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ORIGINAL ARTICLE



# Interventions for work participation of unemployed or work-disabled cancer survivors: a systematic review

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**ABSTRACT**

**Background:** Supporting unemployed or work-disabled cancer survivors in their work participation can have extensive individual and societal benefits. We aimed to identify and summarise interventions for work participation of unemployed or work-disabled cancer survivors.

**Methods:** Five databases (Medline, Embase, PsycINFO, CINAHL and Cochrane Library) were systematically searched for quantitative studies on interventions aimed at enhancing work participation of unemployed or work-disabled cancer survivors. Work participation refers to participation in the workforce, fulfilling one's work role. Manual and automatic screening (with ASReview software) were performed on titles and abstracts, followed by manual full-text screening. Data were extracted regarding study, patient and intervention characteristics, and work participation outcomes. Risk of bias (RoB) was assessed using the Cochrane RoB2 and QUIPS tools.

**Results:** We identified 10,771 articles, of which we included two randomised controlled trials (RCTs), of which one feasibility RCT, and three cohort studies. In total, 1862 cancer survivors were included, with predominantly breast cancer. Work participation was mainly measured as time to return to work (RTW) and RTW rate. Interventions included components of coaching (e.g., psychological or rehabilitation), training (e.g., building confidence and managing fatigue) and self-management. Two RCTs with unclear RoB did not show an effect of multicomponent interventions compared to care as usual. One cohort study found a significant effect of a psycho-educational intervention on RTW rates, with moderate RoB. The other two cohort studies, with moderate RoB, reported significant associations between components including job search and placement assistance, and work participation.

**Discussion:** Only few interventions aimed at enhancing work participation of unemployed or work-disabled cancer survivors, have been evaluated. In two cohort studies, promising components for future multicomponent interventions were identified. However, findings suggest that more evidence is necessary on such multicomponent interventions, in which elements explicitly directed at work and including the workplace should be included.

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Neoplasms; cancer survivors; employment; interventions; systematic review; work participation; return to work

## Background

About half of the people diagnosed with cancer is of working age [1]. The diagnosis and subsequent treatment can have a large impact on these patients' current and future work participation [2]. Work participation refers to one's participation in the workforce, including both time-based measures, such as time to return to work (RTW) and RTW rates (percentage of people that returned to work), and status-based measures including work status and work disability [3]. Because of improved treatment and an ageing population, the group of long-term cancer survivors is growing [4] which is likely to result in higher numbers of unemployed and/or work-disabled cancer survivors [5]. In several systematic reviews it has been revealed that diagnosis and treatment for cancer is an important cause of unemployment and work disability [1,6]. Specifically, it was shown that cancer survivors are 1.4 times more likely to be unemployed than non-cancer controls [1]. Even 10 years after diagnosis, cancer survivors still have a higher risk of being unemployed compared to individuals without a history of cancer [7]. Survivors of

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childhood cancer have a higher chance of being unemployed during adulthood, as they are twice as likely to be unemployed when compared to healthy controls [8]. Additionally, in a study by Parsons and colleagues, it was revealed that more than 50% of adolescent and young adult (18 to 39 years) cancer survivors experienced problems with work or education. These findings suggests that unemployment is a risk for cancer survivors from all ages [9].

In the 'Arena in work disability prevention model' [10], adapted for cancer survivors by Greidanus [11], systems and factors have been described that may affect work outcomes of cancer survivors. One of these systems is the 'workplace system', which includes several factors that have been found to facilitate the return to work of cancer survivors, such as adequate support from the employer and colleagues, and work accommodations [12–15]. Such factors have been extensively explored for cancer survivors with an employment contract. For cancer survivors without an employment contract, however, the entire workplace system, including these factors that may facilitate the cancer survivors' return to work, lacks. This makes it more difficult for cancer survivors without an employment contract to actually return to work, substantiating the need for other types of interventions for these cancer survivors. In two population-based studies on patients with colorectal cancer [16] and breast cancer [17], respectively, it was shown that: (1) the number of participants that received disability benefits and unemployment benefits increased in the four years after diagnosis, and (2) although not statistically tested in these studies, cancer survivors without an employment contract had much lower chances of positive work outcomes than cancer survivors with an employment who were not able to work after diagnosis. These previous findings suggest that unemployed or work-disabled cancer survivors are in particular need for support in finding and maintaining work.

Work is associated with better recovery, a sense of normalcy, financial independence and higher self-esteem and quality of life [18,19]. Cancer survivors who lose their job or experience work disability, face various barriers when reintegrating into the labour market [5,20]. Examples of barriers that cancer survivors with job loss mentioned in a focus group study include having doubts regarding disclosing the diagnosis and adapting to a workplace while dealing with short- and long-term treatment effects [5]. They are confronted with a so-called double loss: loss of their job on top of loss of their health [5]. Having the option to gradually increase work ability and learn new skills can help cancer survivors to conquer these difficulties, increase their confidence and adapt to new situations [5]. However, compared to cancer survivors with a paid employment contract, unemployed cancer survivors often lack such opportunities [20,21], which might result in a large distance from the labour market [5, 21]. Additionally, employers may be reluctant to hire cancer survivors, whom they believe are at risk for sickness absence, reduced productivity and additional costs [5,22].

Furthermore, from a societal perspective, improving the work participation of unemployed and work-disabled cancer survivors can also have considerable economic benefits [1,23], as many of these cancer survivors rely on (partial) work disability benefits [5,17].

A plea for interventions tailored to cancer survivors' specific needs and characteristic has been made in existing reviews on interventions to enhance work participation [24–27]. The four types of interventions mostly commonly studied for cancer survivors are: (1) psycho-educational, (2) vocational, (3) physical and (4) multicomponent interventions. However, because most existing interventions do not focus specifically on unemployed or work-disabled cancer survivors, little is known about the specific needs of these cancer survivors [25,26,28–30]. More knowledge about interventions aimed at supporting this vulnerable group of cancer survivors in their work participation is urgently needed. Hence, the aim of this systematic review was to identify and summarise interventions and specific components of interventions for work participation of unemployed or work-disabled cancer survivors.

## Material and methods

The Preferred Items for Systematic Reviews (PRISMA) Statement was used to structure this review [31,32]. The review protocol was registered in PROSPERO (registration number: CRD42022310011) to enhance reliability [33].

### *Search strategy and eligibility*

A literature search was conducted in electronic databases: Medline (Ovid), Embase (Ovid), PsycINFO (Ovid), CINAHL (Ebsco) and Cochrane library up to December 24$^{th}$, 2021. Additionally, an updated search was performed up to January 23$^{th}$, 2023. Indexed and free text terms related to 'cancer survivor', 'unemployment', 'work disability' and 'work participation' were combined (Supplementary Appendix A).

The inclusion criteria were: (1) $\geq$95% of study participants had to be diagnosed with cancer $\leq$10 years before study entry, of working age (18–65), and unemployed, partially or fully work-disabled at baseline (or subgroup analyses had to be provided for these criteria); (2) the article described any intervention or components of interventions, aimed at enhancing work participation; (3) if applicable, the control group consisted of healthy individuals or cancer survivors that received care as usual; and (4) studies had to be aimed at any outcome measures related to work participation (i.e., either time- or status-based). Participants were considered eligible if they were unemployed or work-disabled. Unemployment was defined as not having an employment contract, including both cancer survivors who lost their job before and after diagnosis. Work disability was defined as a temporary or a sustainable form of not working, measured by concepts such as: disability pension, long-term sick leave, work cessation, or work incapacity.

We applied this broad definition because work disability is a concept often defined by a respective country's legislative and insurance systems. For example, Dutch employers are legally obliged to continue paying at least 70% of the

employee's last salary during the first two years of sick leave, including job protection. After two years of sick leave, the worker's disability is assessed by a specialised physician on the basis of the worker's relative earning capacity and the worker will be assigned disability benefit in case of a loss of earning capacity of 35% or more. In the United States for example, on the other hand, social security is limited, due to which cancer survivors can automatically become unemployed when they are no longer able to perform their job, thereby becoming (temporarily) work disabled. There were no restrictions to language or publication date. Qualitative studies, conference abstracts, (systematic) reviews, editorials, biographies, letters and directories were excluded.

### Selection process

ASReview, i.e., a machine learning tool for systematic reviews, was used for screening [34]. This tool requires users to specify relevant and irrelevant papers, related to a specific research question, to train its algorithm. A total of 1000 articles were therefore screened for their relevance by the first author (FvO) in ASReview, after which the tool generated a ranking, predicting the relevance of all references from the database search. This ranking was used to screen titles and abstracts using the Rayyan online tool (rayyan.ai), which was done by two authors (FvO and PC), using aforementioned eligibility criteria. Based on a previous study on the effectiveness of semi-automated screening tools (including ASReview) [35] and based on researchers' consideration, we decided that after 50 consecutive irrelevant articles, all following articles are unlikely to be relevant and should be excluded. Full texts of potentially eligible articles were retrieved and independently screened by two authors (FvO and PC). Discrepancies between the authors during both steps of the selection process were discussed, until consensus was reached. Manual for-and-backward citation searching was applied to the included articles on 11 February 2022 to search for additional articles.

### Data extraction

The following data were extracted independently by two authors (FvO and PC), using a predesigned table: 1) general information (e.g., author, country); 2) patient- and diagnosis-related characteristics (e.g., age, sex, diagnosis); and 3) study characteristics (e.g., design, type of intervention, primary outcome measure, main findings). Disagreements between both authors were discussed, until consensus was reached. Authors of articles with unclear or incomplete data, were contacted to retrieve additional information.

### Risk of bias assessment

The quality of the included studies was assessed independently by two authors (FvO and PC), using the Cochrane RoB2 risk-of-bias tool for randomised controlled trials (RCTs) and the Quality In Prognosis Studies (QUIPS) tool for cohort studies [36,37]. Both authors' assessments were compared and discussed, until consensus was reached.

The domains of each tool can be found in Figure 2. For the RoB2 tool, trials were considered low risk of bias if all domains were judged as low, and high if at least one domain was rated as high [38]. In all other cases, trials had an unclear risk of bias. For the QUIPS tool, studies were considered low risk of bias when all six domains were rated as low or moderate, with at least four domains, including at least the outcome measurement, rated as low. When two or more domains were scored as high, the study had a high risk of bias. In all other cases, studies were rated as moderate. Independent of their quality, all articles were included in this review.

### Data synthesis

Based on the expected heterogeneity of the articles, we provided a narrative synthesis of the main findings. The synthesis of this review was structured around four types of interventions: (1) psycho-educational (i.e., counselling aimed at negative psychological consequences of cancer and its treatment), (2) vocational (e.g., work modifications or communication between different stakeholders at work),(3) physical (i.e., decreasing negative physical consequences of cancer and its treatment), and (4) multicomponent interventions (i.e., combining elements from different types of interventions, often within different disciplines) [24].

## Results

### Study selection

The initial search identified 9690 articles, of which 3259 were duplicates. Based on the predefined stopping criterion of 50 consecutive irrelevant papers, 83 articles were screened on title and abstract. In total, 31 articles were selected for full-text screening, of which five were included [39–43] (Figure 1). The updated search identified another 1081 articles, which were screened manually on title and abstract. Six articles were selected for full-text screening, but none of these met the inclusion criteria.

### Study characteristics

The included articles were published between 2008 and 2021, included a total of 1862 cancer survivors (predominantly breast cancer) and were conducted in the United States of America, the United Kingdom, the Netherlands and Australia (Table 1). The articles include one RCT and one feasibility RCT (addressed as two RCTs), in which questionnaires were used to gather self-reported information on work participation, and three cohort studies of which one used data from an insurance claim registry, and two used data from the Rehabilitation Services Administration database [39–43]. The last two studies use data from a single registry, but focussed on different study samples and used data collected at different time points. That is, in one study,

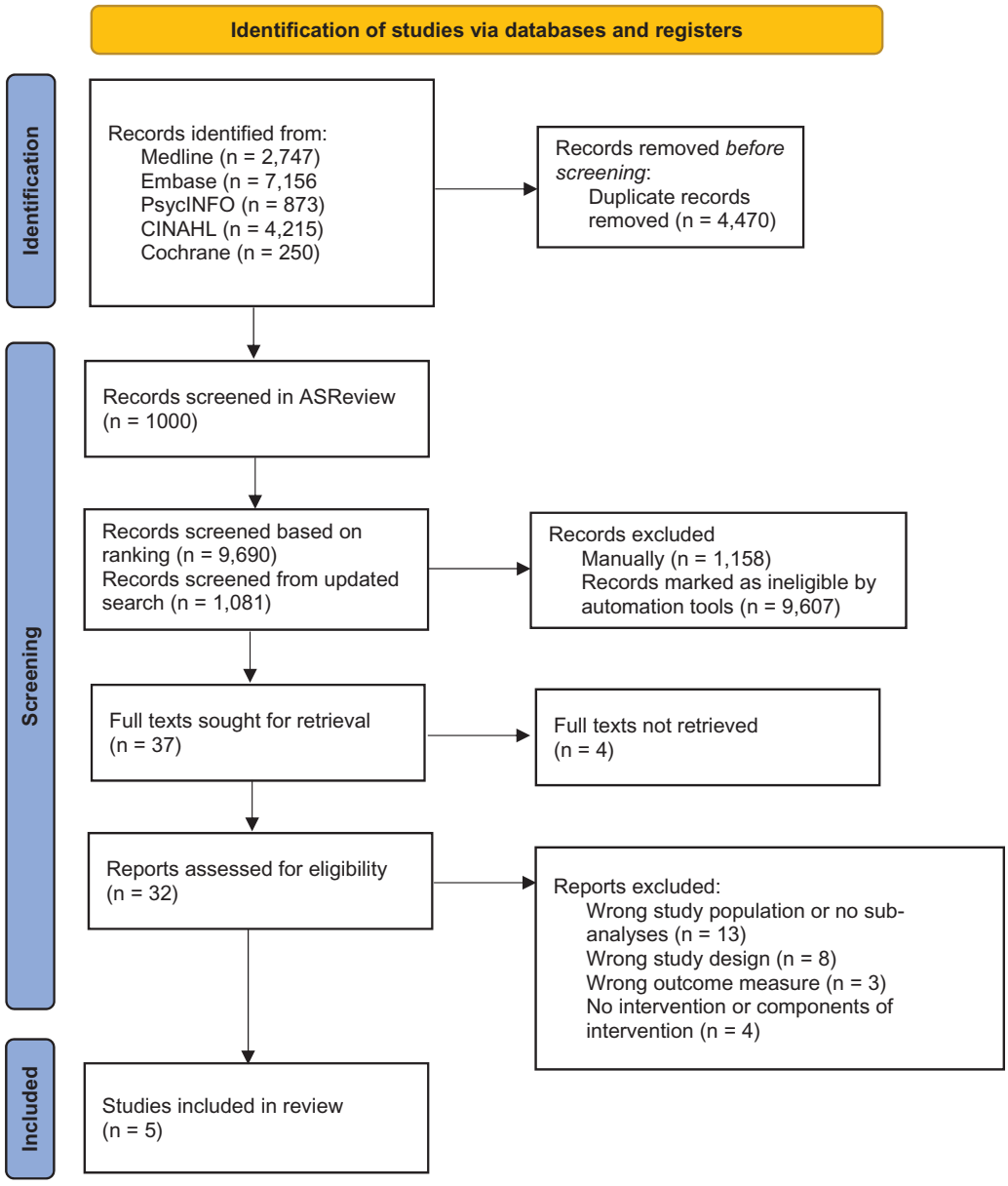


**Figure 1.** PRISMA flowchart of study selection and screening.

participants of working age were included of whom data were obtained in 2005, while in the other study, participants aged 18–25 were included of whom data was obtained in 2004 and 2005. Findings on these two samples cannot be combined and were therefore included as separate studies.

In the RCTs and one cohort study, intervention programs were described aimed at improving work participation, whereas in the two other cohort studies that used data from the same register findings were presented on the association between intervention components and work participation (Table 2). Work participation was mainly defined as RTW rate ($n = 5$) and time to RTW ($n = 3$). In the cohort studies on intervention components, RTW rates were defined as the percentage of participants that found competitive employment. Competitive employment was defined as jobs in which the cancer survivors has an employment contract for which they receive a compensation, typically in the form of wage or salary, independent of the revenue of the unit for which they work (e.g., a corporation, a non-profit institution, or a government unit) [44].

### Risk of bias

Both RCTs had an unclear risk of bias (Figure 2) [39,40]. One cohort study had a moderate risk of bias, because of a moderate score on three out of six domains, and two cohort studies had a low risk of bias due to low scores on four domains, including the outcome measure [41–43]. The complete risk of bias assessment can be found in Supplementary Appendix B.

### Results of individual studies

In the RCTs and one cohort study, two multicomponent interventions and one psycho-educational intervention were identified. In the other cohort studies, intervention

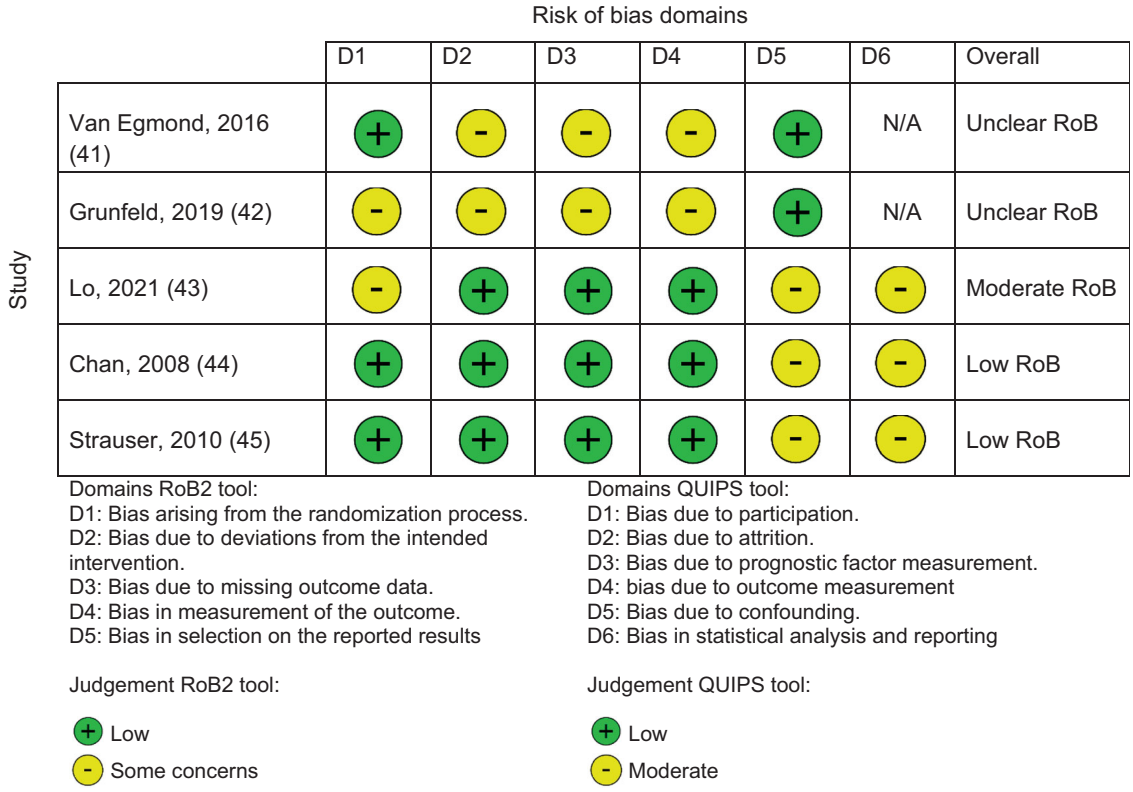


**Figure 2.** Summary risk of bias assessment.

components such as job search assistance, job placement assistance and counselling and guidance, were analysed for their association with work participation. As neither physical interventions nor their components were identified, this category was omitted. Furthermore, although the registry included a wide range of intervention components, the studies did not include all of them for analysis. Next to the interventions in the RCTs and cohort study, a total of 15 intervention components are addressed in this review (Table 3) [42,43]. In one study, intervention components were included in the authors' analysis which were received by at least 5% of the cancer survivors [42], and in the other study, the authors made a selection of intervention components which they thought were relevant to include in the analysis [43].

### *Psycho-educational interventions*

In one cohort study, with moderate risk of bias, a psychological coaching intervention was offered through an eHealth application [41]. The application provided participants with insights into their condition, treatment options and access to a community of cancer survivors in a similar situation. Additionally, tailored coaching sessions together with weekly messages were offered to assist participants in their needs. Propensity score matching of unemployed cancer survivors that received this intervention revealed higher RTW rates after the intervention (30.4%) compared to a similar cohort that received care as usual (17.6%) ($p = .02$). There were no differences in duration until RTW between the two groups.

### *Vocational interventions*

In two cohort studies, with low risk of bias, vocational intervention components that were analysed include job search assistance [42,43], job placement assistance [42,43], miscellaneous training [42,43], vocational rehabilitation counselling and guidance [42], vocational training [42,43], on-the-job support [42,43] and information and referral services [42]. Receipt of job search assistance, job placement assistance and miscellaneous training were associated with finding competitive employment with odds ratios varying between 1.4 and 3.9 (44, 45). Additionally, vocational rehabilitation counselling and guidance was associated with finding competitive employment [42]. Vocational training and on-the-job support improved the odds of finding competitive employment in one study [43], but not in the other [42]. Information and referral services was the only intervention component negatively associated to finding competitive employment [42].

### *Multicomponent interventions*

The multicomponent intervention described in one of the RCTs consisted of a 'preparation for RTW' and an 'actual RTW phase' [39]. The preparation phase was provided by a re-integration agency specialised in oncology, who provided tailored support (e.g., physical or psycho-educational therapy and skill training), and made a RTW plan together with the participant. The actual RTW phase was given by a job hunting agency who explored the participant's job opportunities and actively searched for a job. Differences between the intervention and a control group receiving care as usual were not statistically significant (24.7% vs. 20.9% returned to work, respectively). Additionally, when adjusted for potential confounding

**Table 1.** Study characteristics.

| Author, year (ref) | Country | Design | Follow-up time | N | Age (years) | Female (%) | Education level | Diagnosis[a] | Treatment[b] | Employment status at time of diagnosis |
|---|---|---|---|---|---|---|---|---|---|---|
| Van Egmond, 2016 [39] | The Netherlands | Randomised controlled trial (with self-report questionnaires) | 1 year | 171 (IG: 85; CG: 86) | M: 48.4 SD: 8.6 | 69 | 18% None/primary<br>16% Lower secondary<br>35% Upper secondary<br>31% Higher | 40% Breast<br>13% Hematological<br>47% Other | Surgery (73%)<br>Chemotherapy (64%)<br>Radiotherapy (49%)<br>Hormone therapy (28%) | 56% Temporary contract<br>44% No employment contract |
| Grunfeld, 2019 [40] | United Kingdom | Feasibility randomised controlled trial (with self-report questionnaires) | 1 year | 58 (IG: 38; CG: 30) | M: 50.8 Range: 25–65 | 79 | 1% Primary<br>34% Lower secondary<br>15% Upper secondary<br>50% Higher | 50% Breast<br>15% Gynaecological<br>16% Prostate<br>19% Colorectal | N/A | Working |
| Lo, 2021 [41] | Australia | Retrospective cohort study (registry data) | 2 years | 250 (IG: 125; CG: 125) | IQR IG: 45–58 CG: 47–59 | IG: 91 CG: 94 | N/A | 57% Breast<br>13% Colon<br>24% Other | N/A | Working |
| Chan, 2008 [42] | USA | Cohort study (registry data) | N/A | 1201 | M: 4 SD: 14.1 | 53 | 2% Special<br>20% Primary<br>40% Lower secondary<br>27% Upper secondary<br>11% Higher | N/A | N/A | N/A |
| Strauser, 2010 [43] | USA | Cohort study (registry data) | N/A | 368 | M: 21.5 SD: 2.4 | 43 | 6% Special<br>33% Primary<br>43% Lower secondary<br>17% Upper secondary<br>1% Higher | N/A | N/A | N/A |

*Note:* N: number of participants; IG: intervention group; CG: control group; M: mean; SD: standard deviation; IQR: interquartile range; N/A: not available.
[a]Type of cancer was only reported when the percentage of participants was 10% or higher.
[b]Treatment was only reported if the percentage of participants was 10% or higher.

**Table 2.** Results of individual studies.

| Author, year (ref) | Type of intervention | Intervention (components) | Outcome measures | Results |
|---|---|---|---|---|
| Van Egmond, 2016 [39] | Multicomponent intervention | IG:<br>Two parts: preparation for RTW and RTW<br>Introductory interview with integration coach<br>Focus on job readiness<br>Developing RTW plan<br>Placement in therapeutic or paid work<br>Maximum intervention duration of 3 months<br><br>CG: CAU | Duration until sustainable RTW (working ≥28 days) and RTW rate. | Intention to treat analyses:<br>HR 'duration until sustainable RTW' (IG vs CG): 0.86 [0.46–1.62]<br>IG returned to work earlier than CG (HR 1.11; [0.57–2.19]).<br>IG improved in duration until sustainable RTW compared to CG (HR 1.16; [0.59–2.31]).<br>RTW rates at 1 year follow-up: 22.8%in total; 24.7% in IG, 20.9% in CG.<br>Per protocol analyses:<br>1. CG and participants who started intervention (crude HR 0.75; [0.38–1.47) and (HR 1.02; [0.49–2.12]).<br>2. CG and participants who finished intervention (crude HR 1.32; [0.65–2.68]), adjusted HR: 1.49; [0.70–3.17]) |
| Grunfeld, 2019 [40] | Multicomponent intervention | IG: Four week guided workbook intervention with structured sections and activities providing guidance and support Thinking about illness and treatment Setting and achieving goals Building confidence Developing an action plan for RTW CG: CAU (clinical care and optimal symptom management) | Time to RTW, number of days worked and RTW rates at 6 and 12 month follow-ups. | No significant differences in time to RTW between CG (M: 308 days, SD: 74) and IG (M: 333 days. SD: 153).<br>No significant differences in number of days work per month between the IG at 6 (M: 8.9, SD: 9.2) and 12 (M: 12.4, SD: 7.9) month follow-up and the CG at 6 (M: 5.7, SD: 8.7) and 12 (M: 11.5, SD: 10.1) month follow-up.<br>RTW rates were 30% (CG) and 43% (IG) at 6-month follow-up and 47 (CG) and 68% (IG) at 12-month follow-up but were not included in statistically significant differences. |
| Lo, 2021 [41] | Psycho-educational intervention | IG:<br>1. eHealth app delivered in a real-world setting: coordination of care, insight in condition, treatment options and CS community. Monitor symptoms, diet, exercise, sleep, etc.<br>2. Three telephone health coaching sessions in 12 weeks. Coaches offer interventions tailored to needs and current stage of patient and use principles of behavioural change theories.<br>3. Weekly messages *via* email and text.<br>CG: CAU | RTW rate | RTW rates were significantly higher in IG (30.4%) than in CG (17.6%).<br>RTW rates for survivors only were also significantly higher in IG (33.9%) than in CG (20.8%).<br>RTW rate two years after diagnosis was 33.1% [22.4–42.3] for IG vs. 22.6 % [12.3–31.8] for CG.<br>The median time for the first 15% to RTW was 70.6 weeks [52.6–79.6] for IG vs. 87.1 weeks [60.0–109.1] for CG. |
| Chan, 2008 [42] | A variety of intervention components | Counselling and guidance<br>Job search assistance<br>Information and referral<br>Job placement assistance<br>On-the-job supports<br>College or university training<br>Job readiness training<br>Vocational training<br>Miscellaneous training<br>Rehabilitation technology<br>Transportation services | Competitive employment (employment in an integrated setting, self-employment, or employment in a state-managed Business Enterprise Program) | 57% of unemployed CSs achieved competitive employment after receiving services.<br>Competitive employment was not associated with college or university training, job readiness training, vocational training, on-the-job supports, transportation services, rehabilitation technology, assessment, and diagnosis and treatment of impairments (no effect sizes reported).<br>Competitive employment was associated with:<br>Counselling and guidance (OR: 1.33, [1.02–1.73]) |

(*continued*)

**Table 2.** Continued.

| Author, year (ref) | Type of intervention | Intervention (components) | Outcome measures | Results |
|---|---|---|---|---|
| | | Assessment<br>Diagnosis and treatment of impairments<br>Maintenance services<br>Other services | | Job search assistance (OR: 1.43, [1.02–2.01])<br>Information and referral (OR: 0.63, 0.43–0.94])<br>Job placement assistance (OR: 2.37, [1.72–3.27])<br>Miscellaneous training (OR: 1.61, [1.06–2.44])<br>Maintenance (OR: 1.92, [1.29–2.86])<br>Other services (OR: 1.43, [1.06–1.90])<br>Competitively employed participants spent less time in services ($M = 26.82$ months, SD = 25.58 months) than non-employed ones ($M = 31.93$ months, SD = 25.91 months).<br>Employed participants received more services ($M = 4.36$, SD = 2.10) than non-employed ones ($M = 3.63$, SD= 2.08) |
| Strauser, 2010 [43] | A variety of intervention components | Job search assistance<br>Job placement assistance<br>On-the-job supports<br>Vocational training<br>Maintenance services<br>Miscellaneous training<br>Transportation services | Competitive employment (employment in an integrated setting, self-employment, or employment in a state-managed Business Enterprise Program). | 51.6% of unemployed CSs who received services achieved competitive employment.<br>Transportation services was not associated with competitive employment (no effect size reported).<br>Competitive employment was associated with:<br>Job search assistance (OR: 3.85, [1.77–8.36])<br>Job placement assistance (OR: 2.24, [1.11–4.52])<br>On-the-job supports (OR: 4.20, [1.66–10.63])<br>Vocational training (OR: 2.03, [1.03–4.01])<br>Maintenance (OR: 2.85, [1.38–5.90])<br>Miscellaneous training (OR: 3.40, [1.47–7.86])<br>Competitively employed participants spent more time in ($M = 41.89$ months, SD = 28.25 months) than non-employed ones ($M = 34.26$ months, SD = 28.29 months). Employed participants received more services ($M = 4.41$, SD = 2.02) than non-employed ones ($M = 3.35$, SD =2.10). |

*Notes:* An odds ratio higher than 1 indicates that people were more likely to be employed and an odds ratio lower than 1 indicates that people were less likely to be employed. IG: intervention group; CG: control group; CAU: care as usual; N: number of participants; M: mean; SD: standard deviation; RTW: return to work; CSs: cancer survivors; HR: hazard ratio; CI: confidence interval; OR: odds ratio.
Confidence intervals were only reported in case information was available in the original articles.

Table 3. Definition of intervention components.

| Intervention component | Description |
|---|---|
| Vocational rehabilitation counselling and guidance | Counselling and guidance necessary to achieve an employment outcomes such as vocational counselling or counselling that addresses medical, family or social issues. |
| Job search assistance | Any activities to help the cancer survivor search for an appropriate job such as support in making a resume, finding appropriate jobs, and developing interview skills. |
| Information and referral services | Any services provided from external agencies that are usually not a part of the intervention program. |
| Job placement assistance | Any referral leading to a job interview, independent of whether a person got the job or not. |
| On-the-job supports | Support after being placed in a job in order to make the placement sustainable and to enhance job retention. |
| College or university training | Any academic training above high school level leading to a degree, certificate or other recognised credential. |
| Job readiness training | Any training to prepare an individual for being an employee such as a behavioural training or training to increase productivity. |
| Vocational training | Any training to prepare students for gainful employment without the training leading to an academic degree or certification. |
| Miscellaneous training | Any training that does not belong to the other categories. |
| Rehabilitation technology | Any type of technological assistance a person needs in a variety of areas (e.g., education, rehabilitation, employment). |
| Transportation services | Anything to enable the cancer survivors to travel such as travel expenses or training in the use of public transport. |
| Assessment | Any activity to determine whether someone should receive rehabilitation services and whether they are priority such as trial work experiences and extensive evaluations. |
| Diagnosis and treatment of impairments | A variety of medical support such as surgery, prosthetics and orthotics, physical therapy. This category also includes diagnosis and treatment of mental and emotional disorders. |
| Maintenance services | Financial support for costs such as food, shelter and clothing additional to the usual expenses needed to participate in an intervention or during receipt of an intervention. |
| Other services | All other type of intervention components that do not belong to any of the other categories. |

*Note:* This table only describes interventions that were included in the analyses.

variables, the intervention group had a small, but non-significant, improvement in duration until sustainable RTW compared to the control group (hazard ratio 1.16, 0.59–2.31).

In the other RCT, feasibility of a multicomponent self-management intervention was evaluated with topics of processing the illness and treatment, goal setting, achieving goals and building confidence [40]. Evaluating the effectiveness was not the purpose of this study. Also, an underpowered sample was intentionally included. Participants in the intervention group developed an action plan for RTW, which did not result in any statistically significant differences between the two groups in duration until RTW and number of days worked per month at 6- and 12-month follow-up [40]. Even though differences in RTW rates were not evaluated in a statistical analysis, higher RTW rates were found for participants in the intervention group compared to care as usual, at both 6 (43% vs. 30%) and 12 (68% vs. 47%) months follow-up.

Due to the variety of services classified as maintenance services, this was categorised as a multicomponent intervention (Table 2). Receipt of maintenance services was associated with finding competitive employment in both cohort studies on intervention components [42,43].

### *Other*

Support in technology, referred to as 'rehabilitation technology', was associated with finding competitive employment [42] in one cohort study.

## Discussion

### *Main findings*

In this systematic review, we identified five studies on interventions and intervention components aimed at enhancing work participation of unemployed and work-disabled cancer survivors. Two multicomponent interventions were evaluated in RCTs, of which one was a feasibility RCT, and neither showed significant effects on RTW rates nor time to RTW, compared to care as usual [39,40]. In a cohort study, however, an effect of a psycho-educational intervention on RTW rates was found [41]. Regarding intervention components, two other cohort studies reported significant associations between job search assistance, job placement assistance, on-the-job support, miscellaneous training, maintenance services and vocational training [42,43], and work participation.

### *Interpretation of findings*

Although many interventions have been developed to enhance work participation of employed cancer survivors [24,26,30], only a few interventions and intervention components could be identified aimed at unemployed or work-disabled cancer survivors. We found no evidence that multicomponent interventions are effective in enhancing work participation of unemployed or work-disabled cancer survivors. In addition, existing evidence on the effectiveness of multicomponent interventions for work participation of employed cancer survivors is contradicting. While in one review on employed cancer survivors, moderate quality evidence was found that multicomponent interventions can improve RTW [24], another review on the same group concluded that multicomponent interventions with more than two components were not effective [45]. A systematic review on work participation of people with musculoskeletal, pain-related and mental health conditions by Cullen et al. provided strong evidence for the effectiveness of multicomponent interventions, while single component interventions were not effective [46]. In the current review, many intervention components identified in cohort studies were associated with higher RTW rates [42,43]. Combining such effective intervention components into a

multicomponent intervention could be effective to improve work participation of unemployed or work-disabled cancer survivors, but should be assessed in future research.

Based on findings in this review, conclusions can only be drawn about *associations* between intervention components and work participation. Whether receipt of a specific intervention component, as assessed in the cohort studies, has an actual *effect* on work participation is unclear, and can only be measured in an RCT. While the interventions studied in the included RCTs were not effective, they did include components that were associated with work participation in the cohort studies. Whether such standalone intervention components contribute to work participation can be assessed with a process evaluation along an RCT. In the process evaluation of van Egmond et al. it was shown that less than half of the participants in the intervention group received the intervention according to protocol [39]. Main barriers included a lack of communication, short program duration and high program intensity [47]. Such a process evaluation lacks for the intervention of Grunfeld et al. making it unclear whether participants complied to the protocol [40]. It is therefore unclear whether the lack of effectiveness in these RCTs was caused by a lack of protocol compliance, implementation failure or an actual ineffective intervention. Additionally, the risk of bias analysis of these two studies revealed concerns related to deviations from the protocol, but also missing outcome data and measurement of the outcome. Attrition rates were around 25% in both studies and both studies used self-reported outcome measures. It was unclear whether assessment of the outcomes could have been influenced by knowledge of the intervention received. Together, this might have contributed to unreliable results for the effectiveness of both interventions.

So far, studies on the effectiveness of psycho-educational interventions on work-related outcomes of employed cancer survivors are scarce and of low quality [24]. Purcell et al. [48] found no effect of pre and post radiotherapy education on work outcomes of occupationally active cancer survivors [48]. In another study, it was found that a group education intervention, aimed at increasing cancer knowledge, was only effective in enhancing work participation when a group discussion was added to the program [49]. In a study including unemployed adults on sick leave for different reasons, psycho-education was suggested to be one of the basic characteristics within the range of effective RTW interventions [50]. In this review, we identified a positive effect of a psycho-educational intervention on RTW rates of unemployed cancer survivors [41]. It is unclear whether disparities in results on psycho-educational interventions are due to the unemployment status of participants in this review or due to different outcome measures or study designs of existing evidence.

Associations between intervention components and RTW rates differed between studies [42,43]. That is, vocational training and on-the-job support were associated with competitive employment in one study [42], yet not in the other [43]. These differences could be explained by differences in age between the two study samples, with a specific focus on unemployed cancer survivors between the age of 18 and 25 in the first study. It could be that vocational training and on-the-job support is more effective in this age group, which is, however, hard to determine from a cohort study on registry data. The differences in results confirm that more attention should be paid to providing interventions that people actually need and benefit from. Therefore, participant characteristics, such as age, should be considered when enhancing work participation. The association between a cancer diagnosis at a younger age and work outcomes has received attention in several studies [51–53], but in these studies, no comparison was made between the effectiveness of interventions aimed at enhancing work participation of younger and older cancer survivors.

Many intervention components associated with RTW rates were related to the process of finding or maintaining work, such as job search and job placement assistance. This is in line with previous studies recommending that interventions aimed at enhancing work participation of employed people with chronic diseases (including cancer) should be directed at the person's work [30,45,54]. As unemployed cancer survivors do not have a workplace to start with, interventions should focus on searching a suitable job for them as soon as possible, followed by on-the-job support, e.g., accommodating the workplace to the needs of the cancer survivor [55].

### Strengths and limitations

A strength of this review is its comprehensive search and screening process. We applied semi-automated screening by ASReview, and herewith contributed to a more efficient and accurate search and selection strategy and diminishing the risk of researcher mistakes [35]. Additionally, the review has a broad perspective, e.g., we included both interventions and intervention components and adopted a broad definition of work participation. This allowed us to present a more comprehensive overview of what might be useful in enhancing work participation of unemployed and work-disabled cancer survivors. Related to this, the broad definition of work participation may be considered a limitation, i.e., higher heterogeneity in outcome measures, which are difficult to synthesise [56]. Further, in the RCTs and cohort study, mostly female participants were included. As being female is negatively associated with RTW of employed cancer survivors [20], the generalisability of these studies' findings to male participants is unclear.

### Implications for research and practice

Even though the vulnerable group of unemployed or work-disabled cancer survivors has not been studied thoroughly yet, more research on this group is currently being performed[57]. Researchers and practitioners should consider the wide range of intervention components that were associated with work participation in our review, and select those supporting the needs of individuals to compose a multicomponent intervention. We encourage to include at least components directed at work and that include the workplace. For this specific population, this means to support them in

finding a suitable job as soon as possible, followed by the necessary on-the-job support. Additionally, the effectiveness of these interventions should be evaluated using an RCT design and more attention needs to lie on protocol compliance and intervention evaluation in an extensive process evaluation. Finally, we encourage the development of a standard set of outcome measures related to work participation, in order to enhance the comparability between the effectiveness of individual interventions.

## Conclusion

Only few interventions, aimed at enhancing work participation of unemployed or work-disabled cancer survivors, have been evaluated. In two cohort studies, promising components for future multicomponent interventions were identified. However, findings suggest that more evidence is necessary on such multicomponent interventions, in which elements explicitly directed at work and including the workplace should be included.

## Registration and protocol

The study protocol was registered in PROSPERO (registration number: CRD42022310011) [33].

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## Data availability statement

All available data have been reported in either tables or supplementary files in this manuscript.

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