require further research. In the case of cognitive problems there are ideas about practical actions for the guidance, like the planning of work tasks or a low-stimulus work environment. However, a need for more knowledge about the cognitive load of different ways of working and task structure was expressed. This also requires further research.

Regarding the job resources, there are no surprising results to report, but what appears to be very important is the need to be careful not to reduce job resources unnoticed when job changes are implemented to diminish impact of certain late effects. If that is the case (such as, for example, if someone were to get a less demanding job, with less autonomy at the same time), the result may be less positive than hoped for. This also underscores the importance of this study, as an interdisciplinary approach is proposed using the perspectives of health sciences, management, organizational psychology, clinical and neuropsychology.

Furthermore, an important contribution of this study is that it is not only focused on employees, but also on the self-employed. It has therefore become clear that the possibilities for guidance of the self-employed are not only more limited, because they are not part of an organization, but also that they receive guidance exclusively from certain professionals. However, also the employed seek additional guidance with these professionals, and it would be useful to investigate how the guidance by various professionals and managers combine with each other.

It is important that the way of dealing with late effects after cancer in the work environment, has to be positioned as a shared responsibility of the worker and their employer, as is argued regarding sustainable employability in general (Fleuren et al., 2020; Veld et al., 2015). Any late effects that affect work ability are not only a problem of the individual worker, but also of the organisation, as finding solutions requires a dialogue and must be a joint activity. Moreover, in some organizations there appears to be room for human resource management to fulfill a connecting role. It is also important to realize that on one hand there are still questions, but on the other hand

a lot of knowledge and experience is available, including experiential knowledge. It is important to exchange more knowledge and experience between work organizations, professionals, including experiential knowledge, and share the insights also with the workers themselves.

To conclude, the long-term work ability after treatment for cancer needs an interdisciplinary approach, knowledge sharing and new knowledge gathering, and active involvement of the workers past cancer diagnoses confronted with late effects of cancer or cancer treatment themselves.

Abbreviations

BACO: BedrijfsArts Consulent Oncologie (in Dutch)

In English: Occupational physician consultant oncology

cETO: Committee research ETHics of the Open university

COVID-19: Corona Virus Disease 2019

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Supplementary Information

Additional file 1

Introduction

- 1. Thank you for this interview.**
- 2. Introduction interviewer (role within this study and position).**
- 3. Information regarding the backgrounds of the research line.**

This interview study is part of a research line that focusses on workers more than two years past cancer diagnosis. This focus is important because currently insufficient information is available about the group of workers who were diagnosed with cancer a long time ago. Most research is about the first two years after the diagnosis of cancer or about return to work. This research line is about the group of workers who are already two to ten years after diagnosis of cancer and have returned to work.

The aim is to clarify what is needed for this group to preserve or enhance work ability. Work ability can be described as the extent to which the worker physically, as well as mentally, is able to work, now and in the near future.

This information is important not only for those who work past cancer diagnosis, but also for their colleagues, managers, and professionals who guide these workers.

3. About this interview study.

These interviews are conducted with managers and professionals active in the field of guidance and support of (directly or indirectly) with people who work again after cancer. The interviews concern the ideas of the interviewee, about the experiences and possibilities in the approach in practice. The questions are not about specific individuals.

- 4. Ask (once more) for permission for audio recording.**
- 5. Give and have a letter of consent and a statement of consent read. Ask to sign (if not already read and signed).**
- 6. Tell that a draft report will be e-mailed, to which the interviewee can respond (things different, in or out). In the case of remarks the report will be adjusted. Thereafter it will be anonymized.**

7. TURN ON AUDIO AND MENTION NAME INTERVIEWEE AND DATE!

Interview Topics**General**

Position (managerial or professional):

- Description of work tasks and professional responsibilities.
- How long have you been working in this position?
- Have you guided people who have had cancer directly?
- Collaboration with (other) managers or (other) professionals? Involved in case-management?

Organizational context:

- What attitude do you observe within the organizational context(s) towards absenteeism due to complaints and/or disorders?
- Impression of the degree of inflow and outflow of employees in general?
- How can the mutual contact between employees be described?
- Is cancer a point of attention within the organization? If so, to what extent?
- Use of specific guidelines regarding work and cancer?
- Is it usually known how workers with a past cancer diagnosis longer than two years ago are doing in the workplace? If so, how?

Late effects of cancer and cancer treatment and work ability

- Are you familiar with these late effects of cancer and cancer treatment? Thoughts?
- What kind of late effects of cancer or cancer treatment have you noticed among workers?
 - Fatigue?
 - Cognitive (like problems with concentration)?
 - Physical?
 - Other?
- What is your view of the work ability of this group of workers?

- Is there any influence of late effects?
- What kind of bottlenecks do you observe among people after cancer in work? Barriers? Restrictions?
- With whom do the employees possibly share their experiences with possible late effects of cancer or cancer diagnosis within their organizational context?

Guidance?

- Do you give advice regarding the content of the job or work tasks? If so, what do you advice in certain situations? Do you consult others? If so, who?
- What factors matter? What kind of guidance can be needed?
- Other activities from professional or managerial point of view?

Job resources?

Introduction. Job resources are specific supporting factors in achieving work goals.

Possible job resources:

1. Autonomy; freedom; individual can make their own decisions within their work.
2. Support of colleagues.
3. Open organizational culture.

For each job resources questions in this line:

Do you observe the use of this job resource among workers past cancer diagnosis? If so, to what extent may this job resource help or can this help with the work ability in the case of late effects of cancer or cancer treatment? If not observed, what are your ideas about this job resource?

The worker with late effects

- What can these workers do themselves to preserve or enhance their work ability? Regarding late effects? Regarding work tasks? Other?
- Does self-management or resilience affect any relationship between late effects and work ability?
- What could possibly enhance promote self-management or resilience among these workers?
- Additional: What would be sensible preventive measures in the group for whom the ability to work does not seem to be hindered by late effects?

Interventions?

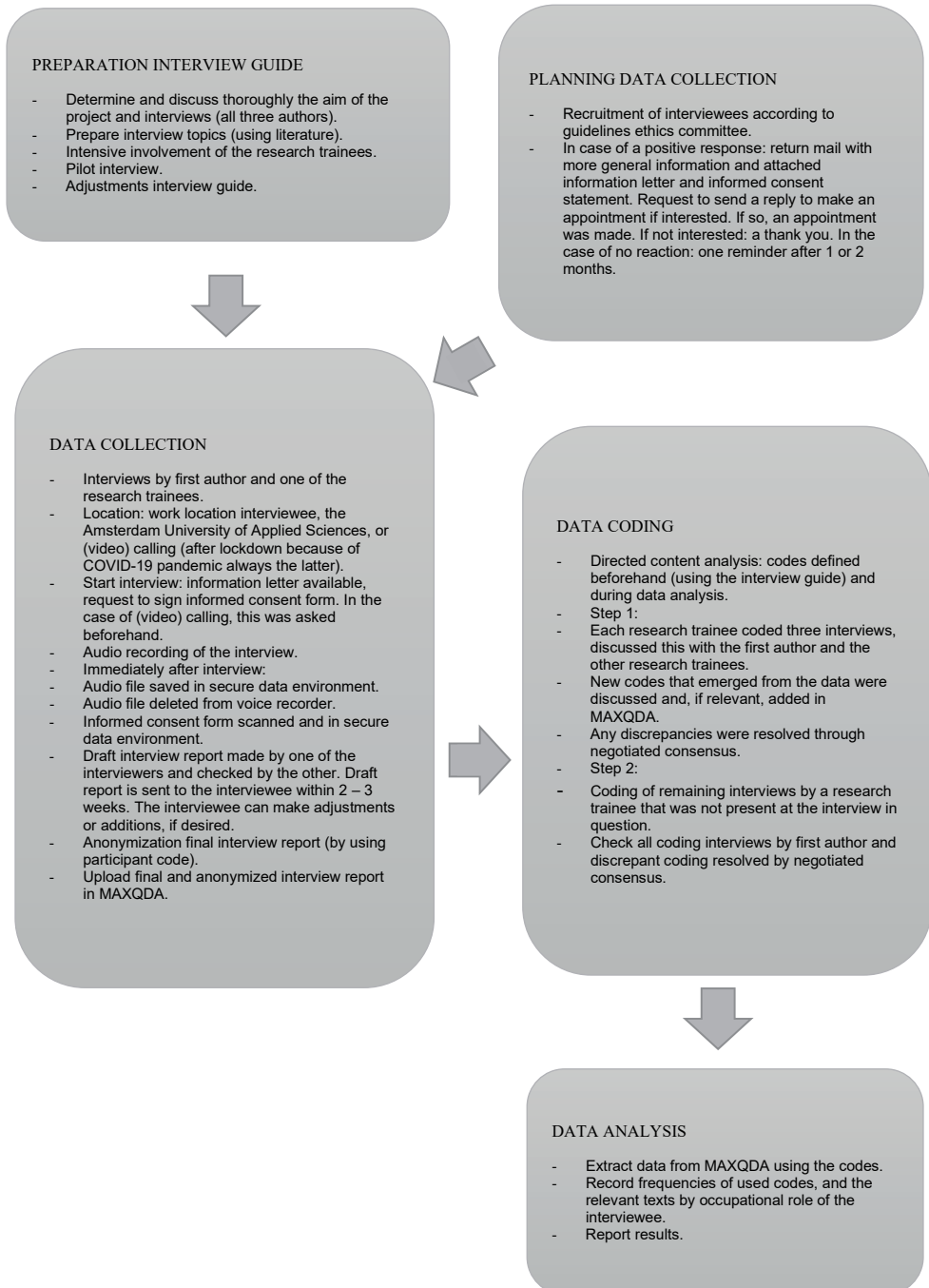
- To what extent can tasks and functions be customized? Willingness employers?
- What is being used in practice for interventions? Experiences?

Completion

- Any other questions/comments/topics?

Additional file 2.

Research methodology. Late effects of cancer (treatment) and work ability: guidance by managers and professionals.



CHAPTER 7



General discussion



General Discussion

The aim of this PhD project was to identify targets for interventions to preserve and enhance the work functioning of workers two to ten years past cancer diagnosis experiencing higher levels of late effects of cancer treatments. Work functioning was operationalised as work ability and burnout complaints.

The late effects consist of three self-reported types of complaints, i.e., physical complaints, fatigue and cognitive complaints. These are the most common late effects directly linked to cancer treatments, which are attracting the attention of researchers today, with cognitive complaints especially during the last decade.

Although the fear of cancer recurrence and a possible different view to life were also mentioned as possible late effects of the cancer diagnosis within the interview study (chapter 6), the other studies within this PhD project did not focus on these effects, because they are not considered long-term direct side effects of the cancer treatment itself, but possible effects of the life event of getting cancer.

Furthermore, several so-called job resources, which are part of the well-known JD-R model (Bakker & Demerouti, 2007; Demerouti et al., 2001) were studied to identify possible targets for interventions in the workplace in order to enhance higher work ability and to prevent burnout complaints among these workers. The focus was mainly on three specific job resources, that can be influenced effectively in the workplace because they concern behaviour within work teams and can be influenced in the workplace itself. The three job resources this PhD project discusses are autonomy, social support from colleagues, and a supportive leadership style. The latter two job resources can also be referred to as support at work.

Not only those who are active in the labour market more than two years past cancer diagnosis, but also managers and professionals who offer these workers guidance, regard the issue of this PhD project very important. This was apparent during the explorations before this PhD project started, and also became clear as many professionals, workers past cancer diagnosis and other stakeholders supported this PhD project not only by expressing their support in words, but also by helping to recruit overwhelming numbers of participants. Moreover, the prize of the Dutch Association of Cancer Patient Organizations at the end of 2018 was a sign of encouragement for this PhD project, focusing on longitudinal research into late effects after cancer treatment and work functioning. It became clear that this topic had not received much research attention before compared to the number of studies focusing on the first two years after cancer diagnosis.

This PhD project provides answers to five sub-questions, which were investigated in five papers, that were accepted for publication in international peer-reviewed journals. First, this final chapter will briefly present the main findings on each of these five sub-questions. Second, an integration of the findings is presented in more detail and discussed. Third, methodological issues will be reflected upon. Fourth, implications for

further research and practice will be brought forward. Finally, an overall conclusion will be presented.

Main findings: sub-questions

Sub-question 1: What is the current state of knowledge about the association between possible late effects of cancer treatment (physical complaints, fatigue or cognitive complaints) and work functioning in workers, more than two years after the cancer diagnosis, who returned to work, and about the possible buffering by job resources of this assumed association? This question was answered by a systematic literature review in **Chapter 2**, including 36 quantitative studies (Boelhouwer et al., 2021b). These studies investigated workers, who had been diagnosed with cancer, regardless of how long ago. Longitudinal analyses on the course of work ability all concerned the first two years after diagnosis and indicated that an initial decline in work ability was followed by a recovery, but work ability may still be lower than among healthy workers. None of the studies beyond the first two years after cancer diagnosis offered longitudinally data on work ability. The included studies reported several cross-sectional associations of late physical complaints, fatigue, or cognitive complaints with lower work ability of workers more than two years past cancer diagnosis. Furthermore, although social support by colleagues or by the supervisor and autonomy were cross-sectionally associated with higher work ability, no analyses were found about a possible moderating effect of these job resources on the relationship between late effects and work ability.

Sub-question 2: What is the influence of mental and/or physical chronic diseases on occupational well-being and do job resources buffer this presumed relationship? This question was answered by a quantitative cross-sectional study among employees ($N = 1951$) in educational and (semi-) governmental organisations in the Netherlands in **Chapter 3** (Boelhouwer et al., 2020). The effect of chronic diseases (i.e., only physical, only mental, or both physical and mental) on occupational well-being (including work ability and burnout complaints) was studied, as well as the effect of job resources (amongst others autonomy, social support by colleagues, and supportive leadership style) on occupational well-being and on the presumed relationship of each of these three chronic disease groups with occupational well-being. Each chronic disease group was associated with a lower work ability. However, higher burnout complaints were only predicted by the two groups with mental chronic diseases (with or without physical chronic conditions), and not by the group with exclusive physical chronic diseases. Furthermore, all three above mentioned job resources predicted lower burnout complaints, while higher work ability was only predicted by autonomy and a supportive leadership style, and not by social support from colleagues. Autonomy buffered the relationship between the chronic disease groups with mental conditions and lower work ability, and the relationship between the group with both physical and mental chronic disease(s) and higher burnout complaints. Furthermore, a supportive leadership style was of less benefit for occupational well-being among the employees with mental chronic diseases (with or without physical chronic diseases) compared to the group of employees without chronic diseases. No buffering was found for social support by colleagues.

Sub-question 3: What is the impact of late treatment effects (physical complaints, fatigue and cognitive complaints) and of job resources (autonomy, supportive leadership style, and colleagues' social support) on future work ability of employees living two to ten years beyond a breast cancer diagnosis? This question was answered by a quantitative longitudinal study among the population of workers with salaried employment (and no self-employment) living two to ten years beyond a breast cancer diagnosis ($N = 287$) in **Chapter 4** (Boelhouwer et al., 2022c). This study showed that higher levels of fatigue and cognitive complaints at baseline (the first questionnaire) predicted lower future work ability. The bivariate correlation of physical complaints and lower future work ability (a second questionnaire, 9 months later) was significant, but less strong than the correlation of fatigue or cognitive complaints with lower future work ability. Higher levels of autonomy, supportive leadership style, and colleagues' social support did not predict higher future work ability. However, cross-sectional associations of the job resources with higher work ability were reported, suggesting that a positive effect possibly only lasts for a short time, so these job resources may need more attention continuously. Among participants with average or high levels of physical complaints, there was no difference in future work ability between medium and high autonomy. However, future work ability was remarkably lower when autonomy was low. No other moderation by the job resources was found.

Sub-question 4: To what extent do the late effects of cancer treatment (physical complaints, fatigue, and cognitive complaints) and job resources (autonomy and supportive leadership style) have effect on future burnout complaints among employees with a breast cancer diagnosis two to ten years ago? This question was also answered by a quantitative longitudinal study among the earlier described population ($N = 287$) in **Chapter 5** (Boelhouwer et al., 2022b). A higher level of fatigue and cognitive complaints at baseline (the first questionnaire) resulted in higher future burnout complaints (a second questionnaire, 9 months later), with partial mediation by baseline burnout complaints. No significant effect of physical complaints was observed; however, this was a result of the stronger correlation of fatigue or cognitive complaints with lower future work ability. Higher levels of autonomy or a supportive leadership style resulted in lower burnout complaints, with full mediation by baseline burnout complaints. No moderation was observed by supportive leadership; however, more autonomy buffered the negative relationship between cognitive complaints and future burnout complaints.

Sub-question 5: What are the experiences and ideas of managers and professionals about the guidance of workers in the case of late effects of cancer (treatment) and what is their idea regarding the effect of autonomy, social support by colleagues, supportive leadership style and an open organisational culture? These questions were investigated with a qualitative survey design, in which semi-structured interviews were conducted with managers ($N = 11$) and professionals ($N = 47$). The results of this study were presented in **Chapter 6** (Boelhouwer et al., 2021a). The late effects discussed in depth during the interviews were mostly physical problems, fatigue, and cognitive problems. Especially with respect to cognitive problems and fatigue, guidance sometimes turned out to be complicated. Autonomy was regarded as an important factor in general and the need for tailor made interventions was expressed. Also, for instance the issue of anxiety of cancer

recurrence or a different view to life was repeatedly raised, as well as the problems the self-employed face in finding (affordable) support or guidance.

Integration of findings and discussion: late effects of cancer treatments and work functioning

The possible late effects for which the association with work functioning was studied were self-reported physical complaints, fatigue and cognitive complaints. It may be difficult for people to know whether a particular complaint is entirely caused by the cancer treatments, but the data collection within this PhD project has used questions about complaints, that are known to be caused by or aggravated by cancer treatments.

To begin with, it is important to mention that the scores on the late effects were observed to be moderately interrelated (chapters 4 and 5). More specifically, physical complaints, fatigue and cognitive complaints showed significant cross-sectional positive bivariate associations with each other. The data also showed that fatigue was more strongly associated with lower work ability and with higher burnout complaints, than cognitive complaints and subsequently physical complaints did. Physical complaints showed the least strong cross-sectional association with lower work ability and higher burnout complaints. The results below will therefore start with fatigue, then cognitive complaints, and finally physical complaints.

First, fatigue is reported to be a common experienced late effect of cancer treatments already since several decennia (Glaus, 1993; Jacobsen et al., 1999; Prue et al., 2006; Reinertsen et al., 2010; Smets et al., 1993; Wagner & Cella, 2004), however underreported for instance in the setting of general practitioners (Heins et al., 2022). Nevertheless, fatigue is associated with lower work ability in the studies included in the systematic literature review, however regarding the population more than two years past cancer diagnosis this concerned cross-sectional data (chapter 2). The results were in line with the cross-sectional descriptive results within the sub-study in this PhD project focusing on work ability (chapter 4). In one of the case-control studies included in the systematic literature review, the association with lower work ability was even reported to be stronger among cancer survivors than among healthy controls (Carlsen et al., 2013). In other words, the predominant conclusion from the quantitative data is that higher levels of fatigue show bivariate associations with poorer work ability, possibly even stronger than among the population without a past cancer diagnosis. Furthermore, the results of the sub-study concerning burnout complaints point in the same direction (chapter 5), as the late effects are observed to be associated with higher burnout complaints, also an indication of poorer work functioning. No previous studies were found on this issue. However, it is reported that the characteristics of fatigue, chronic fatigue syndrome and burnout seem to overlap (Huibers et al., 2003; Leone et al., 2008, 2011).

The above-described results were illustrated by the information shared in the interview study (chapter 6). Fatigue among workers past cancer diagnoses was regarded as a common occurring late effect after cancer treatments, that occurs quite unpredictably

in those, who have been treated for cancer. Hence, it was reported to be associated with lower work ability. Also, it was put forward that burnout complaints may be difficult to distinguish from fatigue because of cancer treatments.

As far as known, there are no previous publications on research into the possible longitudinal effect of late effects of cancer treatments on future work ability or burnout symptoms. This PhD thesis reports on such analyses among employees two to ten years past breast cancer diagnosis. The longitudinal analyses show that fatigue has a lowering effect on future work ability (chapter 4), and an increasing effect on future burnout complaints (chapter 5). Although there are more analyses possible using the collected data, such as among workers with other diagnoses, or among the self-employed, it can be said that fatigue has a more negative impact on future work functioning than cognitive and physical complaints. This implies that fatigue should absolutely not be ignored, also in view of work functioning. It is important to note that this cancer-treatment-related fatigue was not always understood by the work environment (chapter 6), so the role of the professionals, like the occupational physician, can be important to create understanding in the work environment for a worker, who copes with fatigue as a late effect of cancer treatments.

A difficult issue is that fatigue can be experienced very differently. In this PhD project the subscale 'subjective fatigue' of the Checklist Individual Strength (CIS) was used (Vercoulen et al., 1999; Vercoulen et al., 1994). The items focus on physical fatigue and, for example, not on attentional fatigue. This was done deliberately to avoid overlap with cognitive complaints. For this reason, in the systematic literature review within this PhD project (chapter 2), attentional fatigue is regarded in one of the included studies (Von Ah et al., 2017) as a cognitive complaint.

The second type of late effects of cancer treatments discussed here are cognitive complaints, such as difficulty concentrating or difficulty retrieving information. This topic is receiving increasing research attention in recent years, both in terms of possible impairments identified through neuropsychological testing and in terms of self-reported cognitive complaints. Previous interview studies reported that workers past cancer diagnosis experience cognitive complaints as hindering work functioning (Munir et al., 2010). Cognitive complaints were also discussed in the interview sub-study of this PhD project with the professional's guiding workers and also described as affecting functioning at work (chapter 6). Moreover, it was put forward that cognitive complaints appeared to be related to fatigue and that both late effects of cancer treatments can be part of the clinical presentation that may resemble burnout complaints.

The quantitative association of cognitive complaints with work ability among workers longer than two years past cancer diagnosis was only studied in a few studies before (chapter 2). The relevant cross-sectional data indicate that cognitive complaints are associated with poorer work ability. This was confirmed by the cross-sectional descriptive results within the relevant sub-studies in this PhD project, as higher levels of cognitive complaints were associated with lower work ability (chapter 4). Moreover, higher levels of cognitive complaints were also associated with higher burnout complaints (chapter

5). However, among the population of workers, who have undergone cancer treatments, no previous research is known about the relationship between cognitive complaints and burnout complaints. Nevertheless, it is known that among the general population specific cognitive deficits, in particular in the area of executive functions, attention and memory, are reported to be connected to burnout (Deligkaris et al., 2014).

Furthermore, within this PhD project in the sub-studies among employees two to ten years past a breast cancer diagnosis, it was found that cognitive complaints have a longitudinal lowering effect on future work ability and an increasing effect on future burnout complaints (chapters 4 and 5). This is remarkable, as fatigue and physical complaints were included in the same step in the regression analyses, which shows that cognitive complaints have a significant effect independent of the associations with these other two late effects. Apart from this, it is not clear to what extent the effect of higher levels of cognitive complaints may also depend on, for instance, more complex tasks, or maybe only routine tasks.

In the interview study (chapter 6) cognitive complaints were reported not to be clearly visible by others, therefore stressing the importance of sharing these complaints with others in the workplace. However, workers past cancer diagnosis sometimes experience a sensitivity to stimuli, being unable to work in an open-plan office or not being able to multitask well, without realizing that such complaints can in fact be symptoms of cognitive complaints. This is a complicated issue, as research has shown that informing patients about possible cognitive side effects of chemotherapy may increase their occurrence, especially among individuals vulnerable to patient stereotypes (Jacobs et al., 2017). Furthermore, hidden cognitive complaints may pose a real danger in some work situations, for example, for drivers in passenger transport, who must be able to react very quickly while customers also demand their attention. Therefore, it is important to be aware of any possible late cognitive effects of cancer treatments on work functioning. Hence, to share any experienced cognitive complaints a psychologically safe situation within the context of work is needed (chapter 6). The subject of disclosure with regard to late effects in general will be discussed later.

The third type of late effects of cancer treatments discussed here are physical complaints. Physical complaints caused by cancer treatments may involve different kinds of problems, such as lymphedema (Cormier et al., 2010) or musculoskeletal impairment (Murphy & Deng, 2015). Several previous studies showed that physical late effects of cancer treatments may show associations with lower work ability beyond the first two years after a cancer diagnosis (chapter 2). Within the dataset collected during this PhD project, physical complaints among employees past breast cancer diagnoses showed cross-sectional associations with lower work ability and higher burnout complaints, however the longitudinal effect of physical complaints was overshadowed by the effect of fatigue and of cognitive complaints (chapters 4 and 5). Nevertheless, the conclusion still is that physical complaints must be taken into account to assess how these affect work functioning of individual workers past cancer diagnosis and discuss an approach that helps to overcome any obstacles. Work tasks differ and certain physical complaints may form an obstacle to specific tasks. This has become clear in the interview study within this PhD project (chapter 6).

Furthermore, it should be mentioned that within this PhD project the level of physical complaints was assessed by a question about the severity of complaints (no, some or many complaints, respectively 0, 1 or 2 points) caused by ten possible conditions. These conditions were neuropathy, hormonal complaints, hot flushes, osteoporosis, heart complaints (due to cancer treatment), scar adhesions, joint pain, lymphedema, lung problems, and bowel and / or bladder problems. For the level of physical complaints, the total score (0 to 20) was used. This means that an identical score between individuals may concern different profiles in view of the number of reported conditions that generate some or many complaints. Hence, no information is available on the experience of any work handicaps, nor on the type of tasks or jobs. However, it is important to know whether a complaint is experienced as a work handicap, as this is reported to result in different working outcomes among employees with chronic health complaints than when a complaint is not experienced as a work handicap (Steenbeek et al., 2009). Furthermore, it is also possible that the workers past cancer diagnosis, who experienced a work handicap relatively shortly after the cancer diagnosis have already been transferred to another job or are not in paid work anymore.

Moreover, it is important to mention that in the sub-study among workers with chronic diseases (chapter 3), the group with exclusive physical chronic diseases(s) was associated with lower work ability. This underscores that physical complaints may be a point of attention among workers past cancer diagnosis as well in view to their work ability. Unfortunately, within this sub-study, it turned out that only few workers with a cancer history were part of the study sample, and therefore separate regression analyses for this group were not possible. Therefore, a past cancer diagnosis was classified as a physical disease. However, the group with a cancer history is reported to be confronted more often with mental issues, for instance depression, compared to the healthy population (Dauchy et al., 2013). It is important to realize that important symptoms of a depressive disorder are fatigue (Demyttenaere et al., 2005) and cognitive deficits, especially poor response inhibition. These may be persistent features of some forms of major depressive disorder (Bora et al., 2013). As fatigue and cognitive complaints may also be late effects of cancer treatments, some clinical profiles are difficult to disentangle. This may also affect the classification in mental chronic diseases, physical chronic diseases and a combination of mental and physical chronic diseases, as was done in the sub-study among workers with chronic diseases (chapter 3). Since this PhD project did not work with profiles, that would include combinations of late effects taking interrelations into account, these results are difficult to compare. As indicated earlier, fatigue and cognitive complaints can occur at the same time and also influence each other. The number of people, who have or have had cancer in the past suffering 'a lot' from cognitive complaints or from fatigue is significantly higher than in the general population (IKNL, 2019), and these data show that the differences between patients and the general population concerning cognitive complaints are most profound in younger patients (<35-65 years) reporting even more cognitive complaints than people aged 66-75 without a past cancer diagnosis (IKNL, 2019). This shows that there may be certain profiles with specific patterns among the working age group. Future research may clarify this, and specifically to what extent it is important to take such possible profiles into account in the guidance of workers, who have had cancer in the past. These insights will

help the guidance to focus on what offers the best chance of preserving and enhancing work functioning.

Finally, an issue that can apply to all three possible late effects of cancer treatments discussed above, is that these may be regarded as so-called hidden impairments. The invisibility for others may be related to the severity of the symptoms and the circumstances, such as the work tasks. Furthermore, it is possible that the worker has not shared these complaints with the supervisor or manager and/or colleagues. However, even if the past cancer diagnosis is known to them, it is questionable to what extent the work environment knows about certain complaints and even if the complaints are known, it may be difficult to see what these complaints really mean at work. On the other hand, not all workers with hidden impairments need work accommodations (Prince, 2017). However, to be able to find solutions when late effects of cancer treatments are affecting work functioning, disclosure may be very helpful. An important factor is the extent to which a worker dares to disclose, therewith not presenting the complaints as less severe. In addition, it underscores the importance that a worker can feel the psychological safety within the organization to share this personal information, without being confronted with the possible disadvantages such as to be placed in a dead-end job or to be treated differently than other employees (Prince, 2017). With regard to psychological disorders, for example, it is known that disclosure can lead to disadvantages, namely discrimination and stigma. This may subsequently create social distance or yield disrespect from others at work, lower performance expectations of the employee and cause low efforts of work related support (Brouwers et al., 2019). It is indicated that organizational support is necessary, and also positive feedback and social support when a possibly stigmatized identity is first disclosed (Chaudoir & Quinn, 2010). The importance of an open and communicative culture and psychological safety was also endorsed in the interviews, linked to the approach of human resource management in organizations. While some organizations have policies to encourage openness, in other organizations workers with a cancer history will be reluctant to share late effects of cancer treatments out of fear of losing their leadership position or even their job (chapter 6).

Integration of findings and discussion: the role of job resources

This PhD project mainly focused on three job resources; autonomy, social support from colleagues, and a supportive leadership style. The latter two job resources are also referred to as support at work. The impression is that the studies within this PhD project based on the data collection among workers two to ten years past cancer diagnosis (chapters 4 and 5), are the first to longitudinally investigate the effect of job resources on future work functioning among this population. In this PhD project the possible buffering by the job resources was also studied. The results on the job resources are described below in two sections; first autonomy, and second support at work.

Autonomy

In the systematic literature review, that focused on associations with work ability, no studies explicitly focused on autonomy, however few studies focused on concepts related to autonomy, namely decision latitude and control (chapter 2). These variables were found to have a positive association with current work ability. The same result was found for autonomy in the quantitative studies presented in this PhD thesis (chapters 3 and 4). This is in line with previous research in other populations than workers past cancer diagnosis (Brady et al., 2019). In another phase during this PhD project, in the context of answering the research questions with regard to burnout complaints, an additional literature search was conducted into possible connections of autonomy with burnout complaints within the population of workers past cancer diagnosis, but no previous studies were found.

The quantitative sub-studies in this PhD project (chapters 3, 4 and 5) have conceptualised and measured autonomy as the perception of the workers to what extent it is possible to make their own decisions about how the work is carried out and the work pace. Also the perceived opportunities to solve work problems was measured. However, this is only one way to operationalise autonomy, and when interpreting results of studies it is important how job autonomy is assessed and also experienced, which can vary between beneficial and deleterious (Kubicek et al., 2017). Therefore, it is important to indicate that this PhD project assessed autonomy as the self-reported experienced possibilities to take autonomy, and not the need for autonomy or to actually act autonomously. It is important to realize that autonomy can be operationalized in these different ways (Van Dorssen-Boog et al., 2020).

During the interviews with supervisors and professionals, when autonomy was discussed in depth, autonomy was clearly regarded as very important for workers, who were confronted with a cancer diagnosis in the past (chapter 6). However, the possibilities to generate more autonomy were also believed to depend on work related factors, like the extent to which the work content allows for variation or on the hierarchal position of the worker. The solutions, that were found can be characterized as the autonomy to create accommodative measures, like taking a rest or adjusting working times. A warning expressed during the interviews was that workers should not have a job below their intellectual level, as this takes a lot of energy and causes under-stimulation and even less autonomy in the future. Therefore, switching to a job at a lower function level can be a pitfall, and tailor-made measures explored together with the worker are important.

The quantitative study about the effect of chronic diseases in general on job functioning (chapter 3) showed that autonomy was associated with higher work ability and with lower burnout complaints. Furthermore, autonomy buffered the relationship of the group with mental chronic diseases and lower work ability. Autonomy also buffered the relationship of the group with physical and mental chronic disease(s) with higher burnout complaints. In short, the positive influence of autonomy, with buffering effects as well, became clear in this study. However, this study was not specifically targeted at the group of workers past cancer diagnosis. The quantitative studies, that were specifically aimed at women with a past breast cancer diagnosis showed that higher

autonomy was cross-sectionally associated with higher work ability (chapter 4) and with lower burnout complaints (chapter 5). However, autonomy did not predict higher future work ability or lower future burnout complaints. Considering these results, it can be said that although autonomy shows positive cross-sectional associations with better current work functioning, the effect does not last in the future. Autonomy probably needs continuous attention.

Furthermore, two very interesting results concerning moderation by autonomy were reported. First, autonomy buffered the relationship of cognitive complaints with future burnout complaints among employees two to ten years past breast cancer diagnosis (chapter 5). This implies that more autonomy could be helpful in reducing possible future burnout complaints in the case of higher levels of cognitive complaints. Second, participants with average and high levels of physical complaints and low autonomy experienced a level of future work ability that was much lower than when autonomy was at a medium level. Furthermore, participants with average and high levels of physical complaints and high autonomy experienced a level of future work ability similar to when autonomy was at medium level (chapter 4). So, with higher levels of physical complaints autonomy is needed, and it should not be too low and not too high. With autonomy at a high level employees may be at risk of overburdening and perhaps these employees proceed too far beyond their limits when experiencing more autonomy. These results concerning autonomy also imply that, when someone has both physical and cognitive complaints, it is important to carefully monitor the level of autonomy needed and offered. Tailor-made advice is particularly necessary in these situations, as the notion that more autonomy will always be beneficial in view of higher work ability or lower burnout complaints may be a misconception. Also, studies among other populations reported unexpected results for autonomy. For instance, a longitudinal three-wave study in the Netherlands among a large heterogeneous sample of employees, reported that high autonomy was a risk factor for worse work outcomes among employees with a work handicap. Therefore, it is put forward that employees, who experience a work disability can respond differently to autonomy (Steenbeek et al., 2009).

Support at work: social support by colleagues and a supportive leadership style

Support at work may involve social support from colleagues and a supportive leadership style. Social support at work is a construct of interest because its beneficial effects within the general working population on the quality of the relationships in the workplace and the potential to enhance work ability (Brady et al., 2019) and to reduce burnout symptoms (Maslach, 2001). However, many studies lack conceptual clarity and there is no generally accepted way to measure social support at work (Jolly et al., 2021). This makes comparability between studies difficult. Within this PhD project a distinction is made between social support by colleagues and a supportive leadership style by the supervisor or manager. Of course a supervisor may be also acting as a co-worker, or that a colleague has managerial responsibilities too. Therefore, both types of support involve experiencing social support, receiving appreciation and feedback. First, social support by colleagues will be discussed below, and afterwards the supportive leadership style of the supervisor or manager.

Social support by colleagues has been researched among populations of workers past cancer diagnosis in several previous studies. The systematic literature review indicated that social support by colleagues was reported to be cross-sectionally associated with positive outcomes regarding the level of work ability in six previous studies (chapter 2). The positive results are in line with previous findings among healthy populations, for instance hospital nurses (Olsen et al., 2017). No data on the role of social support by colleagues could be found concerning burnout complaints among workers past cancer diagnosis, but there is consistent evidence that a lack of social support is linked to burnout in various other populations (Maslach et al., 2001). Also, the interviews with supervisors and professionals indicated that social support by colleagues may be important and beneficial for work functioning beyond return to work, in other words not only while undergoing primary cancer treatments or shortly thereafter, but also the long term (chapter 6). Among the study population of workers with chronic conditions social support by colleagues was observed to be cross-sectionally associated with lower current burnout complaints, however it was not associated with current work ability (chapter 3).

The lack of support from supervisors is reported to be more detrimental in relation to burnout complaints than a lack of support from co-workers (Maslach et al., 2001), which was the reason to exclusively focus on the support by the supervisor or manager in the sub-study concerning burnout complaints (chapter 5). Therefore, in the quantitative sub-studies among employees, who were confronted with breast cancer two to ten years ago, social support by colleagues was only included in the sub-study investigating the effects on work ability (study 4). The results of this sub-study show that colleagues' social support did not predict higher future work ability, although cross-sectionally there was a positive association. This suggests that a positive effect possibly only lasts for a short time, which may mean that the social support from colleagues is continuously important. Moreover, with a high turnover of personnel, it is conceivable that colleagues as a group change quickly and yield different interaction and collaboration patterns in teams, making it difficult to investigate the effect on the long term. It is also unclear to what extent, for example, the organisational climate or the exemplary behaviour of a manager can be additional factors influencing effective social support by co-workers. Incidentally, it was stated in the interview study (chapter 6) that good relations with colleagues at work before a cancer diagnosis is very important, because these relations are a good basis for mutual contact shortly after cancer diagnosis and also pay off in the long run.

Leadership style was not reported in the systematic literature review because it was not studied in any of the included studies (chapter 2). However, the importance of supportive leadership has been brought forward and endorsed many times in the interview-study (chapter 6). Of course, it is important to bear in mind that the interview participants must have been a specific group given their willingness to participate in the interview study. Moreover, it was brought forward that work adjustments must be tailor-made and the result of dialogue between the worker and the employer (chapter 6). This obviously requires a certain behavioral style to approach the worker, like being able to enter into a positive dialogue.

In the cross-sectional study among the population employees with chronic mental and/or physical conditions, a supportive leadership style was associated with higher work ability and lower burnout complaints (chapter 3). In this study a supportive leadership style also significantly negatively moderated the relationship between the group with mental chronic disease(s) and work ability, so even lower work ability was observed with higher levels of support by the manager or supervisor. It could be that a subgroup of workers with severe mental problems generate more involvement of a supervisor, however predominantly as a reaction on the severe mental problems and therefore beyond some unknown point of beneficial effects of supportive leadership. However, this is just a hypothesis and cannot be proven with these data. Furthermore, these results among workers with chronic diseases in general are difficult to project on the group of workers past cancer diagnosis, as there may be different combinations of physical and mental problems possible among the latter population, apart from possible fundamental differences in disease perception and possible other late effects, like the possible anxiety for cancer recurrence.

The quantitative studies among employees two to ten years past a breast cancer diagnosis showed that higher levels of a supportive leadership style did not predict higher future work ability (chapter 4), nor lower future burnout complaints (chapter 5). Moreover, no moderation by supportive leadership was observed within these two studies. This suggests that among this population the beneficial effect of a supportive leadership style on work ability and burnout complaints may also be short term at the most.

In summary, it can be said that the effect of a supportive leadership style on work functioning has only scarcely been researched among workers more than two years beyond cancer diagnosis. The available results do not offer a clear view, although the results suggest that a possible beneficial effect of a supportive leadership style on work functioning probably needs continuous attention, which may be difficult when managers or supervisors change jobs and a successor is unaware of an employee's cancer history. Nevertheless, a supportive leadership style may be important as the same relevant skills are needed to be able to engage in a dialogue with the worker. It was also pointed out in the interviews that workers past cancer diagnosis appear to be highly motivated. It is of course also conceivable that given this positive appearance, a conversation about obstacles arises less automatically, once more indicating that an open and supporting approach of a supervisor is very important and should be pursued, assuming that the workplace and the organisation offer a psychologically safe work environment.

The overall conclusion is that all three job resources show positive associations with the current work functioning of workers, who were confronted with a cancer diagnosis more than two years ago and may now be coping with the late effects of cancer treatments. The importance of the job resources for work functioning was also brought forward in the interview study by managers and professionals. However, no direct effects of job resources on future work functioning were found among employees past breast cancer diagnoses. Nevertheless, the results on moderation by autonomy require attention

and customisation, since higher levels of autonomy play a buffering role in cognitive complaints with regard to future burnout complaints, but should not be too high in cases of high levels of physical complaints in order to preserve or enhance future work ability.

Methodological issues

Several methodological issues deserve attention and are discussed below.

First, it is important to emphasise that the collected survey data among employees with chronic diseases (chapter 3) and with a past cancer diagnosis (chapters 4 and 5) are not representative for the populations in concern in the Netherlands. The recruitment within this PhD project (studies 4 and 5) using social media meant that anyone, who wanted to participate could do so, and although the number of participants was higher than hoped for, the percentage of women with a breast cancer diagnosis was higher (72% in the first questionnaire) than within the entire working population in the Netherlands. We do know from the results of the systematic literature review done within this PhD project (Boelhouwer et al., 2021b), that the level of work ability among women, who have had breast cancer is lower than among the relatively younger men who had testicular cancer on one hand, and is higher than among the on average older men with a prostate cancer diagnosis on the other hand (Lindbohm et al., 2012). The same risk of bias applies to the numbers of workers with recurrence or distant metastasis. This concerned about 5% of the participants within the study-sample, however it is unknown how high this percentage is among Dutch employees two to ten years past breast cancer diagnosis. Furthermore, the group of participating workers was relatively highly educated. It is unknown to what extent this is comparable with those in work two to ten years after cancer diagnosis in the Netherlands, but since only few participants had exclusively physical work tasks, this may also have led to a bias in the relationships studied. Furthermore, it turned out that mainly salaried workers took part, although the group of self-employed persons was considerable (a publication about this group is under review and not included in this PhD thesis). Also, within the systematic literature review 13 of the 36 studies were reported to have included self-employed workers, however data separately for this group could not be found. Furthermore, the sub-study among workers with physical and/or mental chronic diseases concerned exclusively salaried workers.

Second, the participants for the interview study were also recruited in a way that could have caused a bias because the participation already made clear these interviewees were interested in the aim of the study. However, given the aim of the sub-studies the self-selection by the participants was not a problem, nevertheless it is important to also report this here once more.

Third, regarding the physical complaints, fatigue and cognitive complaints, it is never possible to state with certainty that the reported complaints were actually late effects of the cancer treatments. For instance fatigue is associated with several chronic conditions, and fatigue may be partly explained by psychological distress (Franssen et al., 2003).

In the case someone with a cancer history and with comorbid diseases suffers from fatigue, the cause of the fatigue may be unclear, however, this does not make the need to pay attention to these complaints any less. In addition, it is also possible that late effects of cancer treatments have been missed, because not everyone will report existing impairments or workers may not realise that certain complaints are caused by the cancer treatment. Cardiovascular risks, including heart disease, for example, may be a late effect of for instance radiotherapy and chemotherapy (Totzeck et al., 2019), but also of treatments with trastuzumab (monoclonal antibodies) for some types of breast cancer (Genuino et al., 2019), which is possible not generally known.

Fourth, there were only few previous studies to which comparisons could be made with results concerning workers more than two years past cancer diagnosis. No previous longitudinal studies were available regarding work ability and no previous studies at all concerning burnout complaints. However, this also indicates that this PhD project is quite unique. Longitudinal analyses of the impact of late effects of cancer treatments on work ability and burnout complaints have never been performed before, and the role of a number of job resources has also been analysed. Much more research should be done on targets for interventions, which can be used in the workplace to preserve and enhance work functioning among workers confronted with possible late effects of cancer treatments.

Implications for practice and suggestions for further research

To summarise, workers experiencing higher levels of fatigue and cognitive complaints report lower future work ability and higher future burnout complaints. Physical complaints also have an effect; however, not significant in combination with the stronger effects of fatigue and cognitive complaints. Furthermore, the late effects may be interrelated in different profiles or complaint patterns. This has not been studied in this PhD project, while it is very conceivable that these profiles or patterns exist. For instance, fatigue and cognitive complaints may be related and some people may experience both complaints, while others do not. This is something that should be addressed in further research. Certain subgroups may be extra vulnerable and it is also conceivable that interventions should be tailored to the level of energy one has and to the cognitive skills at that moment. It could therefore be important to discover any subgroups with different late-effect-profiles within the group of participants and hence be able to provide tailor-made interventions specifically for certain profiles for use in the professional practice and in the workplace. This has not yet been addressed in this PhD project, but is a desirable follow-up study with the data already collected and subsequently to work out together with professionals and workers past cancer diagnosis.

The support of colleagues and supervisors seems important for current work functioning, but the effect is temporary and does not extend to future work functioning. Autonomy is probably important, especially in the case of cognitive complaints, but this job resource must be fine-tuned if higher levels of physical complaints exist. Moreover, workers themselves also have certain ideas of what is beneficial for their

work functioning and may indicate that vitalising measures are more motivating than accommodative measures, as was reported among other populations before. Accommodative measures can be experienced as taking tasks from workers away that they would rather have kept, while vitalising measures may give an extra impulse. Furthermore, listening to the worker and entering into dialogue is important to understand what job resources the worker needs in what way to enhance work functioning and to discuss what is possible in the workplace.

During the interviews with professionals, many specialists in this field appeared to be available, but the question is to what extent they have the opportunity to reach the workers in the workplace. It seems that only with a relapse or a clear problem, specialist help may be called in. Moreover, the question is to what extent human resource management is aware of the possibilities in the field of psycho-oncology. A general vitality program is not aimed specifically at this population of workers. Human resource management could play an important role in bridging the gap between the workplace and the professional field aimed at guiding workers with a past cancer diagnosis. Therefore, it is also recommended to conduct research within organisations using a dialogue between workers past cancer diagnosis and human resource management. Furthermore, human resource management needs more evidence-based knowledge on tools, in the case a supervisor, manager or an employee asks for advice. Hence, a more pro-active role may be pursued. Consequently, further research should be conducted also into other job resources, such as job crafting, specialised coaching or other targets for interventions, that can be possibly used within organisations.

For all professionals, and especially for those, who have little experience with workers, who have had cancer, it is important to be prepared by knowing about possible problems and be able to discuss these issues. Therefore, it is important to be always aware when a worker has been treated for cancer and may experience late effects of the treatments. This also means that comorbid chronic conditions must be known and the possibility that this is the case should be examined, which is possibly not always the case. Therefore, in such a situation the worker also needs to reflect upon the situation and should try to find out to what extent certain problems may be influenced by late effects on one hand or by work-related or other factors on the other hand. Of course, help will be needed in unravelling any problems, but this requires a way of thinking about the situation before and after cancer and this may be confronting. Furthermore, the guidance of workers with burnout complaints definitely caused by the work situation requires another approach than when fatigue or cognitive complaints resulting from cancer treatments cause clinical burnout complaints.

Advice can also be given to workers, who may experience late effects of cancer treatments. First of all, it is especially important to be aware that certain complaints may be related to the cancer treatments, even many years ago, and need attention. With professional help it is possible to view work and complaints in combination and to reduce the problems. In this way it can be prevented, for instance, that persistent fatigue caused by cancer treatments is labelled as a burnout. This is important because the worker needs to understand that the approach to enhance work functioning will

be different depending on the cause of the complaints. However, little may be known about this among managers, supervisors and human resource management, let alone about the ways and possibilities to approach the worker in concern and the work activities. Especially cognitive complaints and fatigue are complicated because of their invisibility for the environment. Therefore, to acknowledge that any late effects affect work functioning, the complaints should be shared. This is sometimes difficult because people may be afraid of discrimination or stigma. It is important for workers to know that an occupational physician has medical professional secrecy, so this may offer possibilities for guidance and support close the work situation without unwanted disclosure. Second, it is important to realise that solving things all by oneself does not always work best, because autonomy at work, for example, is something that can best be designed in consultation and dialogue and should not be too high not to lead to demands beyond the limits of the worker. Third, it is important for all workers past cancer diagnosis to know that many professionals, who are not affiliated with the employer can also offer guidance (Boelhouwer et al., 2021a). It may be necessary for the worker to take the initiative to find guidance and support if needed also with these professionals, like an occupational therapist or other specialised professional. Also support by informal care, like walk-in-centres offer, or support by the private environment, like family, partner and friends, may be important, as these possibly buffer the association of late effects with lower work functioning (Boelhouwer et al., 2022a). These types of support may also be needed by the self-employed. Additional analyses among this group of workers in the dataset used in this PhD project (however not published in this thesis), showed that those, who started with self-employment after the cancer diagnosis appeared to experience higher cognitive complaints than those, who were already self-employed at the time of the diagnosis or those, who were in paid employment and still are (Boelhouwer & Van Vuuren, 2022). So, many workers may need support from professionals and the informal network can also offer opportunities.

Apart from the suggestions for further research proposed before, the data collected by this PhD project offers several opportunities to answer additional questions, for instance, with a focus on the employed with recurrent cancer or metastasis (approximately 5% in the sample), or about the effect of other factors, like work-life balance, job crafting, etcetera.

Conclusion

To summarise, late effects of cancer treatments are associated with current work functioning, and fatigue and cognitive complaints in particular also are related to future work functioning. Job resources appear to have no direct effect on future work functioning, however autonomy requires customisation depending on the profile of the late effects present in an individual worker. Autonomy should not be too low, but in some situations it should not be too high either. An open dialogue is important, however the basic condition for this is an open and communicative organisational culture and therefore a certain level of psychological safety is needed.

This research entered a field about which little is known, namely late effects of cancer treatments that may affect work functioning, paired with investigating possible targets for interventions in the workplace. This research field, where psycho-oncology and work and organisational psychology meet, is a niche. An interdisciplinary approach is needed. Research questions should be defined in co-creation with the professional field, the workplace and the workers past cancer diagnosis themselves. The latter group is the main source of information and continuous dialogue with them is needed in order to provide solutions to be implemented in everyday working life.

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APPENDICES



Appendices



Summary

An estimated 5 percent of the workers in the Netherlands have been diagnosed with cancer in the past. Not so long ago, a cancer diagnosis meant that people would stop working immediately. Today, nearly three-quarters of the workers who get cancer, sooner or later, return to work. In addition, cancer diagnoses are more common among the entire population, which is mainly explained by population growth and the growing number of elderly people, who are at higher risk of developing cancer than younger people. On average the working population is aging due to a higher retirement age, which leads to an increasing number of cancer diagnoses within the group of workers. In addition, the survival rates for a number of common types of cancer have increased. An example is breast cancer, for which the average 5-year survival rate is now 88%. These developments together cause that the group of workers, who had to deal with a cancer diagnosis in the past has grown and is expected to increase in the future.

Unfortunately, little research is known about work functioning of those, who have been confronted with a cancer diagnosis in the past. Current research mainly focuses on the reintegration process, normally during the first two years after diagnosis. This PhD research focuses specifically on the period from two years until ten years after cancer diagnosis and after the workers returned to work.

Getting cancer can be a life-changing experience, which may cause psychosocial effects in the long term, such as the fear of cancer recurrence. The treatments are intended to cure or suppress the disease, but may have unintended effects in the long term, that can affect functioning at work. The possible association between these so-called late effects of cancer treatments and the current and future functioning at work is the focus of this PhD research. Subsequently, opportunities in the work environment are investigated, which could support and enhance the functioning in work of people two to ten years past cancer diagnosis.

This PhD research focuses on three types of late effects; physical complaints, fatigue and cognitive complaints. When physical late effects are considered, a wide range of complaints is apparent, like radiation therapy can cause long-term problems due to damage to, for example, the connective tissue or the heart. Operations can involve scarring (adhesion formation) or, for example, lymphedema because the lymph nodes have been removed. Antihormone therapy can cause osteoporosis or pain in the joints. Chemotherapy and immunotherapy can result in problems of the heart functioning. Besides physical complaints fatigue is a common late effect of cancer treatments. This fatigue is described as unpredictable and not related to the activities that have been performed, in any case very different from 'normal' fatigue, which healthy people experience after exercising. Also cognitive problems are a possible late consequence of the cancer treatments. These problems are increasingly focus of research. Chemotherapy may affect brain functioning, resulting in complaints like loss of concentration or memory problems. However, treatments with antihormones may also potentially have an influence on cognitive functioning. Cognitive problems can be investigated with neuropsychological research or can be reported by those, who suffer

from them, for example by questionnaire research. Fatigue and cognitive complaints can be related to each other, but also to other psychosocial factors. Fatigue can cause cognitive complaints, but the reverse can also occur. So when both fatigue and cognitive complaints occur, a possible mutual causal relationship must be investigated. This influences the targets for interventions to enhance functioning of the worker in concern, since the question is therefore whether attention should first be paid to cognitive complaints, fatigue or both.

As mentioned above, this PhD research investigates the association between physical complaints, fatigue and cognitive complaints on the one hand and work functioning on the other. With regard to work functioning work ability and burnout complaints are investigated. In addition, the question is what can help workers when late effects diminish work functioning. A number of resources in the work environment, that are derived from the Job-Demands Resources (JD-R) model are examined. Resources are factors, which are beneficial for functioning at work and concern – in addition to, for example, possible personal resources such as resilience – also factors, that can play a role in interactions and work processes in the workplace. This last group of resources is the focus of this PhD research. The choice was made for autonomy and support in the workplace (from colleagues and from supervisors or managers). The question is if these resources have a beneficial direct effect on work functioning and if these resources may have a buffering effect on the expected associations between chronic late effects and less favorable work functioning. Buffering would imply that these resources make the association between chronic late effects on the one hand and possibly reduced functioning in work on the other hand less strong, which is beneficial. The research obviously focuses on workers, who have been confronted with a cancer diagnosis in the past and are dealing with possible chronic late effects of cancer treatments. In addition, a sub-study was carried out among workers with mental and/or physical chronic conditions other than cancer.

Five questions have been investigated and answered in this PhD research:

Sub-question 1: What is the current state of knowledge about the association between possible late effects of cancer treatment (physical complaints, fatigue or cognitive complaints) and work ability in workers, more than two years after the cancer diagnosis, who returned to work, and about the possible buffering by job resources of this assumed association?

This question was answered by a systematic literature review. A number of studies showed that the work ability decreased in the first two years after diagnosis, but was followed by a recovery. Nevertheless, after two years, work ability was still lower than among healthy workers. No previous studies were found about the course of work ability past the first two years after diagnosis. However, studies were found that reported on various cross-sectional associations of late effects (physical complaints, fatigue or cognitive complaints) with work ability of workers, who were diagnosed with cancer more than two years ago. A lower working ability was observed with higher late effects.

Social support by colleagues or by the manager and autonomy were cross-sectionally associated with a higher work ability. No studies were found about a possible buffering effect of these resources on the relationship between late effects and work ability. Research into longitudinal effects, or effects over time, were also not found in the studies included in this systematic literature review.

Sub-question 2: What is the relationship between mental and/or physical chronic conditions at work functioning and do resources buffer this supposed association?

This sub-study among employees in educational and (semi-)government organizations in the Netherlands showed that all three groups (physical chronic disorders, mental chronic disorders, and both physical and mental disorders) are associated with a lower work ability. In general, higher burnout complaints were all found to be associated with mental chronic disorders (whether or not combined with physical chronic conditions), and not with exclusively physical chronic conditions. Higher autonomy and a supportive leadership style were related to a higher work ability. This did not apply to social support from colleagues. The three job resources were all related to fewer burnout complaints. Autonomy buffered the association between chronic mental disorders and lower work ability, and the association between the group with both physical and mental chronic conditions and more burnout complaints. A more supportive leadership style was associated with a less favorable relationship with functioning at work among the group employees with mental chronic diseases (with or without physical chronic conditions). Furthermore, no buffering was found for social support by colleagues.

Sub-question 3: What is the association of late effects of treatment (physical complaints, fatigue and cognitive complaints) and of resources at work (autonomy, supportive leadership style and social support from colleagues) with the future work ability of employees, who were confronted with a breast cancer diagnosis two to ten years ago?

This sub-study showed that higher levels of fatigue and cognitive complaints predicted lower future work ability (9 months later), taking into account the level of the individual work ability score on the first questionnaire. In addition to fatigue and cognitive complaints, physical complaints had no significant effect on future work ability. However, physical complaints were also associated with a lower future work ability and should not be ignored. Higher levels of autonomy, a supportive leadership style and social support from colleagues did not predict higher future work ability. However, a higher level of these resources was associated with a higher current working ability, suggesting that the beneficial effect may only last for a short time. In participants with average or many physical complaints, there was no difference in future work ability between average and high autonomy. However, future work ability was remarkably lower when autonomy was low. No moderation by the other resources was found in this sub-study.

Sub-question 4: To what extent do the late effects of cancer treatments (physical complaints, fatigue and cognitive complaints) and job resources (autonomy and supportive leadership style) have an association with future burnout complaints in employees with a breast cancer diagnosis two to ten years ago?

In this sub-study, it was found that a higher level of fatigue and cognitive complaints predicted higher future burnout complaints (9 months later), taking into account the individual initial score of burnout complaints on the first questionnaire. In addition to fatigue and cognitive complaints, no significant causal effect of physical complaints on future burnout complaints was observed, because the influence of fatigue and cognitive complaints was stronger. Higher levels of autonomy or a supportive leadership style had no direct effect on future burnout complaints but an association with current burnout complaints, which in turn were associated with future burnout complaints. No buffering was observed with regard to supportive leadership, but more autonomy did buffer the negative association between cognitive complaints and future burnout complaints. The latter had not been studied before and is a remarkable finding.

Sub-question 5: What are the experiences and ideas of managers and professionals about the guidance of employees with late effects of cancer (treatment) and what is their idea about the effect of autonomy, social support by colleagues and an open organizational culture?

In the interviews, the late effects of cancer treatments were discussed. Both the previously described physical complaints, fatigue and cognitive problems were recognized and considered as late effects, that were experienced during functioning at work. Some professionals reported that the willingness to share such complaints in the context of work requires an open and safe psychological climate, which unfortunately is not present in every organization or workplace. When the manager or human resource management is aware of cognitive problems and fatigue, guidance is sometimes complicated, due to the invisibility and complexity of the complaints and because ways to deal with them are not always known on the work floor and within work activities and require special customization. Some tasks can no longer be performed in the case of cognitive complaints, because of the associated risks. In those cases, it is necessary to be familiar with these complaints and the possible consequences during work. Specialized professional support is possible, but does not reach everyone, who needs it. Autonomy in work was generally considered an important factor and the need for tailor-made interventions was expressed. There were warnings with regard to workers taking a step back in job level, because this may involve the risk of less autonomy in the new work situation, which was considered disadvantageous. Also, the fear of cancer return or a different view on life were discussed in various interviews as a form of possible late effects of getting cancer, as well as the problems that self-employed people face. Many self-employed people are insufficiently insured and therefore have no opportunities to find (affordable) support or guidance.

General conclusions and recommendations

First of all, it is important to note that the complaints reported by the workers are not caused with certainty (only) by the cancer treatments. However, because previous research has shown that these complaints can be characterized as late effects, this PhD study has used the self-reporting of physical complaints, fatigue and cognitive complaints .

It was noticed that all three complaints show mutual associations, especially for fatigue and cognitive complaints, this is known from other research. During the interviews in this PhD research, it was pointed out that fatigue can be the cause of cognitive complaints and that cognitive complaints can cause fatigue. Furthermore, previous studies have shown that fatigue is a common late effect of cancer treatment and is associated with lower work ability, and that this association may even be slightly stronger among workers, who have faced cancer in the past than among other populations of workers. In the sub-studies based on the data collection in this PhD project among workers two to ten years after cancer diagnosis, fatigue and cognitive complaints are not only associated with a lower current work ability and higher current burnout complaints, but were also predictive of a lower future work ability and higher future burnout complaints. The importance of these results is that fatigue and cognitive complaints can not only be a hindrance in work functioning at the moment, but it affects future functioning in work as well. This shows the importance to take such complaints seriously. In addition, when investigating burnout symptoms, severe fatigue due to cancer treatments can possibly lead to a burnout diagnosis, which can result in the treatment not being in line with the cause of the complaints.

The job resources autonomy and support in the workplace (by colleagues or by supervisors / managers) had no direct association with future work ability or burnout complaints among salaried workers, who were confronted with a breast cancer diagnosis in the past. Nevertheless, these resources appear to be associated with higher current work ability and lower current burnout complaints, suggesting a short-term effect on better work functioning, indicating that these resources need attention continuously. The searches of the literature showed that a number of studies had also found that autonomy and support by colleagues was associated with higher current work ability among workers after cancer diagnosis. However, for none of the job resources had been investigated whether there was buffering of the relationship between possible late effects and work ability or burnout complaints. In the sub-study among workers with chronic conditions, autonomy and a supportive leadership style appeared in a number of cases to have a buffering effect on the associations with work ability or burnout complaints. No buffering was found of social support by colleagues. In the sub-studies based on the data collection within this PhD project among workers two to ten years after a breast cancer diagnosis, a result regarding buffering can only be reported for autonomy. This concerns the buffering by autonomy of the relationship between cognitive complaints and future burnout complaints. Apparently, higher autonomy in case of higher cognitive complaints helps to reduce future burnout complaints. This is an important and previously unreported result, because it shows that the role of the worker and the opportunities that are offered in determining the content and approach to work has a more favorable effect on functioning at work the higher cognitive complaints are. A reverse effect (namely deterioration of the relationship) was found for autonomy regarding the relationship between physical complaints and work ability. Autonomy should not be too low in the situation of high levels of physical complaints, because then the work ability is much lower than at an average level of autonomy. However, in the situation of high levels of physical complaints a similar work ability is observed for an average level and for a high level of autonomy. Therefore the conclusion is that there is

an optimum level of autonomy in the case of physical complaints. Moreover, this shows that – as professionals indicated during the interviews – customization is important. Finally, this PhD research shows that the most favourable level of autonomy must be properly determined; depending on the profile of different late effects and in this will have to be determined in dialogue with the worker. Further research may show profiles of different levels of late effects, providing guidelines with regard to the most optimal approach in the workplace. For example, adjustments in hours and tasks are adjustments often mentioned, however it is also important to focus on how work tasks or the job can provide as much work pleasure and positive energy as possible, with a view to functioning well at work, also within this population of workers.

Practical implications for supervisors, managers, professionals and workers with or past cancer.

Contact, openness and seeking solutions in dialogue turned out to be keywords in the interviews, but unfortunately this is not common in every work environment. Especially cognitive complaints and fatigue are complicated given their invisibility to the environment. In order to recognize that any late effects affect functioning at work, the complaints must therefore be shared, but workers sometimes find this difficult out of fear for discrimination or stigmatization. That fear is not necessarily unfounded, as also emerged from the interviews. Partly for this reason, it is important that all employees are aware that an occupational physician has to comply with doctor-patient confidentiality. There are also specialized occupational physicians in the field of oncology (so-called BACO's) and many other professionals, who are specialized in the field of work and cancer. These professionals offer many opportunities for guidance and support. Within organizations, human resource management can play a crucial role as an advisor to supervisors and managers, directing the approach to work and cancer and making other professional guidance accessible to the employees. Moreover, informal care or support from the private environment can also be very important for the worker.

For all professionals, and especially for those who have little experience with workers who have had cancer, it is important to be aware of the late effects of cancer and cancer treatments. It is crucial that all late physical effects relevant in the workplace, as well as cognitive complaints and fatigue, are taken seriously. The worker should be familiar with the possibility of late effects of the treatments so they can be recognized if they should occur, and the most appropriate approach should be chosen. Facing the situation before and after cancer and cancer treatments can be confronting. Unfortunately, professional help is not easy to find and accessible for all workers. Late effects of cancer treatments are common and should be more explicitly on the agenda of researchers, human resource management and line management, and all those who can help workers, who are struggling with this.

Samenvatting

Naar schatting is inmiddels ongeveer 5 procent van de werkenden in Nederland in het verleden geconfronteerd met een kankerdiagnose. Nog niet zo heel lang geleden betekende een kankerdiagnose dat men meteen stopte met werken. Tegenwoordig keert bijna drie kwart van de werkenden die kanker krijgen, vroeger of later, weer terug naar werk. Bovendien komen kankerdiagnoses onder de gehele bevolking steeds meer voor, hetgeen voornamelijk verklaard wordt door de bevolkingstoename en door het groeiend aantal ouderen, bij wie kanker meer voorkomt dan bij jongeren. Doordat de werkende bevolking door de hogere pensioenleeftijd gemiddeld steeds ouder wordt, is er binnen de groep werkenden dus daardoor ook sprake van een toenemend aantal kankerdiagnoses. Daarnaast zijn de overlevingskansen voor een aantal veel voorkomende vormen van kanker gestegen. Een voorbeeld is borstkanker, waarvoor de gemiddelde 5-jaarsoverleving inmiddels 88% is. Al deze ontwikkelingen verklaren dat de groep werkenden die in het verleden te maken heeft gehad met een kankerdiagnose is toegenomen en naar verwachting nog verder in omvang zal toenemen.

Helaas is er vanuit onderzoek weinig bekend over het functioneren in werk van diegenen die in het verleden met een kankerdiagnose zijn geconfronteerd. Het onderzoek dat vooral wordt gedaan, betreft de periode waarin het re-integratieproces normaal gesproken plaatsvindt, dat wil zeggen tijdens de eerste twee jaar na diagnose. Dit promotieonderzoek richt zich specifiek op de periode daarna, namelijk vanaf twee jaar na kankerdiagnose en na de terugkeer naar werk.

Het krijgen van kanker kan een ingrijpende ervaring zijn, die ook op de lange termijn psychosociale gevolgen kan hebben, zoals bijvoorbeeld de angst voor terugkeer van kanker. De behandelingen zijn bedoeld om te genezen of de ziekte te beteugelen, maar kunnen op de lange termijn diverse onbedoelde effecten hebben die van invloed kunnen zijn op het functioneren op het werk. Het mogelijke verband van deze zogeheten late effecten van kankerbehandelingen en het huidige én toekomstig functioneren in werk, is de focus van dit promotieonderzoek. Vervolgens gaat het ook om mogelijkheden in de werkomgeving om hier op in te spelen, waardoor het functioneren in werk wordt ondersteund of verbeterd.

In dit promotieonderzoek staan drie soorten late effecten centraal; lichamelijke klachten, vermoeidheid en cognitieve klachten. Ten eerste, wanneer lichamelijke late effecten in ogenschouw worden genomen, blijkt de grote diversiteit van dergelijke klachten als mogelijk gevolg van kankerbehandelingen. Zo kan bestralingstherapie op de lange termijn klachten geven door schade aan bijvoorbeeld het bindweefsel of het hart. Operaties kunnen verkleefde littekens met zich meebrengen of bijvoorbeeld lymfoedeem doordat de lymfeklieren zijn verwijderd. Anti-hormoontherapie kan botontkalking veroorzaken of pijn in gewrichten. Problemen met de hartfunctie kunnen het gevolg zijn van chemotherapie en immuuntherapie. Ten tweede, is vermoeidheid een veel voorkomend laat effect van kankerbehandelingen. Deze vermoeidheid wordt beschreven als onvoorspelbaar en niet in overeenstemming met

de verrichte activiteiten, in ieder geval heel anders dan de 'gewone' vermoeidheid die gezonde mensen na inspanning kennen. Ten derde, gaat het om cognitieve problemen als mogelijk laat gevolg van de kankerbehandelingen. Deze problematiek staat steeds meer in de belangstelling van onderzoekers. Chemotherapie blijkt invloed te kunnen hebben op het brein, waarmee klachten als concentratieverlies of problemen met het geheugen verklaard worden. Echter ook behandelingen met anti-hormonen kunnen mogelijk van invloed zijn. Cognitieve problemen kunnen worden onderzocht met neuropsychologisch onderzoek of kunnen gerapporteerd worden door diegenen die hiermee kampen, bijvoorbeeld door middel van vragenlijstonderzoek. Vermoeidheid en cognitieve klachten kunnen onderling samenhangen, maar ook met andere psychosociale factoren. Vermoeidheid kan cognitieve klachten veroorzaken, en het omgekeerde kan ook. Wanneer er dus sprake is van zowel vermoeidheid, als van cognitieve klachten, moet uitgezocht worden of er sprake is van een onderlinge oorzakelijke relatie. Dat heeft invloed op de richtingen die het beste gekozen worden om tot oplossingen te komen om het functioneren te verbeteren. De vraag is dan namelijk of er in geval van zowel cognitieve klachten als vermoeidheid allereerst aandacht moet zijn voor de vermoeidheid, voor de cognitieve klachten of misschien toch voor beide tegelijk.

Zoals hierboven reeds gezegd, wordt in dit promotieonderzoek het verband tussen lichamelijke klachten, vermoeidheid en cognitieve klachten enerzijds en functioneren in werk anderzijds onderzocht. Voor wat betreft het functioneren in werk gaat het in dit promotieonderzoek om werkvermogen en burn-outklachten. Daarnaast is het de vraag wat werkenden kan helpen wanneer late effecten het functioneren in werk in de weg zitten. Hierbij wordt een aantal hulpbronnen in de werkomgeving onderzocht die zijn ontleend aan het Job-Demands Resources (JD-R) model. Hulpbronnen zijn factoren die gunstig zijn voor het functioneren in werk en betreffen – naast bijvoorbeeld mogelijke persoonlijke hulpbronnen zoals veerkracht – ook factoren die op de werkvloer in interacties en werkprocessen een rol kunnen spelen. Om deze laatste groep hulpbronnen gaat het in dit promotieonderzoek. Gekozen is daarbij voor autonomie en steun op de werkvloer (door collega's en door leidinggevenden). De vraag is steeds of deze hulpbronnen een gunstige samenhang laten zien met het functioneren in werk én of deze hulpbronnen mogelijk een bufferende werking hebben op de verwachte verbanden tussen chronische late effecten en ongunstiger functioneren in werk. Buffering zou betekenen dat deze hulpbronnen het verband tussen chronische late effecten enerzijds en mogelijk daardoor verminderd functioneren op het werk anderzijds minder sterk maken, en dat is dan dus gunstig. Het onderzoek richt zich uiteraard op werkenden die in het verleden geconfronteerd werden met een kankerdiagnose en te maken hebben met mogelijk chronische late effecten van kankerbehandelingen. Hiernaast is er echter ook een deelstudie gedaan onder werkenden met mentale en/of lichamelijke chronische aandoeningen anders dan kanker.

Vijf vragen zijn in dit promotieonderzoek onderzocht en beantwoord:

Deelvraag 1: Wat is de huidige stand van kennis over de samenhang tussen mogelijke late effecten van kankerbehandeling (lichamelijke klachten, vermoeidheid of cognitieve klachten) en werkvermogen bij werkenden meer dan twee jaar na de diagnose van kanker die weer aan het werk zijn, én over de mogelijke buffering door werkbronnen van deze veronderstelde samenhang?

Deze vraag werd beantwoord door een systematisch literatuuronderzoek. Uit een aantal studies was op te maken dat het werkvermogen in de eerste twee jaar na diagnose afnam, maar werd gevolgd door een herstel. Toch bleek werkvermogen na twee jaar nog steeds lager te zijn dan bij gezonde werkenden. Er werden geen eerdere studies gevonden over het beloop van het werkvermogen na de eerste twee jaar na diagnose. Wél waren er onderzoeken die rapporteerden over verschillende cross-sectionele verbanden van late effecten (lichamelijke klachten, vermoeidheid of cognitieve klachten) met werkvermogen van werkenden die meer dan twee jaar geleden de diagnose kanker kregen. Er werd bij hogere late effecten een lager werkvermogen vastgesteld. Sociale steun door collega's of door de leidinggevende en autonomie hingen cross-sectioneel samen met een hoger werkvermogen. Er werden geen onderzoeken gevonden naar een mogelijk bufferend effect van deze hulpbronnen op het verband tussen late effecten en werkvermogen. Onderzoek naar longitudinale effecten, oftewel effecten door de tijd heen, werden ook niet gevonden in de studies die in dit systematisch literatuuronderzoek waren opgenomen.

Deelvraag 2: Wat is het verband tussen mentale en/of lichamelijke chronische aandoeningen op het werkfunctioneren en bufferen hulpbronnen dit veronderstelde verband?

Uit deze deelstudie onder werknemers in onderwijs- en (semi-)overheidsorganisaties in Nederland, bleek dat alle drie de groepen (lichamelijke chronische aandoeningen, mentale chronische aandoeningen, en zowel lichamelijke als mentale aandoeningen) samengaan met een lager werkvermogen. Hogere burn-outklachten bleken alleen een samenhang te vertonen met de twee groepen met mentale chronische aandoeningen (al dan niet gecombineerd met lichamelijke chronische aandoeningen), en dus niet als er uitsluitend sprake was van lichamelijke chronische aandoeningen. Over het algemeen gingen hogere autonomie en een ondersteunende leiderschapsstijl samen met een hoger werkvermogen, maar dat gold niet voor sociale steun van collega's. Deze hulpbronnen hingen wel alle drie samen met minder burn-outklachten. Autonomie bufferde het verband tussen de chronische mentale aandoeningen en een lager werkvermogen, én het verband tussen de groep met zowel lichamelijke als mentale chronische aandoeningen en meer burn-outklachten. Verder was bij een meer ondersteunende leiderschapsstijl juist sprake van een minder gunstig verband met functioneren in werk onder de werknemers met mentale chronische aandoeningen (met of zonder lichamelijke chronische aandoeningen) te zien. Er werd geen buffering gevonden voor sociale steun door collega's.

Deelvraag 3: Wat is de impact van late effecten van de behandeling (lichamelijke klachten, vermoeidheid en cognitieve klachten) en van hulpbronnen in het werk (autonomie, ondersteunende leiderschapsstijl en sociale steun van collega's) op het toekomstige werkvermogen van werknemers die 2 - 10 jaar geleden geconfronteerd werden met een borstkankerdiagnose?

Deze deelstudie toonde aan dat hogere niveaus van vermoeidheid en cognitieve klachten een lager toekomstig werkvermogen voorspelden (9 maanden later), waarbij rekening werd gehouden met de hoogte van de individuele score aan werkvermogen op de eerste vragenlijst. Lichamelijke klachten hadden naast vermoeidheid en cognitieve klachten geen significant effect op toekomstig werkvermogen. Echter ook lichamelijke klachten gingen op zich afzonderlijk samen met een lager toekomstig werkvermogen en moeten niet genegeerd worden. Hogere niveaus van autonomie, een ondersteunende leiderschapsstijl en sociale steun van collega's voorspelden geen hoger toekomstig werkvermogen. Wel gaat een hoger niveau van deze hulpbronnen samen met een hoger werkvermogen op hetzelfde moment, wat suggereert dat het gunstige effect mogelijk slechts kort aanhoudt. Bij deelnemers met gemiddelde of veel lichamelijke klachten was er geen verschil in toekomstig werkvermogen tussen gemiddelde en hoge autonomie in het werk. Het toekomstige werkvermogen was echter opmerkelijk lager wanneer de autonomie laag was. Er werd geen moderatie door de andere hulpbronnen gevonden in deze deelstudie.

Deelvraag 4: In hoeverre hebben de late effecten van kankerbehandelingen (lichamelijke klachten, vermoeidheid en cognitieve klachten) en hulpbronnen in werk (autonomie en ondersteunende leiderschapsstijl) effect op toekomstige burn-outklachten bij werknemers met een diagnose borstkanker 2 - 10 jaar geleden?

In deze deelstudie werd vastgesteld dat een hoger niveau van vermoeidheid en cognitieve klachten leidden tot hogere toekomstige burn-outklachten (9 maanden later), waarbij rekening werd gehouden met de individuele beginscore aan burn-outklachten op de eerste vragenlijst. Er werd naast vermoeidheid en cognitieve klachten geen significant oorzakelijk effect van lichamelijke klachten op toekomstige burn-outklachten waargenomen, doordat de invloed van vermoeidheid en cognitieve klachten sterker was. Hogere niveaus van autonomie of een ondersteunende leiderschapsstijl hadden geen direct effect op toekomstige burn-outklachten, want dat effect liep volledig via de huidige burn-outklachten. Er werd geen buffering waargenomen voor ondersteunend leiderschap, maar meer autonomie bufferde wél het negatieve verband tussen cognitieve klachten en toekomstige burn-outklachten. Dit laatste was niet eerder onderzocht en is een opvallende bevinding.

Deelvraag 5: Wat zijn de ervaringen en ideeën van managers en professionals over de begeleiding van werknemers bij late effecten van kanker(behandeling) en wat is hun idee over het effect van autonomie, sociale steun door collega's en een open organisatiecultuur?

In de gehouden interviews zijn de late effecten van kankerbehandelingen besproken. Zowel de eerder beschreven lichamelijke klachten, vermoeidheid en cognitieve

problemen werden herkend en beschouwd als late effecten van kankerbehandelingen die ervaren kunnen worden tijdens het functioneren in werk. Sommige professionals meldden dat de openheid om dergelijke klachten in de context van werk te delen, een open en veilig psychologisch klimaat in de omgang met elkaar vergt, en dat dat helaas niet in iedere organisatie of op iedere werkvloer aanwezig is. Wanneer de leidinggevende of human resource management op de hoogte is van cognitieve problemen en vermoeidheid werd ook aangegeven dat begeleiding soms ingewikkeld is, enerzijds door de onzichtbaarheid en de complexiteit van de klachten, anderzijds omdat manieren om ermee om te gaan in de praktijk op de werkvloer en binnen werkactiviteiten niet altijd bekend zijn of speciaal maatwerk vergen. Sommige taken kunnen bij cognitieve klachten overigens niet meer uitgevoerd worden, vanwege de daaraan verbonden risico's. In die gevallen is het dus absolute noodzaak om bekend te zijn met deze klachten en de mogelijke gevolgen tijdens het werk. Er is gespecialiseerde professionele ondersteuning mogelijk, maar deze is veelal onbekend of komt om andere redenen lang niet bij iedereen die dat nodig heeft terecht. Autonomie in het werk werd in het algemeen als een belangrijke factor beschouwd en de behoefte aan interventies op maat werd uitgesproken. Zo werd er ook gewaarschuwd voor de valkuil van het doen van een stap terug in functieniveau, waardoor het risico bestaat dat de nieuwe werkzaamheden minder autonomie mogelijk maken, hetgeen als nadelig werd beschouwd. Ook kwamen de angst voor terugkeer van kanker of een andere kijk op het leven in diverse interviews aan de orde als een vorm van mogelijke late effecten van het krijgen van kanker, evenals de problemen waarmee zelfstandigen worden geconfronteerd. Veel zelfstandigen zijn onvoldoende verzekerd en hebben daardoor geen mogelijkheden om (betaalbare) ondersteuning of begeleiding te vinden.

Algemene conclusies en aanbevelingen

Allereerst is het belangrijk om op te merken dat de door de werkenden gerapporteerde klachten niet met zekerheid (alleen) door de kankerbehandelingen worden veroorzaakt. Omdat echter met eerder onderzoek is aangetoond dat deze klachten als late effecten kunnen worden gekenmerkt, is in dit promotieonderzoek van de zelfrapportage van fysieke klachten, vermoeidheid en cognitieve klachten uitgegaan.

Al deze klachten bleken onderlinge samenhang te vertonen. Met name voor vermoeidheid en cognitieve klachten is dit ook uit ander onderzoek bekend. Tijdens de interviews in dit promotieonderzoek werd er bovendien op gewezen dat vermoeidheid de oorzaak van cognitieve klachten kan zijn en dat cognitieve klachten voor vermoeidheid kunnen zorgen. Uit eerdere studies bleek ook dat vermoeidheid een veelvoorkomend laat effect van kankerbehandeling is en samengaat met een lager werkvermogen, en dat dit verband onder werkenden die in het verleden met kanker werden geconfronteerd mogelijk zelfs iets sterker is dan onder andere populaties werkenden. In de deelstudies in dit promotietraject werd op basis van de eigen dataverzameling onder werkenden 2 - 10 jaar na kankerdiagnose ook gezien dat vermoeidheid en cognitieve klachten niet alleen samengaan met een lager huidig werkvermogen en hogere burn-outklachten op hetzelfde moment,

maar ook voorspellend waren voor een lager toekomstig werkvermogen en hogere toekomstige burn-outklachten. Het belang van deze resultaten is dat vermoeidheid en cognitieve klachten dus niet alleen op dit moment belemmerend kunnen zijn in functioneren in werk, maar dat er een effect kan zijn dat doorwerkt in toekomstig functioneren in werk. Dit maakt het nog belangrijker om dergelijke klachten serieus te nemen. Bij het onderzoeken van burn-outklachten kan ernstige vermoeidheid door kankerbehandelingen er bovendien mogelijk toe leiden dat dit tot een burn-out diagnose leidt. Dit kan dan weer tot gevolg hebben dat de behandeling niet aansluit bij de oorzaak van de klachten.

De hulpbronnen autonomie en steun op de werkvloer (door collega's en door leidinggevenden) bleken in de analyses onder werkenden die in het verleden borstkanker kregen geen direct effect te hebben op toekomstig werkvermogen of burn-outklachten. Wel blijken deze hulpbronnen samen te gaan met hoger werkvermogen en lagere burn-outklachten op het moment zelf. Vandaar dat het vermoeden is dat het effect vrij kortdurend is en steeds aandacht nodig heeft. Voor autonomie en de steun van collega's bleek tijdens het literatuuronderzoek dat in een aantal studies onder werkenden na kanker ook was vastgesteld dat dit samenhang met hoger werkvermogen. Voor geen enkele van de hulpbronnen in werk bleek echter eerder te zijn onderzocht of er sprake was van buffering van het verband tussen mogelijke late effecten en werkvermogen of burn-outklachten. In de deelstudie onder werkenden met chronische aandoeningen bleken autonomie en een ondersteunende leiderschapstijl in een aantal gevallen een bufferende werking te hebben op de verbanden met werkvermogen of burn-outklachten. Er werd echter geen buffering gevonden door sociale steun door collega's. In de deelstudies gebaseerd op de eigen dataverzameling onder werkenden 2 - 10 jaar na een borstkankerdiagnose, is alleen voor autonomie een resultaat met betrekking tot buffering te melden. Dit betreft de buffering door autonomie van het verband tussen cognitieve klachten en toekomstige burn-out klachten. Kennelijk helpt hogere autonomie in geval van hogere cognitieve klachten in het verminderen van toekomstige burn-outklachten. Dit is een belangrijk en niet eerder gerapporteerd resultaat, want dit laat zien dat de rol van de werkende en de ruimte die deze krijgt in het zelf bepalen van de inhoud en de aanpak van het werk een gunstiger werking heeft op het functioneren in werk naar mate cognitieve klachten hoger zijn. Een omgekeerd effect (namelijk verslechtering van het verband) werd voor autonomie gevonden aangaande het verband tussen lichamelijke klachten en werkvermogen. Autonomie mag bij veel lichamelijke klachten niet te laag zijn, omdat het werkvermogen dan veel lager is dan bij een gemiddeld niveau van autonomie, maar hoge autonomie heeft bij veel lichamelijke klachten een gelijk werkvermogen tot gevolg als bij een gemiddeld niveau van autonomie. Er is dus sprake van een optimum niveau aan autonomie bij een hoog niveau aan lichamelijke klachten. Bovendien blijkt hier ook uit dat – zoals professionals tijdens de interviews ook aangaven – maatwerk belangrijk is. Uit dit promotieonderzoek blijkt tenslotte dat het meest gunstige niveau aan autonomie goed moet worden bepaald; afhankelijk van het profiel van verschillende late effecten. Dit zal in dialoog met de werkende vastgesteld kunnen worden. Toekomstig onderzoek zou wellicht profielen aan verschillende niveaus van late effecten kunnen aantonen, waarmee eenvoudiger richtlijnen kunnen worden gegeven over de meest optimale aanpak op de werkvloer.

Ook kan dan meer advies worden gegeven, want bijvoorbeeld aanpassingen in uren en taken zijn aanpassingen die veel worden genoemd, maar hoe werktaken of de baan ook zo veel mogelijk werkplezier en positieve energie op kunnen leveren moet niet vergeten worden, juist met het oog op goed functioneren in werk, óók binnen deze populatie werkenden.

Praktische implicaties voor leidinggevenden, professionals en werkenden met of na kanker.

Contact, openheid en in dialoog oplossingen zoeken, bleken in veel van de gehouden interviews sleutelwoorden, maar mét de kanttekening dat helaas niet iedere werkomgeving dit toelaat. Vooral cognitieve klachten en vermoeidheid zijn gecompliceerd gezien hun onzichtbaarheid voor de omgeving. Om te erkennen dat eventuele late effecten het functioneren op het werk beïnvloeden, moeten de klachten daarom worden gedeeld, maar dat vinden werkenden soms lastig vanuit vrees voor discriminatie of stigmatisering. Die vrees hoeft overigens ook niet ongegrond te zijn, bleek tijdens de interviews. Mede daarom is het belangrijk dat alle werknemers ervan op de hoogte zijn dat een bedrijfsarts een medisch beroepsgeheim heeft. Ook bestaan er gespecialiseerde bedrijfsartsen op het gebied van oncologie (zogenoemde BACO's) en vele andere professionals die gespecialiseerd zijn op het gebied van werk en kanker. Deze professionals bieden vele mogelijkheden voor begeleiding en ondersteuning. Binnen organisaties kan human resource management een cruciale rol kunnen spelen als adviseur van leidinggevenden, regie voerend op de aanpak rondom werk en kanker en als partij die de andere professionals bereikbaar maakt voor de werknemers. Overigens kan ook de informele zorg of steun vanuit de privé omgeving heel belangrijk zijn voor de werkende.

Voor alle professionals, en vooral voor degenen die weinig ervaring hebben met werkenden die kanker hebben gehad, is het belangrijk om op de hoogte te zijn van de late effecten van kanker en kankerbehandelingen met het oog op het functioneren in werk. Het is belangrijk dat alle late lichamelijke effecten die relevant zijn op de werkplek, evenals cognitieve klachten en vermoeidheid, serieus worden genomen. Ook de werkende zou bekend moeten zijn met de mogelijkheid van late effecten van de behandelingen zodat deze herkend kunnen worden als deze mochten optreden, en zodat er voor de best passende aanpak kan worden gekozen. Geconfronteerd worden met de situatie voor en na kankerdiagnose en kankerbehandelingen kan ingewikkeld zijn. Dat is iets wat veel van deze werkenden hebben ondervonden. Helaas is professionele hulp niet voor alle werkenden makkelijk vindbaar en toegankelijk. Late effecten van kankerbehandelingen komen veel voor en dit onderwerp én wat werkenden die hiermee kampen verder helpt, moet nadrukkelijker op de agenda komen van onderzoekers, human resource management, leidinggevenden en allen die hier een rol in kunnen spelen.

Dankwoord

Dit promotietraject startte in 2017, maar eigenlijk ontstond het idee van dit promotieonderwerp al kort nadat ik in 2012 zelf borstkanker kreeg. In de inleiding van dit proefschrift vertelde ik daar al over. Ik merkte destijds meteen hoe belangrijk het voor me was dat collega's gewoon hun vragen stelden, een praatje durfden te maken en met me meedachten. Ook heb ik toen gemerkt hoe lastig het is om zelf te weten wat je wel of niet aankunt, maar duidelijk was tegelijkertijd dat ik daarover in gesprek wilde en niet dat men buiten mij om acties in gang zette. Maar ga er maar aan staan, als je voor het eerst een collega of medewerker hebt die zomaar even op een dag aan allen mailt dat ze kanker heeft en vertelt dat ze zolang er niks gebeurt gewoon blijft werken. Niet bepaald 'running business'. Daarom hier, nu meer dan 10 jaar na dato, allereerst dank aan de **collega's Toegepaste Psychologie van toen** en speciaal dank aan **Marja Blaazer**, destijds opleidingsmanager bij Toegepaste Psychologie. Ik heb jullie steun ervaren, en óók hoe moeilijk zo'n situatie kan zijn op de werkvloer en dat het soms zoeken is.

Het gevoel van kwetsbaarheid, niet je gebruikelijke veerkracht of weerbaarheid hebben, de angst voor wat de toekomst kan brengen, en ook soms het bijzonder soort humor, dat begrijpen lotgenoten toch het makkelijkste, is mijn ervaring. Heel snel ontmoette ik ze. In de ruimte waar de chemo's en de latere infusen immuuntherapie plaatsvonden, op een online forum, in een Facebook-groep 'met een slotje', in real life bij bijeenkomsten en later bij symposia. Ook bleken er mensen te zijn die ik al kende die kanker hadden gehad, waarvan ik dat tot op dat moment helemaal niet wist. Of leerde ik mensen kennen, die niet meer beter konden worden en ontdekte dat dat kon betekenen dat het leven voorlopig nog doorging. Ik hoorde zoveel ervaringen, óók met de werksituatie. Wat een ellende maken sommigen mee. Maar óók hoorde ik, hoe goed het soms kan gaan in het onderling contact met de mensen uit de werkomgeving, zelfs als werken voorlopig veel minder of helemaal niet kan. Of als aanwezigheid op de werkvloer wisselend is of onvoorspelbaar. En dat mensen ook anders kunnen gaan denken over werk. Dank **lotgenoten**, voor alles wat jullie met mij hebben gedeeld. Jullie zijn mijn eerste inspiratiebron geweest voor de keuze van dit promotieonderwerp.

Het heeft een paar jaar geduurd voor ik kon beginnen met dit promotietraject. De opleiding Toegepaste Psychologie bestond nog niet zo lang en de promotieregeling onderging veranderingen. Bovendien had Toegepaste Psychologie geen lectoraat. **Jean Tillie**, dank voor het desondanks formeren van een beoordelingscommissie om mijn promotievoorstel te beoordelen. Zonder deze actie was dit promotietraject niet op deze manier van de grond gekomen en zonder de facilitering vanuit de **Faculteit Maatschappij en Recht** was dit proefschrift er nu niet geweest.

Het pad in het begin was niet zonder hindernissen. Samen met **Willemijn Vermeer** en **Esther Parigger** heb ik die hindernissen kunnen nemen. Dank voor jullie betrokkenheid en vertrouwen in mij en mijn onderzoeksmodel. En de gouden tip van **Maayke Jansen**, dat ze via het NIP een hoogleraar kende die zich bezighield met duurzame inzetbaarheid en die begeleiden heel leuk vindt, was onbetaalbaar. Ik heb de mailtjes uit november 2016

in mijn mailbox terug kunnen vinden en na al die jaren weer doorgelezen. Dat was een super actie van jou Maayke en dat ben ik absoluut niet vergeten. Veel dank!

En toen leerde ik dus **Tinka van Vuuren** kennen. Op 5 december 2016 bij Seats2Meet op het Stationsplein in Den Bosch. Wát een enthousiasme, positiviteit, deskundigheid en vooral wat heerlijk dat zij niet terugschrok voor mijn interdisciplinaire onderzoeksmodel waarin zowel arbeid- en organisatiepsychologie, psycho-oncologie als gezondheid een rol spelen. Ze was enthousiast en dat was voor mij zó fijn. Ze vond mijn model niet te complex of te veel facetten vanuit verschillende invalshoeken bevatten. Integendeel, zij had waardevolle toevoegingen en suggesties om het nog verder uit te bouwen. Dit was méér dan een 'tipping point'! En ze had al een hele groep promovendi te begeleiden, en tóch kon ik er ook nog bij. En door het hele promotietraject heen heb ik de samenwerking als fijn en constructief ervaren. En Tinka's tempo in denken, schakelen, reageren, feedback geven en het bovendien direct oppikken van mijn mening of punt, was precies wat ik nodig had én prettig vind werken. Bellen vanuit de auto, Teamsen vanuit de Mac Donald, appen in de avond of het weekend want er stond iets voor mij interessants in de krant, de mini-EAWOP meeting bij haar thuis, en zo kan ik nog wel even doorgaan. En dan het enorme netwerk van Tinka en dat zij mij zoveel ingangen bood, en me alles gunde en me óók mooie complimenten maakte. Mij alle kansen gaf om te shinen! Zo tof om een promotor als Tinka te mogen hebben. Dank Tinka, ik vind je fantastisch, ik kon steeds op je rekenen en jouw positieve houding was (en is!) helemaal top.

Willemijn Vermeer, vanaf het allereerste begin was zij betrokken. Vele jaren terug, ver voor ik officieel startte, had ik Willemijn al gevraagd of zij mijn copromotor wilde worden en zij was meteen enthousiast. Wat fijn dat zij mijn copromotor wilde worden! Haar rol heb ik enorm gewaardeerd. Betrokken, kritisch, vragen stellen waarbij een ander perspectief werd ingenomen. Dat waren dan nogal eens nét dingen die heel essentieel bleken. En altijd steunend en positief, al die jaren. Ook fijn om af en toe gewoon te delen wat er zoal speelde. Jouw steun en positieve reacties waren onbetaalbaar. Veel dank, Willemijn!

De leden van de promotiecommissie, **Annet de Lange, Han Anema, Lilian Lechner** en **Pascale Peters**, wil ik enorm bedanken voor de aandacht en tijd die zij hebben besteed aan het lezen en beoordelen van dit proefschrift. Ook bedank ik **Sietske Tamminga** en **Joris van Ruyseveldt** voor hun bereidheid om te opponeren tijdens de verdediging en de tijd die zij in de voorbereiding daarvan hebben gestoken.

Meteen vanaf de start waren op verschillende momenten collega's vanuit de stafafdelingen van de faculteit Maatschappij en Recht betrokken bij van alles dat er bij dit promotietraject kwam kijken. Zij hebben daarmee ontzettend veel voor mij betekend. Bij de wervingsactiviteiten voor deelnemers (denk aan de animatie, de flyer, de webpagina, hulp bij de survey) en in 'van alles' voor het symposium Werk & Kanker op 24 juni '22. Ik denk dan aan het meedenken, de aanmeldtool, de bewegwijzering, tekstredactie, dat ik met een ontwerp bureau aan de slag kon voor de presentatie en de Infographic, om een paar voorbeelden te noemen. **Matthijs, Wilma, Mieke, Priscilla, Kirsty, Eline, Michiel, Cindy**, héél veel dank!

Toen het promotietraject nog maar net gestart was, doken er diverse mensen op van binnen en buiten de Hogeschool van Amsterdam, om te horen wat ik ging doen en kennis te maken. Heel bijzonder dat mensen die ik nog niet kende vanuit de Hogeschool die zelf kanker hadden gehad, of hun partner, mij opzochten, mij aanmoedigden en door de jaren heen belangstelling bleven tonen. Ook vertelde iemand over haar zoon, die toen hij kanker kreeg tegen allerlei ingewikkelde problemen binnen het onderwijs was aangelopen. Reden om in samenwerking met het studentendecanaat de flyer 'Student en kanker' te maken. Van buiten de Hogeschool kwamen diverse organisaties kennismaken. Het **professionele werkveld** in al z'n diversiteit was tijdens de gehele promotieperiode zo benaderbaar. Dank voor iedere uitnodiging voor een kennismaking, webinar, podcast of presentatie. Ik ben jullie allen zeer dankbaar.

Nederlandse Federatie van Kankerpatiëntenorganisaties (**NFK**), dank voor jullie aanmoedigingsprijs in 2018, uitgereikt door **Mirjam van Belzen** en **Sylvia Bastiaan-Trinthamer**. Wat een fijne opsteker was dat!

En dank aan iedereen die hielp met de verspreiding van de wervingsberichten voor de vragenlijsten. Zoals het posten, liken, sharen op online media. Dank ook aan diegene die op de fiets naar de Albert Heijn ging om de wervingsflyer op te hangen. Dank ook aan diegene die de flyer in zijn fietsenzaak ophing. Of in haar fysiotherapiepraktijk. Dank ziekenhuis Alrijne, waar ik met mijn vader door een gang lopend de flyer aan de muur zag hangen. De inloophuizen. De re-integratiebedrijven. En ga zo maar door. De eerste vragenlijst werd door 750 personen ingevuld en daarvan de tweede door ongeveer 500 en weer daarvan de derde vragenlijst door ongeveer 400 personen. Dank **deelnemers** aan de vragenlijsten! Zonder jullie had ik weinig te vertellen gehad.

De werving voor de interviews verliep ook vlot. Dank iedereen die hielp om geïnterviewden te werven. En vooral: **geïnterviewden**, dank! Jullie perspectief was enorm belangrijk.

Voor één van de vijf artikelen in dit proefschrift heb ik mogen werken met een omvangrijk, geanonimiseerd databestand dat door **Loyalis** (inkomensverzekeraar, een merk van a.s.r.) was verzameld onder werkenden in (semi)overheid, onderwijs en zorg. Ook hiervoor mijn dank.

Janneke Staaks en **Jolanda Kleen**, informatiespecialisten, leverden voor de systematische literatuur review een belangrijke bijdrage door het creëren van de benodigde selectieparameters voor de verschillende databases en het uitvoeren van de zoekopdrachten. Super bedankt!

Dank ook aan de **studenten** die onderzoekstages bij mij liepen of mijn afstudeeropdrachten oppakten. Fijn om samen kritisch na te denken over de onderzoeksmethoden en deze verder vorm te geven of de interviews af te nemen. Leuk ook, om studenten te begeleiden, die bijvoorbeeld bij Huis aan het Water een opdracht uitvoerden.

Verder was het fijn om zo heel af en toe met het promotiegroepje binnen AKMI (Amsterdams Kenniscentrum voor Maatschappelijke Innovatie) samen te komen. Ik noem hier **Rosine van Dam** die er steeds weer voor voelde om samen te proberen de groep bij elkaar te krijgen. En **Jolanda Sonneveld** bedankt voor de onderzoeksmethode-afstemming.

Verder wil ik speciaal bedanken **Daniel van Middelkoop**, lector teamprofessionalisering bij de Hogeschool van Amsterdam, faculteit Business en Economie, voor de support. Het begon op Twitter, geloof ik. En wat mooi dat ik ook een aantal keren bij het overleg van The Worklab kon zijn en zo de kans heb gekregen om kennis te maken met het team én mijn promotieonderzoek te presenteren.

En natuurlijk dank voor de interessante gesprekken met en bemoediging door andere onderzoekers. Het zijn er te veel om op te noemen. Ik noem hier toch graag een paar van de mensen die ik via Tinka van Vuuren heb leren kennen en die ook bij het congres van de European Association of Work and Organizational Psychology (EAWOP) in 2019 in Turijn aanwezig waren. Wat was dát een leuke ploeg. Ik zie dan vooral meteen die gezellige eettafel buiten op straat voor me en dat de elektriciteit uitviel waardoor het alarm afging. Een paar namen hier. Ik vond het ontzettend interessant om te horen waar jullie mee bezig waren en kennis te maken; **Pauline van Dorssen-Boog, Hiske de Boer, Roland Blonk, Sjiera de Vries, Caroline Horikx, Karen Pak, Judith Semeijn, Veerle Brenninkmeijer, Stephan Corporaal**. En **Martine Coun**, jij was daar ook, maar ik leerde je pas later kennen. Dank voor alle informatie en hulp!

Dan het symposium Werk & Kanker op 24 juni '22. Niet een direct onderdeel van het promotietraject, maar wel in het verlengde ervan. Wat fantastisch om dat zo groots te hebben kunnen doen. Ik wilde graag alle partijen met elkaar in contact brengen: het werkveld met z'n afzonderlijke 'eilandjes', de praktijk, onze opleiding, studenten en afgestudeerden, onderzoekers en werkenden die kanker hebben gehad. Samenwerken aan werk en kanker. **Frank Posthumus**, dank dat jij als opleidingsmanager Toegepaste Psychologie, hier in deze vorm jouw akkoord voor hebt gegeven. Samen met **Sietske Jansma** de eerste inhoudelijke voorbereidingen gestart. **Tinka van Vuuren** en **Willemijn Vermeer**, dank voor de samenwerking ook nu weer. Wat super dat jullie tijdens mijn presentatie met het symposium op een aantal momenten de korte vragen aan de experts stelden en we er samen stonden. **Joyce Pouw**, bedankt voor jouw meedenken en feedback op inhoud, organisatie en de uitwerking. De **afdeling Communicatie** van de faculteit Maatschappij en Recht heeft veel betekend bij de voorbereidingen, dank! Organisatieteam, **Sietske Jansma, Rita Swart** en **Maaïke Pardieck**, bedankt, ik hoop dat jullie niet urenlang geworden zijn van dit samen met mij organiseren. En ook bedankt voor jullie enorme inzet op de dag zelf. Tijdens het symposium hebben ook veel andere collega's een rol gepakt. **Anne Koster, Dennis Breet, Franz Maissan, Fraukje Koster, Hanneke Lodewijk, Ilse Wessel, Japke Ebbinge, Maayke Jansen, Michel Wagemans, Susan Polak**, en ook hier weer **Joyce Pouw**, super! Ook de studenten die hebben geholpen en het loopbaanloket: dank! En even speciaal **Kees Mak**, bedankt voor jouw super leuke reactie na mijn keynote tijdens het symposium! En dan 'last but not least', al diegenen die in de middagrondes tijdens het symposium een workshop hebben verzorgd

of presentatie hebben gegeven en zo kennis en kunde vanuit het professionele werkveld en de praktijk hebben gedeeld, ontzettend veel dank! Het was fantastisch.

Iets anders positiefs wil ik hier ook meteen melden en dat is, dat mijn collega's binnen het zogeheten **Themateam Duurzame Inzetbaarheid** binnen de opleiding Toegepaste Psychologie het voorstel om ook te focussen op de werkenden die te maken hebben met min of meer 'onzichtbare' chronische klachten heeft omarmd. Mooi om de plannen verder uit te werken en ermee aan de slag te gaan!

Mijn paranimfen bij de promotie, **Reina Dooijewaard** en **Vivien Hertogh**. Wat fijn om jullie aan mijn zijde te hebben. Reina, dank voor jouw trouwe vriendschap al sinds het Hervormd Lyceum West, en alle steun óók weer tijdens dit promotietraject. Jouw meedenken en betrokkenheid, echt super. Zonder jou was ik trouwens überhaupt niet op het idee gekomen om bij Toegepaste Psychologie te solliciteren! Vivien, dank voor jouw vriendschap sinds wij inmiddels zo'n 30 jaar geleden samen gingen werken in een complex ICT-project vanuit onze toenmalige werkgevers. Ook jij bent een trouwe bondgenoot. Je bent niet altijd in Nederland, maar óók op afstand was je altijd betrokken en vroeg je steeds naar de acties van dat moment. En zo fijn dat jullie beiden meegelezen hebben met de Introduction en de General Discussion.

Speciaal wil ik hier nu nog twee personen noemen, die mij vanaf het prilste begin hebben gesupporterd. **Jeantine Lunshof**, die ik leerde kennen in haar rol als één van mijn docenten tijdens de master Gezondheidswetenschappen aan de VU. Haar bemoediging, interesse en complimenten, hebben mij extra power gegeven. Dank, Jeantine! Ook speciaal hier wil ik noemen **Juuf Oostrom**, voormalig directeur van Betafin B.V. Jaren hebben wij samengewerkt en daarna steeds contact gehouden. Een paar maanden voordat mijn promotietraject officieel startte, leefde hij nog. Ook de laatste keer dat ik hem sprak vroeg hij naar de vorderingen om tot de start van een promotietraject te komen. Toen wij nog samenwerkten, vele jaren daarvoor, ging ik 'ineens' weer studeren en in atv uurtjes heen en weer naar college. Zonder zijn steun toen, had ik niet zo veel studiemeters kunnen maken. En onze gesprekken over allerlei organisatieprocessen en strategische kwesties, spoken nu nog wel eens door mijn hoofd.

Mijn zus **Astrid van Rhijn-Boelhouwer** heeft naast haar baan als controller bij een ministerie ook extra studies opgepakt. Ze is historica, bestuurskundige en óók grafisch ontwerper. Dus dat naast een baan nog 'even' een studie erbij doen en daar dan een paar jaar in de avonden en weekenden mee bezig zijn, zit een beetje in de familie. Ik heb zelf totaal geen feeling voor grafisch ontwerpen en mijn publicaties waren denkkelijk iets soortgelijks voor mijn zus. Maar het "Goed dat je dit doet", daar was ik blij mee. We hadden in 2020 vanaf april vele maanden compleet andere dingen aan ons hoofd en daar hebben wij ons samen met onze gezinnen doorheen geslagen. Het promotietraject ging 'full speed' door, maar is dan iets van een hele andere orde. Ik kijk er naar uit met jou en jouw gezin een drankje te doen om deze promotie te vieren.

En dan zijn er zoveel anderen in de familie- en vriendenkring die hun belangstelling hebben getoond, lieten weten dat ze het een belangrijk onderwerp vonden, mij hebben aangemoedigd of zelfs hielpen bij de werving voor de interviews. Of die los

van het promotietraject tijdens de Coronaperiode contact bleven zoeken, interesse toonden, wandelafspraken maakten, appten, mailden of als het weer kon iets gezelligs organiseerden. Ik ben niet volledig, maar noem graag **Jan, Truus, Lenie, Tessa & Manou, tante Tiny, Saskia, Christa, Rubia, Carl, Constance, Maud, Lucy, Manon, Sylvia, Patricia, Helma, Bauk, Anja, Constance, Inge & Marcus, Jolanda, Greet**. En **Glenn, Lygia & Harrie, Dennis & Samira, oom Leo, John & Sharine, Kenneth & Loes, Margo, tante Helène** en verdere familieleden Molly en Dielingen, dank voor de fijne contacten en uitnodigingen voor eten, of een feestje, belletjes of lieve appjes in de afgelopen jaren, want dát hielp óók om de positieve energie te hebben om dit promotietraject te volbrengen.

En mijn ouders, **Greet Boelhouwer-Luttge** en **Ton Boelhouwer**. Kon ik jullie ook nú ook maar bedanken voor jullie invloed en steun. Het doorzettingsvermogen van Greet en de inzet door haar hele leven heen om nieuwe dingen te leren en iets neer te zetten, daar heb ik een voorbeeld aan gehad. En doorzetten, ook als het tegenzit. Mijn moeder, Greet, heeft niet meer kunnen beseffen waar ik mee bezig was, maar gelukkig hebben we nog wel lang veel fijne reises kunnen maken. Mijn vader, Ton, eerst bezig met het ontwerpen en berekenen van staalconstructies voor bruggen bij Publieke Werken (detail: locatie Wibauthuis) en daarna leraar Wis- en Natuurkunde en adjunct-directeur bij de 2e Christelijke L.T.S. Patrimonium in Amsterdam West. Als 19-jarige al bij Judoclub Shin-Shin in Amsterdam Geuzenveld/Slotermeer op de mat les gaan geven, al gauw in het bestuur, en tot op hoge leeftijd bezig met 'de club'. Ik zag Ton in zijn diverse rollen steeds bezig in een soort combinatie van leraar, manager en organisator. Daar moest ik tijdens dit promotietraject wel eens aan denken; is zoiets erfelijk? Mijn beide ouders waren sociaal betrokken en hebben zelf ook best moeten 'buffelen'. Geen gespreide bedjes of een handig netwerk om even ergens een paar streepjes voor te hebben. Hoe ouder ik word, hoe trotser ik eigenlijk op hén ben. Ton was zéér betrokken bij iedere stap die ik maakte, óók in dit promotietraject. Vanaf april 2020 heb ik de gesprekken met hem van de éne op de andere dag moeten missen. Ik had daarvóór niet kunnen bedenken dat hij mijn promotie niet meer mee zou maken. Terwijl ik dit schrijf, voel ik al hoe ik hem zal missen op de eerste rij tijdens de promotieplechtigheid op 30 september 2022.

Reggy, al zoveel jaren zijn we een stel, en met **Eline** samen al vierentwintig jaar een gezin. Door dik en dun, en ook nu zijn jullie er. Dit promotietraject is niet bepaald onopvallend aan jullie voorbijgegaan. Jullie hebben mij altijd gesteund en waren blij voor me als iets was gelukt. Bovendien Reggy, jouw zorg voor Eline en mij, iedere dag staat het eten klaar, en wát voor eten. Zonder jouw zorg had ik nooit zoveel uren kunnen maken. Eline, jij hebt ook altijd je trots laten blijken, onbetaalbaar. En jouw uitspraak, laatst weer, "Ik heb alle vertrouwen in je", dat doet me heel wat. En nu eindelijk kunnen we dit vieren.

Na alle inspanningen zal deze 'computer lady' in de weekenden en op de avonden minder in haar werkhoek te vinden zijn, vermoedelijk, ik beloof alleen niks. Want loslaten zal ik het thema niet. Het gaat zelfs wat breder inmiddels. De groep werkenden die kampt met min of meer onzichtbare aandoeningen of chronische klachten heeft mijn hart. Deze werkenden, of ze nou in loondienst zijn, ondernemer, zzp'er, of in andere flexconstructies werkzaam, verdienen onze steun en een denken in mogelijkheden!

About the author

Ingrid Boelhouwer has completed several university studies: she holds a Master of Pedagogy, Master's degrees in Work and Organizational Psychology and in Clinical Neuropsychology (cum laude) and a Master's degree in Health Sciences. During her career in business, for 16 years, her focus was on management, marketing, process management and business strategy. In 2007 Ingrid switched to working in higher education. First, as a freelance trainer at the School of Medicine (Vrije Universiteit Amsterdam), then as an educational developer, lecturer, thesis supervisor and examiner at a private university of applied sciences and at a university of applied sciences with distance learning. In 2010 Ingrid joined the department of Applied Psychology of the Amsterdam University of Applied Sciences, as a lecturer and one year later as member of the management team. However, after her breast cancer diagnosis, she chose a different path realizing that she wanted to fulfill her dream of doing PhD research. What she heard within patient associations and from fellow sufferers inspired her to choose the focus of her PhD research.



Her PhD project 'Work after cancer' started in 2017 and investigated the association of possible late effects of cancer treatments and functioning at work, and targets of interventions. The late effects investigated are physical complaints, fatigue and cognitive complaints. An interdisciplinary approach was a conscious decision in order to investigate workable solutions in working life of workers who have had a cancer diagnosis in the past and experience late effects of cancer treatments. In December 2018, the Dutch Federation of Cancer Patient Organizations (NFK) presented Ingrid an encouragement award to support this PhD project.

Ingrid has published five papers for this PhD thesis in several journals; *Frontiers in Psychology*, *International Archives of Occupational and Environmental Health*, *BMC Public Health*, and *WORK: A Journal of Prevention and Assessment & Rehabilitation*. Furthermore, a paper about work functioning of self-employed workers past cancer diagnosis was accepted for publication in June 2022 by the Dutch scientific journal *Gedrag & Organisatie*.

She has presented her research on several occasions, like the lustrum research conference, 10 years of HRM practical research, state of the art and outlook (2018), the 19th EAWOP Congress, Turin, Italy (2019), the 11th biennial international conference of the Dutch HRM network (2019) and at the Vrije Universiteit Amsterdam during the event "Towards inclusive careers across the lifespan: Integrating HRM and careers perspectives" (2020). Unfortunately, several other presentations were canceled due to the Covid-19 pandemic.

Ingrid would like to share the results of her PhD project (and the results of the further analyzes she intends to perform with the data she has collected) with the field of education and with the professional field. She wants to undertake further research to expand this interdisciplinary approach, whereby the questions from the professional field, the workplace and the ideas and experiences of the workers involved are leading.

Ingrid also notices the need for more exchange of information and knowledge between the various professional groups involved, as well as the need of connecting the professional field, research and education. This was one of the goals of the Werk & Kanker symposium on 24th June 2022, which Ingrid organized at the Amsterdam University of Applied Sciences. This symposium was also aimed at thanking the participants of her PhD research. Ingrid presented the results of her PhD research during the keynote that day, including additional results on work engagement and regarding the self-employed. The last sentence of her presentation was "Let's collaborate even more on work and cancer!".



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