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Influence of significant others on work participation of individuals with chronic diseases: a systematic review

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ABSTRACT

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Introduction: It is widely recognized that significant others (SOs), such as a partner, family member or friend, can influence health outcomes of individuals with a chronic disease. However, not much is known about which specific cognitions and behaviours of SOs influence work participation. In this systematic review we aim to identify cognitions and behaviours of SOs that are related to work participation of individuals with a chronic disease.

Methods: Relevant articles were identified in PubMed, Embase, PsycINFO, SocINDEX and Web of Science. We included studies reporting on SO-factors related to work participation in populations with various chronic diseases. A quality assessment was performed, and evidence was thematically synthesised.

Results: Out of 5,168 articles, 18 were included (15 qualitative and 3 quantitative) of moderate to high quality. Studies were on cancer, chronic pain, brain injuries and mental health disorders. After thematic synthesis 27 factors could be distinguished. Consistent evidence was found that SOs' positive and encouraging attitudes regarding work participation, encouragement and motivating behaviour, and open communication with patients are facilitators for work participation. Consistently reported barriers were SOs' positive attitudes towards sickness absence and advise, encouragement or pressure to refrain from work.

Discussion: Our findings show that several cognitive behavioural factors of SOs can facilitate or hinder work participation of individuals with a chronic disease. Intervening on these factors by involving SOs in disability prevention and return to work intervention strategies may be beneficial. More prognostic studies are needed, as the current evidence is mostly based on qualitative studies.

Strengths and limitations of this study

- To our knowledge this is the first systematic review to provide a comprehensive overview of the current knowledge on specific cognitions and behaviour of significant others that may influence work participation of individuals with a chronic disease.
- A methodological strength is the systematic search of the literature in five relevant databases, with an additional reference check.
- This review is limited to English articles; articles in languages other than English were excluded.
- Due to the small number of available quantitative studies it was not possible to perform a meta-analysis.

INTRODUCTION

Cognitions and behaviour of significant others (SOs) can play an important role in health outcomes of individuals with a chronic disease[1–6]. In the clinical setting it has been shown that the behaviour of a partner, family member or close friend can have either detrimental or favourable effects on perceived symptoms and behaviour of individuals with a chronic disease, thereby influencing recovery, treatment effects, quality of life and disability[3–5]. Although it is widely recognized that SOs can also influence work participation of individuals with a chronic disease, for instance through social support[7–11], research on the influence of SOs on work outcomes is scarce. Despite increasing evidence that behaviours and beliefs of SOs are important for work outcomes[7–11], not much is known about which specific cognitions or behaviours of SOs influence work participation of their relatives and friends.

A rationale for the influence of SOs on work participation can be found in cognitive behavioural models, which propose that a person’s cognitions (beliefs, perceptions and attitudes) generate behavioural and emotional responses to illness events and guide coping strategies[3,12–14]. There is evidence that behaviours of SOs influence the behaviour and consequently health and work outcome of individuals with a chronic disease[15–17]. Illness perceptions held by SOs–consisting of perceptions and beliefs concerning the disease–have been proposed to be a mechanism through which SOs may influence work participation[15,17]. In this context, several studies have described that SOs can reinforce an individual’s unhelpful cognitions about illness, such as beliefs about limitations due to the disease, mistaken beliefs about the nature of illness, pessimistic beliefs regarding the outcome of treatment, and the unlikelihood of returning to work[18,19].

In occupational health care, there is a growing notice that the role of SOs may be an essential target in occupational health services and that the mechanisms described here can be used in practice[20]. As there is evidence that clinical health care interventions in which SOs are involved are more effective than care as usual where SOs are not involved[21–24], this may also prove to be beneficial in occupational health care. In recent years, the focus in health care has shifted to self-management and adapting to a disease[25]. Therefore, in the Netherlands the role of the Occupational Physician has recently been extended[26]. Aside from being responsible for the return to work (RTW) process of sick-listed workers, they have the responsibility to support workers to cope with problems due to disease and to empower them to manage their own health and wellbeing to prevent sickness absence[25,26]. In this context, professionals should support workers to use their own resources to successfully adapt to a disease and to enable them to work[25]. One resource that may be used to support individuals with a chronic disease to participate in work is their network of SOs.

Although it is recognized that SOs can influence workers' recovery and work outcome[1,27,28], more research is needed to determine which specific cognitive behavioural factors in the social environment influence work participation and should therefore be taken into account in occupational health care. Therefore, in this systematic review we aim to identify cognitions and behaviours of SOs that are related to work participation of individuals with a chronic disease. Investigating which SO-related factors are associated with work participation of individuals with a chronic disease may increase our understanding of staying at work and RTW processes, which can be applied in occupational health interventions to facilitate work participation.

METHOD

Search strategy

We conducted a search in PubMed, Embase, PsycINFO, SocINDEX and Web of Science (inception of databases to April 2017). When available, subject headings such as MeSH terms in PubMed were used, in addition to free text words. Four main categories (1. chronic illness, 2. work participation, 3. SOs and 4. SOs' cognitions and behaviours) were combined with the Boolean operator 'AND' to identify studies (Supplementary file: Text S1). Additionally, we conducted a reference check to identify additional studies not retrieved through database searching.

Selection of studies

The article selection was performed in three phases by two independent reviewers (NS, HdV). In the first phase, articles were excluded based on title. Secondly, articles were excluded based on abstract. In the third phase the reviewers selected articles for final inclusion based on full text appraisal. To be included, articles had to meet the following criteria: (i) the study population consisted of subjects with a chronic illness or their SOs; (ii) the subjects were 18-67 years old (working population); (iii) the study examined sickness absence, work disability, unemployment, RTW or staying at work as the outcome; (iv) at least one of the independent variables investigated concerned cognitions or behaviour of a SO (a close family member, close friend, spouse or partner) and (v) the article was written in English. Studies were excluded when both reviewers considered that these did not fulfil the inclusion criteria. Disagreements regarding inclusion were resolved by consensus. If no consensus was reached or in case of doubt, the article was screened by the other authors and discussed to reach consensus.

Data extraction

Two reviewers (NS, HdV) independently extracted the data from all selected studies using an adapted version of the Cochrane Data collection form for intervention reviews on RCTs and non-RCTs[29]. The following information was extracted from every included study: study design; study objectives; diagnosed condition; general description of subjects including age, gender and additional details; outcome measures; type of SO; investigated or identified cognitions or behaviour of SOs; and relation with the studied work outcome.

Assessment of quality

The quality of included quantitative studies was assessed using the Quality Assessment Tool for Quantitative Studies from the Effective Public Health Practice Project 2007, recommended by Cochrane[30,31]. This tool is suitable for assessment of studies of any quantitative design. Two reviewers (NS, HdV) used this tool to rate studies on selection bias, study design, confounders, blinding, data collection method and withdrawals and dropouts (Supplementary file: Table S1). Based on these criteria, quality was rated as low when two or more components had weak ratings, moderate when one component had a weak rating and strong if there were no weak ratings.

The quality of included qualitative studies was independently assessed by two reviewers (NS, HdV) using a checklist with criteria for assessment of qualitative studies derived from the Cochrane Supplemental Handbook Guidance[32]. This checklist identified credibility, transferability, dependability and confirmability (Supplementary file: Table S2). Based on these criteria, studies were rated as having high quality if all criteria were met; moderate if flaws were identified in one or more criteria that raised some doubt about the results; and low when flaws were identified in one or more criteria that seriously weakened confidence in the results.

Evidence grading

For each individual outcome, the body of evidence was assessed using the GRADE approach[31]. In grading the evidence, qualitative studies were not considered. The initial level of evidence was determined by study design, after which the level of evidence may have been downgraded depending on the presence of five factors or upgraded depending on the effect size (Supplementary file: Box S1).

Data synthesis

As it was expected that most studies would be of qualitative nature, a thematic synthesis[33] was conducted, with a separate synthesis of results for quantitative and qualitative studies. This method is often used to analyse data in primary qualitative research to integrate the findings of multiple qualitative studies. The thematic analysis consisted of three stages: line-by-line extraction of the data, developing descriptive themes, and generating analytical themes. In the first stage, the relevant findings of the studies were extracted, including the association with the studied work outcome. In the second stage, the findings were grouped together to form various descriptive themes. Finally, in the third stage, the descriptive themes were grouped together by type of factor (cognitions or behaviour).

RESULTS

Selection of studies

The search of the databases identified 5,168 articles, excluding duplicates (Figure 1). After screening on titles and abstracts, 117 articles remained for possible inclusion. Reference checks identified 18 additional studies, resulting in a total of 135 articles for full-text assessment. After full-text screening, 117 studies were excluded. The main reason for exclusion was that no cognitions or behaviours of SOs were identified or discussed. Other reasons for exclusion were that studies did not examine any work outcome; did not focus on workers with a chronic disease; or the study population was not of working age. Five articles were discussed within the team in order to reach consensus. The first author of one article was contacted for additional information to allow making a decision. Finally, 18 articles met the criteria for inclusion and were assessed for quality.

Study characteristics

The main characteristics of the included quantitative and qualitative studies are respectively presented in Tables 1 and S3 (Supplementary file). The reported cognitions and behaviours of SOs are presented with the direction of its association with the studied work outcome.

Studies with various populations were included, mostly involving somatic diseases including various types of cancer, chronic pain and brain injuries. However, one study focused on individuals with severe and persistent mental illnesses. Within the included studies, participants' age ranged from their early twenties to their late sixties.

Three quantitative studies (one cross-sectional, one retrospective and one prospective cohort study) and 15 qualitative studies were included. One quantitative study focused primarily on the influence of behaviours of SOs on work participation of individuals with a chronic disease, while in the other two studies the influence of behaviours and cognitions of SOs on work participation was one of several factors being investigated. In all three studies the study population consisted of individuals with a chronic disease, no SOs were part of the study sample. Of the qualitative studies, seven studies focused primarily on the role of SOs regarding work participation of individuals with a chronic disease. The other eight qualitative studies did include findings on this topic, but it was not the primary focus of the study. In five qualitative studies interviews were conducted with SOs, whereas in the other studies the study population consisted only of individuals with a chronic disease.

Table 1. Characteristics of included quantitative studies

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Balswick 1970[36] USA, Iowa	Cross-sectional	To examine the relationship between spouse companionship support and the degree of vocational rehabilitation success on the part of a handicapped spouse	245 predominantly white participants diagnosed with a physical or mental handicap with a mean age of 36 years and an average education of 12 years.	Spouse	Employment success (proportion of time that the patient was employed fulltime during the previous year)	Participating in the patient's life outside the job (only for those patients having had twelve or more years of education) $\chi^2=6.34$ ($p<0.01$) Providing more "dubious" support: expressing concern about the handicap, encouraging the patient in work, talking with the patient about goals and plans (among those subjects with an education under 12 years) $\chi^2=4.57$ ($p<0.05$)	+ -
Kong et al. 2012[34] China	Retrospective cohort study	To predict the RTW outcome and optimize the intervention scheme of a case management program initiated in China	335 participants with work-related injuries–mostly fractures (61.8%) or another limb injury (75.8%– with a mean age of 36.3 years (SD = 9.7 years). Most participant were male (86.0%), married (75.8%), migrant (60.3%), with middle school education (82.7%). 261 participants (77.9%) were successful at RTW. For those who were not currently employed, 45 workers (60.8%) were under sick leave until the end of follow-up, 23 (31.1%) failed to find suitable jobs, 3 (4.1%) didn't intend to work again, and 3 (4.1%) retired early because of age.	Family members	Successful return to work (sustained work for at least 3 months during follow-up period) and shorter absence duration (period between discharge from the rehabilitation center and resuming work)	Positive family attitude towards return to work (RTW: $p<0.05$, absence duration: $p<0.01$)	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Sandström & Esbjornsson 1986[35] Sweden	Prospective cohort study with follow-up at 1 and 4 year	To determine the significance of the patient's own prediction as to whether he/she would, or would not, return to work after vocational rehabilitation	52 participants with non-specific low back pain. Male participants (N = 35) had a mean age of 41 years (range 27-49) and female participants (N = 17) had a mean age of 38 years (range 29-49). Twelve men and six women were unemployed at the start of the study.	Close relatives	Return to work (study I: sick listed for 25 days or less, study II: sick listed for six months or less)	Opinion of closest relatives that the patient is too ill to return to work (p<0.05) Worries of closest relatives regarding deterioration of the patient’s condition if returning to work (p<0.01 comparing sick listed persons with workers with less than 25 sick days during one year, p<0.05 comparing sick listed persons with workers with less than 6 months of sick leave during one year)	- -

+ = facilitator for studied work outcome - = barrier for studied work outcome

Quality assessment

The results of the quality assessment of quantitative studies are presented in Table 2. In all studies the data collection method was rated as weak because the data collection tools were not shown to be reliable and/or valid or this was unclear. However, as this was the only weak rating in every study, the overall quality was moderate for all studies.

The results of the quality assessment of qualitative studies are presented in Table 3. The quality of the included qualitative studies ranged from moderate to high. The agreement of the two reviewers was high on credibility, transferability and dependability and moderate on confirmability. The confirmability was unclear for multiple studies, often due to lack of information; however, we considered it unlikely that this would seriously alter the results.

Table 2. Quality assessment of quantitative studies

Author(s)	Selection bias	Study design	Confounders	Blinding	Data collection method	Withdrawals and dropouts	Quality
Balswick , 1970[36]	2	2	2	2	3	4	2
Kong et al., 2012[34]	1	2	1	2	3	2	2
Sandstrom and Esbjornsson, 1986[35]	2	2	2	2	3	1	2

1 = strong rating 2 = moderate rating 3 = weak rating 4 = not applicable

Table 3. Quality analysis of qualitative studies

Author(s)	Credibility	Transferability	Dependability	Confirmability	Quality
Auerbach and Richardson, 2005[38]	1	1	1	?	2
Brooks et al., 2013[15]	1	1	1	?	2
Dorland et al., 2016[43]	1	1	1	1	1
Duijts et al., 2016[44]	1	1	1	?	2
Frederiksen et al., 2015[45]	1	1	1	?	2
Gagnon et al., 2016[41]	1	1	1	1	1
Main et al., 2005[48]	1	1	1	1	1
McCluskey et al., 2011[37]	1	1	1	1	1
McCluskey et al., 2014[4]	1	1	1	?	2
McCluskey et al., 2015[39]	1	1	1	?	2
Nilsson et al., 2011[46]	1	1	1	1	1
Rubenson et al., 2007[42]	1	1	1	?	2
Svensson et al., 2010[40]	1	1	1	1	1
Tamminga et al., 2012[47]	1	1	1	1	1
Tan et al., 2012[10]	1	1	1	?	2

1 = high 2 = moderate 3 = low ? = unclear

Grading the evidence of SO factors in quantitative studies

The results of the level of evidence assessment of quantitative studies are presented in Table 4. All three studies were observational; therefore all studied factors initially had a low level of evidence. We found no reasons to downgrade the level of evidence of any of the factors. The level of evidence of one factor (positive family attitude towards RTW) was upgraded to moderate because a large effect was found (HR = 4.0)[34]. The five factors assessed for level of evidence were each found in only one quantitative study. Although many factors were not studied in quantitative studies and could therefore not be graded, various factors were reported in multiple qualitative studies (Table 5).

Synthesis of quantitative studies

In the three quantitative studies five SO factors were reported, which are described in the sections below.

Significant others' cognitions

Beliefs of SOs regarding the consequences of the disease and RTW were found to be related with RTW. The opinion of close relatives that patients were too ill to return to work and worries that the condition would deteriorate if patients would return to work were both negatively related to RTW[35]. Additionally, positive attitudes of family towards RTW was found to be strongly related to a shorter duration of sickness absence and a higher chance of RTW[34].

Significant others' behaviour

Participatory support from a spouse–measured by a combination of engaging in relaxing activities together, attending events together and sharing meals–was found to be significantly associated with more employment success (the proportion of time the patient was employed full-time during the past year)[36]. However, this was only true for patients with twelve or more years of education[36]. On the other hand, the degree of what the authors defined as "dubious support" from a spouse had a negative relationship with employment success among lower educated patients[36]. In that study dubious support was measured with three questions in which participants had to indicate how much their spouse was concerned about the participant's handicap, how much their spouses encouraged them in their work, and the number of times participants talked over their goals and plans with their spouses[36]. The authors reasoned that spouses should be less concerned about the handicap when participants were more adjusted in their work, and that more adjusted participants would need less encouragement and had less need to talk over life goals and plans. The authors state that positive responses on dubious support could therefore not only be a sign of healthy companionship support, but could also be an indication of oversupport[36].

Table 4: Level of evidence of SO factors studied in quantitative studies

Factor	Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence
Participating in the patient's life outside the job	1	Cross-sectional study	Not serious	Not serious	Not serious	Not serious	None	Low
“Dubious” support	1	Cross-sectional study	Not serious	Not serious	Not serious	Not serious	None	Low
Positive family attitude towards return to work	1	Retrospective cohort study	Not serious	Not serious	Not serious	Not serious	Strong association	Moderate
Opinion of closest relatives that the patient is too ill to return to work	1	Prospective cohort study	Not serious	Not serious	Not serious	Not serious	None	Low
Worries of closest relatives regarding deterioration of the patient’s condition if returning to work	1	Prospective cohort study	Not serious	Not serious	Not serious	Not serious	None	Low

Table 5: Overview of evidence found for SO factors associated with work participation

Type of factor	Factors investigated	Number & type of articles	High quality	Moderate quality	Consistency
Cognitions	Work as cause of the disease[37]	1 QS	1 QS		n/a
	Working is not possible due to disease (ability to work depends on a cure)[4,35]	1 PCS, 1 QS		1 PCS, 1 QS	+
	Consequences of the disease are permanent[15,37]	2 QS	1 QS	1 QS	+
	Believing that return to work will lead to deterioration of condition[35,37]	1 PCS, 1 QS	1 QS	1 PCS	+
	Perceiving that patient has no rights with regard to previous employment[15]	1 QS		1 QS	n/a
	Perceived low level of control over the patient’s employment[4,15]	2 QS		2 QS	+
	Positive and encouraging attitudes/outlook in general and with regard to return to work[34,39–41]	1 RCS, 3 QS	2 QS	1 RCS, 1QS	+
	Positive attitude about the patient and his abilities (viewing the patient as not being disabled or a victim)[15,38]	2 QS		2 QS	+
	Negative attitudes about the availability of suitable work[37]	1 QS	1 QS		n/a
	Distrust towards the patient and the severity of the complaints and disease[40]	1 QS	1 QS		n/a
	Exaggerated protective attitude[42]	1 QS		1 QS	n/a
	Positive attitudes towards sickness absence[43–46]	4 QS	2 QS	2 QS	+
Behaviours	Enabling discussion about return to work, talking with, and listening to the patient[38,39,41,47]	4 QS	2 QS	2 QS	+
	Sharing information[46]	1 QS	1 QS		n/a
	Giving feedback, advice and guidance with regard to future planning[38,41]	2 QS	1 QS	1 QS	+
	Showing understanding and empathy[37,39,41,42]	4 QS	2 QS	2 QS	-
	Emphasizing what a patient can still do[15]	1 QS		1 QS	n/a
	Highlighting beneficial consequences of employment[15]	1 QS		1 QS	n/a
	Encouraging and motivating the patient[10,38,39,41,43,47,48]	7 QS	4 QS	3 QS	+

Type of factor	Factors investigated	Number & type of articles	High quality	Moderate quality	Consistency
	Emphasizing the negative consequences of the disease[15]	1 QS		1 QS	n/a
	Waiting on a cure[4]	1 QS		1 QS	n/a
	Validating patients' statements of incapacity and self-limiting behavior[15,37]	2 QS	1 QS	1 QS	+
	Advising, encouraging and pressuring the patients to refrain from work or not return to work[10,43–46]	5 QS	2 QS	3 QS	+
	Helping with daily activities, household tasks and transportation[37,40–42,46,47]	6 QS	5 QS	1 QS	-
	Exploring and accessing beneficial services and resources (both at and outside of work)[15,41]	2 QS	1 QS	1 QS	+
	Participation in the patient's life, doing joint activities/initiating activities[36,39]	1 CSS, 2 QS	1 QS	1 CSS, 1 QS	+
	Providing dubious support[36]	1 CSS		1 CSS	n/a

QS = Qualitative study CSS = Cross-sectional study PCS = Prospective cohort study RCS = Retrospective cohort study
n/a = not applicable (reported in only one study)

Synthesis of qualitative studies

The 15 qualitative studies reported on 60 factors (including duplicate factors). After thematic synthesis 26 factors remained, the results of which are described below.

Significant others' cognitions

Negative beliefs of SOs regarding the causes and consequences of the disease were reported to be a barrier for work participation. Beliefs that work was the cause of the disease or complaints and that RTW would lead to subsequent complaints were both found to be barriers for RTW[37]. Additionally, beliefs that the consequences of the illness (on work) were permanent[15,37] and that return to work depended on a cure for the disease[4] were found to be present in SOs of patients that were not able to remain in employment and return to work. Finally, perceptions that patients had no rights with regard to their previous employment[15] and that SOs had a low level of personal control over patients' illness, recovery, work situation, and employment[4,15] were reported to be barriers for patients' ability to remain in employment and RTW.

Additionally, positive, encouraging and supportive attitudes from SOs were reported as a determinant of patients' ability to remain in employment[15], job retention[38], staying at work[39], and RTW[40] and productive occupations[41]. In these cases, SOs remained positive both about patients and their abilities and viewed patients as not being disabled or victims[15,38]. On the other hand, negative and pessimistic attitudes of SOs were reported to negatively affect patients' ability to stay at work[40] and return to work[37]. SOs' negative attitudes were directed at the availability of suitable work[40] and consisted of distrust towards the severity of patients' complaints and disease. Finally, exaggerated protective attitudes[42] and expressing positive attitudes towards sickness absence[43–46] were reported to be barriers for work functioning and RTW.

Significant others' behaviour

Maintaining open communication with patients was reported as a behavioural determinant of job retention[38], staying at work[39], and RTW[46,47] and productive occupations[41]. This communication included talking with and actively listening to patients; sharing information; enabling discussion about return to work; and giving feedback, advice and guidance.

There are contradicting findings with regard to showing understanding and empathy. On the one hand, patients and SOs emphasized the importance of understanding and sympathy from SOs with regard to patients' ability to stay at work[39] and return to work[42] and productive activities[41]. On the other hand, in one study patients who had not successfully returned to work reported a high degree of sympathy from their SOs in combination with SOs validating their incapacity and self-limiting behaviour[37]. The authors hypothesized that these behaviours may have acted as obstacles for RTW, as SOs reinforced patients' unhelpful beliefs concerning for example the chance of re-injury or the likelihood of RTW[37].

Empowering, encouraging and motivating behaviour from SOs was also reported as a behavioural determinant of a patient's ability to remain in employment[15], job retention[38], staying at work[39], work functioning[43] and return to work[10,47,48] and productive occupations[41]. SOs emphasized what patients could still do despite their illness and highlighted beneficial consequences of employment. Furthermore, they encouraged and motivated patients to have a positive outlook and to keep active or return to activities and work. On the other hand, SOs of patients who were not able to remain in employment or return to work emphasized the negative consequences of the disease and seemed to validate patients' statements of incapacity and self-limiting behaviour[15,37]. Furthermore, SOs of patients with a disability claim expressed that they were waiting on a cure in order for the patient to be able to return to work[4]. Additionally, advising, encouraging and pressuring patients to refrain from working or returning to work were reported as barriers for work functioning[43] and RTW[10,44,46], and could lead patients to take sickness absence days[45].

Furthermore, practical support was reported to be a facilitator for patients' ability to remain in employment[15] and for RTW[40,42,46,47] and productive occupations[41]. Practical support in this context varied from providing practical help with daily activities, household tasks and transportation, to exploring and accessing beneficial services and resources. However, one study reported that help with everyday activities and high levels of routine dependency could be a barrier for RTW[37].

Finally, initiating activities and doing joint activities were seen as facilitators of returning to productive occupations[41] and staying at work[39] by patients and SOs.

Synthesis of overall results

After thematic synthesis, a total of 27 factors were distinguished (Table 5). The results indicate that SOs' cognitions and behaviours potentially can facilitate or hinder work participation of workers with a chronic disease. A positive attitude of SOs towards RTW, and activity participation outside work were found to be facilitators for work participation in both qualitative and quantitative studies. Overall, there is consistent evidence that positive, encouraging and supportive attitudes; maintaining open communication; and encouraging and motivating behaviour of SOs were facilitators for work participation (i.e. staying at work, a shorter duration of sickness absence, job retention and RTW). There is also consistent evidence that negative perceptions, beliefs and attitudes regarding the causes and consequences of the disease and overprotective behaviour were barriers for work participation (i.e. employment success, work functioning, ability to remain in employment and RTW). Evidence regarding the influence of practical support and showing understanding and empathy on work participation is inconsistent.

DISCUSSION

Within our knowledge, this is the first systematic review focusing explicitly on cognitions and behaviour of SOs that may influence work participation of individuals with a chronic disease. Although the possible influence of SOs on work participation is recognized in occupational health care[1,2], research focusing primarily on relevant cognitions and behaviours of SOs in the context of work participation is scarce. This review aimed to address this research gap, with some promising results.

We included 18 studies with various populations, consisting of patients with cancer, chronic pain, brain injuries, and in one study patients with severe and persistent mental illnesses. Seven qualitative studies focused primarily on the role of SOs regarding work participation of individuals with a chronic disease[4,15,36,37,39–41]. The findings show that cognitions and behaviours of SOs may influence work participation of their relative or friend. Of the 27 identified factors, seven factors were reported in at least four studies.

First, there was consistent evidence that positive and encouraging attitudes of SOs regarding returning to work or staying at work can facilitate these outcomes[34,39–41]. Secondly, there was consistent evidence that encouragement and motivating behaviour from SOs may facilitate job retention, work functioning, staying at work and RTW[10,38,39,41,43,47,48]. Maintaining open communication–e.g. to enable discussion on return to work and have conversations with patients about the illness and (return to) work–was also reported to be a facilitator for job retention, staying at work and RTW[38,39,41,47]. On the other hand, SOs' positive attitudes towards sickness absence and their advice, encouragement or pressure to refrain from work were consistently found to be barriers for staying at work, work functioning and RTW[10,43–46]. Finally, there is some evidence that practical help with daily activities and empathy and understanding from SOs can facilitate work participation[39–42,46,47]. However, the evidence for these factors is not consistent, as each factor has once been reported as a possible barrier for staying at work and RTW[37]. These contradicting findings can be explained by underlying processes, such as interaction between cognitions and behaviours of patients and SOs. For example, practical help from SOs could enable patients to stay at or return to work which would otherwise not be possible due to fatigue or pain[40,42,47]. On the other hand, practical help could also be indicative of overprotection in which SOs may reinforce patients' unhelpful beliefs and encourage or pressure patients to limit activities and not to return to work[37].

The findings in this review are consistent with findings of studies on the influence of cognitions and behaviours of SOs on other patient outcomes (e.g. health outcomes, symptom severity, quality of life, self-management behaviour, functioning)[16,17,49–52]. For instance, SOs' beliefs on the causes and consequences of the disease and symptoms and their own and patients' personal control of the disease have been shown to be related to patient outcomes[16,17,50]. Furthermore, various behaviours of SOs–such as encouraging patients to rest, discouraging patients from activities, expressing concern, encouraging activities, initiating and participating in activities, taking over tasks, maintaining open communication and talking with patients–have also been found to be related to various outcomes[16,49,52].

With regard to the results of this systematic review it should be noted that, with the exception of one study, all included studies focused on populations with somatic chronic diseases, i.e. cancer, chronic pain and brain injuries. It remains unclear whether the processes involved are similar for populations with other somatic or mental diseases, as the role of significant others –for example concerning beliefs and type of support–may differ between these groups. Research on illness perceptions about health outcomes has shown that the respective importance of the five dimensions of patients' illness representations–causes, duration, consequences, symptoms and controllability or curability of the disease–differ between diseases[53,54]. Thus, instead of a generic importance of cognitions and behaviours, specific maladaptive cognitions and behaviours may be more common or of more importance in some diseases than in others[55]. Finally, as work outcome studied in the included studies varied widely, it was impossible to determine whether cognitions and behaviours of SOs differ across work outcomes. The majority of studies focused on RTW, while research on other work outcomes such as staying at work, job retention and work functioning is scarce.

Limitations

A limitation of this study is that articles in languages other than English were excluded. As a consequence, some useful and relevant studies might have been missed. In addition, all included studies were from high-income countries except for two studies from upper middle-income countries, restricting the generalizability of the results. Generalizability of results is also restricted due to the limited amount of quantitative studies that were available on this topic. Most of the included studies were of qualitative design, with relatively small study samples. Thus, although various cognitions and behaviours of SOs were reported as being important with respect to work participation, most of these factors were not confirmed in quantitative studies.

Finally, we identified multiple qualitative studies exploring facilitators and/or barriers for work performance or RTW that did not report on any cognitions or behaviours of SOs. Thus, not all individuals with a chronic disease report their social environment as being a relevant factor for work participation. There are various possible explanations why individuals may not mention their SOs when discussing facilitators and barriers for work participation[56]. For instance, participants may not relate their disease and ability to work to circumstances in their social environment[56] or they may be unaware of how SOs may influence their cognitions, behaviours and work participation.

Implications and recommendations for future research

Our findings support the hypothesis that cognitions and behaviours of SOs can influence work participation of individuals with chronic diseases such as cancer, chronic pain, brain injuries and mental health disorders. As there is growing evidence that clinical health care interventions in which SOs are involved in treatment are more effective than care as usual where SOs are not involved in treatment[21–24], this may also prove to be beneficial in the work context of occupational health care. However, with the limited amount of studies on this topic with regard to work participation more research is needed for which several recommendations can be made.

First, our review shows that quantitative research on cognitions and behaviours of SOs with regard to work participation of individuals with a chronic disease is scarce. We identified only three quantitative studies in which specific cognitions or behaviours of SOs were investigated in relation to work participation[34–36]. More qualitative research is available in this context, in which cognitions and behaviours of SOs are identified that may be important with regard to work participation. Therefore, future research should focus on quantitatively confirming these findings, thus providing a higher level of evidence.

Second, future studies should explore which cognitions and behaviours of SOs are most strongly related to work participation and determine if these relationships are disease generic or disease specific. This could result in valuable insights into which of these factors would be most promising to take into account in occupational health care to facilitate return to work of workers on sick leave and prevent work disability of individuals with a chronic disease.

Finally, future prognostic studies may focus on the relationship between dyadic agreement of patients with a chronic disease and their SOs and work participation, as dyadic agreement has been shown to influence other patient outcomes such as wellbeing[57] and may also influence work participation.

Conclusions

In this review, we identified 27 cognitions and behaviours of SOs that were reported as determinants for work participation of individuals with a chronic disease. Our findings show that several cognitive behavioural factors of SOs can facilitate or hinder work participation. Aside from one factor (positive family attitude towards return to work) for which moderate-level evidence was found, all factors were of low-level evidence. Despite the overall low level of evidence, our review indicates that involving SOs in occupational health care and intervening on these factors may be beneficial. High quality prognostic studies are needed that investigate cognitive behavioural factors of SOs in relation to work participation to confirm our findings. Future studies could for example focus on exploring which cognitions and behaviours of SOs are most strongly related to duration of sick leave and RTW.

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Contributors All authors contributed to the conception and design of the study. NS developed the search strategy with support from an information specialist (acknowledged); all authors reviewed the search terms. NS and HdV performed the literature search, study selection, data extraction and interpretation of the data and drafted the manuscript. NS, HdV, SvdB, MH and SB have contributed to revising the article critically for important intellectual content. The final version of this manuscript has been approved by all the authors.

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Data sharing statement Extra data is available by emailing NCS.

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Figure legends

Figure 1: Flow diagram of the search process.

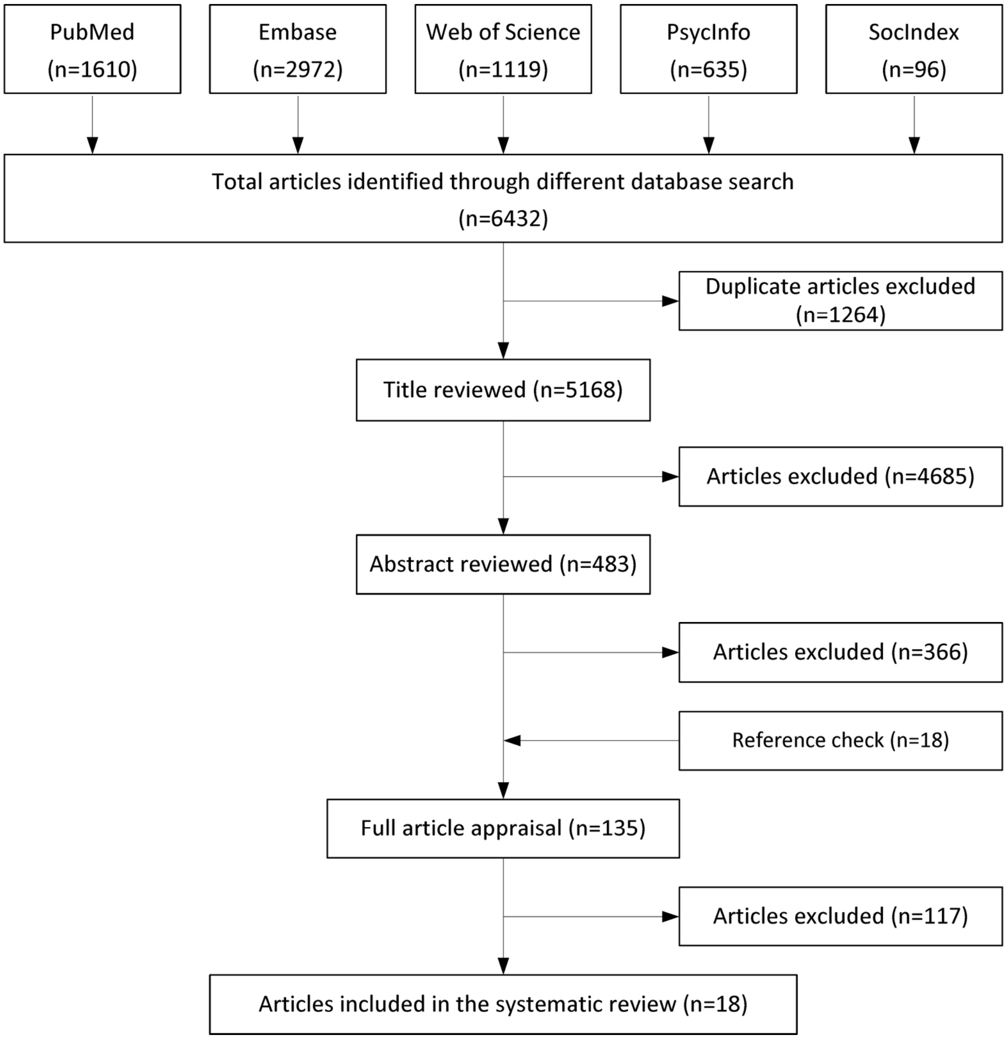

Figure 1: Flow diagram of the search process.

175x181mm (300 x 300 DPI)

SUPPLEMENTARY FILES

Text S1: detailed search strategy of the literature

Search history PubMed:

#1 Mesh terms and free text words related to chronic illness

"Chronic Disease"[Mesh] OR "Disabled Persons"[Mesh] OR "Chronic Pain"[Mesh] OR "Diabetes Mellitus"[Mesh] OR "Neoplasms"[Mesh] OR "Fatigue Syndrome, Chronic"[Mesh] OR "Musculoskeletal Diseases"[Mesh] OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Cardiovascular Diseases"[Mesh] OR "Brain Injuries"[Mesh] OR "Back Pain"[Mesh] OR "Depressive Disorder"[Mesh] OR chronic disease[tiab] OR chronic diseases[tiab] OR disabled person[tiab] OR disabled persons[tiab] OR Chronic pain [tiab] OR Chronic fatigue [tiab] OR Diabetes mellitus [tiab] OR Neoplasm [tiab] OR Neoplasms [tiab] OR Cancer [tiab] OR pulmonary disease[tiab] OR pulmonary diseases[tiab] OR COPD [tiab] OR Cardiovascular [tiab] OR Musculoskeletal [tiab] OR back pain [tiab] OR heart disease[tiab] OR heart diseases[tiab] OR brain injuries[tiab] OR brain injury[tiab]

#2 Mesh and free text terms related to work

“Employment” [MESH] OR “sick leave” [MESH] OR employed[tiab] OR employment[tiab] OR Return to work [tiab] OR Back to work [tiab] OR Sickness absence [tiab] OR work disabled[tiab]

#3 Mesh and free text terms related to significant others

“Family”[MESH] OR “Interpersonal relations”[MESH] OR Family [tiab] OR interpersonal relation[tiab] OR interpersonal relations[tiab] OR interpersonal relationship[tiab] OR interpersonal relationships[tiab] OR spouse[tiab] OR Husband [tiab] OR Wife [tiab] OR partner[tiab] OR significant other[tiab] OR significant others[tiab] OR close communities[tiab] OR close community[tiab]

#4 Mesh and free text terms related to significant others’ cognitions, beliefs, attitudes or behavior

"Communication"[Mesh] OR belief[tiab] OR beliefs[tiab] OR support[tiab] OR supported[tiab] OR attitude[tiab] OR attitudes[tiab] OR cognition[tiab] OR cognitions[tiab]

#1 AND #2 AND #3 AND #4

Search history Embase:

#1 Emtree terms and free text words related to chronic illness

'chronic disease'/exp OR 'disabled person'/exp OR 'chronic pain'/exp OR 'diabetes mellitus'/exp OR 'neoplasm'/exp OR 'chronic fatigue syndrome'/exp OR 'musculoskeletal disease'/exp OR 'chronic obstructive lung disease'/exp OR 'cardiovascular disease'/exp OR 'brain injury'/exp OR 'backache'/exp OR

'depression'/exp OR ‘Chronic disease’:ti,ab OR ‘Chronic diseases’:ti,ab OR ‘Disabled person’:ti,ab OR ‘Disabled persons’:ti,ab OR ‘Chronic pain’:ti,ab OR ‘Chronic fatigue’:ti,ab OR ‘Diabetes mellitus’:ti,ab OR Neoplasm:ti,ab OR Neoplasms:ti,ab OR Cancer:ti,ab OR ‘Pulmonary disease’:ti,ab OR ‘Pulmonary diseases’:ti,ab OR COPD:ti,ab OR Cardiovascular:ti,ab OR Musculoskeletal:ti,ab OR ‘back pain’:ti,ab OR ‘Heart disease’:ti,ab OR ‘Heart diseases’:ti,ab OR ‘Brain injuries’:ti,ab OR ‘Brain injury’:ti,ab

#2 Emtree terms and free text words related to work

'employment'/exp OR 'medical leave'/exp OR employed:ti,ab OR employment:ti,ab OR 'return to work':ti,ab OR 'back to work':ti,ab OR 'sickness absence':ti,ab OR 'work disabled':ti,ab

#3 Emtree terms and free text words related to significant others

'family'/exp OR 'human relation'/exp OR Family:ti,ab OR ‘interpersonal relation’:ti,ab OR ‘interpersonal relations’:ti,ab OR ‘interpersonal relationship’:ti,ab OR ‘interpersonal relationships’:ti,ab OR spouse:ti,ab OR Husband:ti,ab OR Wife:ti,ab OR partner:ti,ab OR ‘significant other’:ti,ab OR ‘significant others’:ti,ab OR ‘close communities’:ti,ab OR ‘close community’:ti,ab

#4 Emtree terms and free text words related to significant others’ cognitions, beliefs, attitudes or behavior

'interpersonal communication'/exp OR Belief:ti,ab OR Beliefs:ti,ab OR Support:ti,ab OR Supported:ti,ab OR Attitude:ti,ab OR Attitudes:ti,ab OR cognition:ti,ab OR cognitions:ti,ab

#1 AND #2 AND #3 AND #4

Search history PsycINFO:

#1 Descriptor terms and free text words related to chronic illness

DE "Chronic Illness" OR DE "Disorders" OR DE "Chronic Mental Illness" OR DE "Chronic Fatigue Syndrome" OR DE "Chronic Pain” OR DE "Disabilities" OR DE "Illness Behavior" OR DE "Disabled Personnel" OR DE "Diabetes Mellitus" OR DE "Type 2 Diabetes" OR DE "Diabetes" OR DE "Diabetes Insipidus" OR DE "Neoplasms" OR DE "Musculoskeletal Disorders" OR DE "Physical Disorders" OR DE "Lung Disorders" OR DE "Cardiovascular Disorders" OR DE "Traumatic Brain Injury" OR DE "Back Pain" OR DE "Major Depression" OR DE "Depression (Emotion)" OR TI ”chronic disease” OR AB ”chronic disease” OR TI ”chronic diseases” OR AB ”chronic diseases” OR TI ”disabled person” OR AB ”disabled person” OR TI ”disabled persons” OR AB ”disabled persons” OR TI ”Chronic pain” OR AB ”Chronic pain” OR TI ”Chronic fatigue” OR AB ”Chronic fatigue” OR TI ”Diabetes mellitus” OR AB ”Diabetes mellitus” OR TI ”Neoplasm” OR AB ”Neoplasm” OR TI ”Neoplasms” OR AB ”Neoplasms” OR TI ”Cancer” OR AB ”Cancer” OR TI ”pulmonary disease” OR AB ”pulmonary disease” OR TI ”pulmonary diseases” OR AB ”pulmonary

diseases” OR TI ”COPD” OR AB ”COPD” OR TI ”Cardiovascular” OR AB ”Cardiovascular” OR TI ”Musculoskeletal” OR AB ”Musculoskeletal” OR TI ”back pain” OR AB ”back pain” OR TI ”heart disease” OR AB ”heart disease” OR TI ”heart diseases” OR AB ”heart diseases” OR TI ”brain injuries” OR AB ”brain injuries” OR TI ”brain injury” OR AB ”brain injury”

#2 Descriptor terms and free text words related to work

DE "Employment Status" OR DE "Unemployment" OR DE "Employability" OR DE "Reemployment" OR DE "Employee Retention" OR DE "Employee Leave Benefits" OR DE "Employee Benefits" OR TI ”employed” OR AB ”employed” OR TI ”employment” OR AB ”employment” OR TI ”Return to work” OR AB ”Return to work” OR TI ”Back to work” OR AB ”Back to work” OR TI ”Sickness absence” OR AB ”Sickness absence” OR TI ”work disabled” OR AB ”work disabled”

#3 Descriptor terms and free text words related to significant others

DE "Spouses" OR DE "Family" OR DE "Significant Others" OR DE "Family Members" OR DE "Marital Relations" OR DE "Interpersonal Relationships" OR DE "Husbands" OR DE "Wives" OR DE "Spouses"OR TI ”Family” OR AB ”Family” OR TI ”interpersonal relation” OR AB ”interpersonal relation” OR TI ”interpersonal relations” OR AB ”interpersonal relations” OR TI ”interpersonal relationship” OR AB ”interpersonal relationship” OR TI ”interpersonal relationships” OR AB ”interpersonal relationships” OR TI ”spouse” OR AB ”spouse” OR TI ”Husband” OR AB ”Husband” OR TI ”Wife” OR AB ”Wife” OR TI ”partner” OR AB ”partner” OR TI ”significant other” OR AB ”significant other” OR TI ”significant others” OR AB ”significant others” OR TI ”close communities” OR AB ”close communities” OR TI ”close community” OR AB ”close community”

#4 Descriptor terms and free text words related to significant others’ cognitions, beliefs, attitudes or behavior

DE "Communication" OR DE "Interpersonal Communication" OR DE "Nonverbal Communication" OR TI ”belief” OR AB ”belief” OR TI ”beliefs” OR AB ”beliefs” OR TI ”support” OR AB ”support” OR TI ”supported” OR AB ”supported” OR TI ”attitude” OR AB ”attitude” OR TI ”attitudes” OR AB ”attitudes” OR TI ”cognition” OR AB ”cognition” OR TI ”cognitions” OR AB ”cognitions”

#1 AND #2 AND #3 AND #4

Search history SocINDEX:

#1 Descriptor terms and free text words related to chronic illness

DE "CHRONIC diseases" OR DE "CHRONIC diseases -- Psychological aspects" OR DE "CHRONIC diseases -- Social aspects" OR DE "PEOPLE with disabilities" OR DE "SICK" OR DE "PEOPLE with disabilities --

Employment" OR DE "CHRONIC fatigue syndrome" OR DE "DIABETES" OR DE "CANCER" OR DE "CANCER -- Psychological aspects" OR DE "CANCER -- Social aspects" OR DE "LUNGS -- Cancer" OR DE "HEART diseases" OR DE "PAIN" OR DE "MENTAL depression" OR TI ”chronic disease” OR AB ”chronic disease” OR TI ”chronic diseases” OR AB ”chronic diseases” OR TI ”disabled person” OR AB ”disabled person” OR TI ”disabled persons” OR AB ”disabled persons” OR TI ”Chronic pain” OR AB ”Chronic pain” OR TI ”Chronic fatigue” OR AB ”Chronic fatigue” OR TI ”Diabetes mellitus” OR AB ”Diabetes mellitus” OR TI ”Neoplasm” OR AB ”Neoplasm” OR TI ”Neoplasms” OR AB ”Neoplasms” OR TI ”Cancer” OR AB ”Cancer” OR TI ”pulmonary disease” OR AB ”pulmonary disease” OR TI ”pulmonary diseases” OR AB ”pulmonary diseases” OR TI ”COPD” OR AB ”COPD” OR TI ”Cardiovascular” OR AB ”Cardiovascular” OR TI ”Musculoskeletal” OR AB ”Musculoskeletal” OR TI ”back pain” OR AB ”back pain” OR TI ”heart disease” OR AB ”heart disease” OR TI ”heart diseases” OR AB ”heart diseases” OR TI ”brain injuries” OR AB ”brain injuries” OR TI ”brain injury” OR AB ”brain injury”

#2 Descriptor terms and free text words related to work

DE "EMPLOYMENT (Economic theory)" OR DE "SICK leave" OR DE "ABSENTEEISM (Labor)" OR DE "LEAVE of absence" OR TI ”employed” OR AB ”employed” OR TI ”employment” OR AB ”employment” OR TI ”Return to work” OR AB ”Return to work” OR TI ”Back to work” OR AB ”Back to work” OR TI ”Sickness absence” OR AB ”Sickness absence” OR TI ”work disabled” OR AB ”work disabled”

#3 Descriptor terms and free text words related to significant others

DE "FAMILIES" OR DE "FAMILY relations" OR DE "INTERPERSONAL relations" OR DE "HUSBAND & wife" OR DE "WIVES" OR DE "SPOUSES" OR DE "HUSBANDS" OR TI ”Family” OR AB ”Family” OR TI ”interpersonal relation” OR AB ”interpersonal relation” OR TI ”interpersonal relations” OR AB ”interpersonal relations” OR TI ”interpersonal relationship” OR AB ”interpersonal relationship” OR TI ”interpersonal relationships” OR AB ”interpersonal relationships” OR TI ”spouse” OR AB ”spouse” OR TI ”Husband” OR AB ”Husband” OR TI ”Wife” OR AB ”Wife” OR TI ”partner” OR AB ”partner” OR TI ”significant other” OR AB ”significant other” OR TI ”significant others” OR AB ”significant others” OR TI ”close communities” OR AB ”close communities” OR TI ”close community” OR AB ”close community”

#4 Descriptor terms and free text words related to significant others’ cognitions, beliefs, attitudes or behavior

DE "COMMUNICATION" OR DE "COGNITION " OR DE "PERCEPTION" OR DE "FAMILY communication" OR TI ”belief” OR AB ”belief” OR TI ”beliefs” OR AB ”beliefs” OR TI ”support” OR AB ”support” OR TI ”supported” OR AB ”supported” OR TI ”attitude” OR AB ”attitude” OR TI ”attitudes” OR AB ”attitudes” OR TI ”cognition” OR AB ”cognition” OR TI ”cognitions” OR AB ”cognitions”

#1 AND #2 AND #3 AND #4

Search history Web of Science:

#1 Topic terms and free text words related to chronic illness

TS="Depressive Disorder" OR TS="Depressive Disorders" OR TS="Depression" OR TS=”chronic disease” OR TS=”chronic diseases” OR TS=”disabled person” OR TS=”disabled persons” OR TS=”Chronic pain” OR TS=”Chronic fatigue” OR TS=”Diabetes mellitus” OR TS=”Neoplasm” OR TS=”Neoplasms” OR TS=”Cancer” OR TS=”pulmonary disease” OR TS=”pulmonary diseases” OR TS=”COPD” OR TS=”Cardiovascular” OR TS=”Musculoskeletal” OR TS=”back pain” OR TS=”heart disease” OR TS=”heart diseases” OR TS=”brain injuries” OR TS=”brain injury”

#2 Topic terms and free text words related to work

TS=“sick leave” OR TS=”employed” OR TS=”employment” OR TS=”Return to work” OR TS=”Back to work” OR TS=”Sickness absence” OR TS=”work disabled”

#3 Topic terms and free text words related to significant others

TS=”Family” OR TS=”interpersonal relation” OR TS=”interpersonal relations” OR TS=”interpersonal relationship” OR TS=”interpersonal relationships” OR TS=”spouse” OR TS=”Husband” OR TS=”Wife” OR TS=”partner” OR TS=”significant other” OR TS=”significant others” OR TS=”close communities” OR TS=”close community”

#4 Topic terms and free text words related to significant others’ cognitions, beliefs, attitudes or behavior

TS="Communication" OR TS=”belief” OR TS=”beliefs” OR TS=”support” OR TS=”supported” OR TS=”attitude” OR TS=”attitudes” OR TS=”cognition” OR TS=”cognitions”

#1 AND #2 AND #3 AND #4

Supplementary data

Table S1: Overview of quality assessment criteria for quantitative studies (from the Effective Public Health Practice Project)[30]

Component	Strong rating	Moderate rating	Weak rating
Selection bias	The study sample was very likely to be representative of the target population and the participation rate was more than 80%	The study sample was somewhat likely to be representative of the target population and the participation rate was 60-79%	All other responses or not stated
Design	Randomized controlled trial or controlled clinical trial	Cohort studies, case control, or an interrupted time series	All other study designs
Confounders	Controlled for at least 80% of confounders	Controlled for 60-79% of confounders	Controlled for less than 60% of confounders, or not stated.
Blinding	Outcome assessor(s) and study participants were blinded to intervention status and/or research question	Blinding of either outcome assessor(s) or study participants	No blinding of either outcome assessor(s) or study participants
Data collection methods	Tools are shown to be valid and reliable	Tools are shown to be valid, but reliability is not described	No evidence of validity or reliability
Withdrawals and dropouts	The follow up rate was more than 80% of participants	The follow up rate was 60-79% of participants	The follow-up rate was less than 60% of participants or withdrawals and dropouts were not described

Table S2: Overview of quality assessment criteria for qualitative studies (derived from Cochrane)[32]

Criteria	Questions for assessment
Credibility	Were techniques used to validate the findings of the study, such as: member checks, verbatim quotes or triangulation, independent analysis of the data by more than one researcher?
Transferability	Were details provided about the setting, context and study sample, such that the readers can evaluate to what extent the research findings are transferable to other settings?
Dependability	Was information provided about the data collection method, saturation, taping and transcribing interviews and analysis procedures, with a self-critical account of the research process?
Confirmability	Were techniques used to assure that findings are qualitatively confirmable, such as: use of an audit trail such that each research stage could be repeated or assessing the effects of the researcher(s) due to background, education, personal experiences, and perspective?

Underlying methodology	**Quality rating**
Randomized trials; or double-upgraded observational studies	High
Downgraded randomized trials; or upgraded observational studies	Moderate
Observational studies or double-downgraded randomized trials	Low
Triple-downgraded randomized trials; or downgraded observational studies; or case series/case reports	Very low

Downgrade if

-1 serious risk of bias
-2 very serious risk of bias
-1 serious inconsistency of results
-2 very serious inconsistency of results of unexplained heterogeneity
-1 serious indirectness of evidence
-2 very serious indirectness of evidence
-1 serious imprecision of results
-2 very serious imprecision of results
-1 likely publication bias
-2 very likely publication bias

Upgrade if

+1 large effect (RR/HR > 2 or RR < 0.5 with no plausible confounders)
+2 very large effect (RR/HR > 5 or RR < 0.2 with no major threats to validity)
+1 Presence of a dose-response gradient
+1 All plausible confounding would reduce a demonstrated effect
+1 All plausible confounding would suggest a spurious effect when results show no effect

Definition of level of evidence

High = we are very confident that the true effect lies close to that of the estimate of the effect
Moderate = we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low = our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low = we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect

Box S1: Criteria for assessing the level of evidence[31]

Table S3. Characteristics of included qualitative studies

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Auerbach & Richardson 2005[38] USA, California	Semi-structured interviews	To investigate the work experiences of individuals with SMI to determine their perspectives on the processes involved in working	6 participants (4 women) diagnosed with severe and persistent mental illness (SMI), with an age range of 21-60 years. All participants worked in competitive employment for at least 18 months during the previous 3 years.	Peers, family and friends	Job retention	Encouraging the patient to work Talking and giving feedback to the patient Believing in the patient Letting the patient know that the illness doesn't identify the patient	+ + + +
McCluskey, de Vries, Reneman, Brooks, and Brouwer 2015[39] UK & The Netherlands	Semi-structured interviews & open-ended questions. Patients and significant others were interviewed separately	To examine the extent and nature of support provided by significant others	62 participants, of whom 31 participants were diagnosed with chronic musculoskeletal pain and 31 participants were a significant other of one of the patients. The mean age of patients was 49.2 years in the UK and 49.0 years in the Netherlands and of the significant others 36.6 years and 50.2 years respectively. All patient participants had managed to stay at work.	Significant others, partner/ spouse	Staying at work	Helping the patient to cope with the illness by maintaining communication about the pain, listening to the patient and showing understanding Encourage the patient to keep active Supporting the worker in their management of pain by doing joint activities Maintaining a positive attitude in general Encouraging a positive outlook in patients	+ + + + +
Frederiksen, Karsten, Indahl, and Bendix 2015 Denmark	Three semi-structured focus group interviews	To explore and obtain knowledge of factors that challenge/help manual workers to cope with back pain at work, and factors influencing their decision to call in sick	20 participants (5 women) who had reported back pain at least once during follow up of an RCT study. Participants had a mean age of 53.5 years (SD = 7.0). All participants had daily physically demanding work. 3 participants also functioned as a trade union, safety or working environment representative, involving half-day administrative work.	Spouse	Sickness absence (calling in sick)	Trying to talk the patient out of going to work	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Dorland, Abma, Roelen, Smink, Ranchor, and Bültmann 2016[43] The Netherlands	Focus group study, with semi-structured interview schedules (three groups)	To explore barriers and facilitators of work functioning from the perspectives of cancer survivors and occupational health professionals	22 participants (15 women) with various cancer diagnoses; the majority of them had breast cancer (n=10). The mean age of participants was 47.2 years (SD=7.4). Participants had a high (68%) or medium (32%) level of education, had returned to work within the three years prior to the study and were working at least 12 hours per week.	Family and friends	Work functioning (varying from working without any problems to not working at all)	Encouraging the cancer survivor to go back to work or to stay at work	+
						Advising against return to work due to concern	-
Brooks, McCluskey, King and Burton 2013[15] England (UK)	Individual semi-structured interviews	To explore whether the illness beliefs of significant others differed depending on their relative's working status, and to make some preliminary identification of how significant others may facilitate or hinder work participation for those with persistent back pain	18 participants, of whom 9 participants diagnosed with non-specific low back pain of at least twelve weeks duration and 9 participants were a significant other of one of the patients. Participants were either working (N = 5) or were not working due to back problems (N = 4). Working patients had a mean age of 49.2 years (range 45-52 years) and patients who were not working had a mean age of 57 years (range 51-63 years).	Spouse (7) child (2)	Ability to remain in employment	Emphasizing what the patient could do despite their back problem, rather than what they were unable to do	+
						Involved in negotiating and maintaining necessary concessions at work	+
						Highlighting beneficial consequences of employment	+
						Rejecting any notion of the patient being disabled by their condition; not seeing the patient as a victim	+
						Emphasizing the far-reaching consequences of the back pain; 'catastrophize' regarding potential rather than actual consequences of the condition;	-
						Not perceiving the patient as having any rights or recourse to action in the context of his or her previous employment	-
						Resigned to the permanent effects of the patient's back problem on their employment status; consider the patient as 'disabled'	-
						Defending the patients by railing against others' lack of understanding of the patient's condition; viewing patients as unfairly stigmatized as potential malingerers	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
						Perceive themselves as lacking in personal control over their –or their significant other's–employment situation	-
McCluskey, Brooks, King, and Burton 2011[37] England (UK)	Individual semi-structured interviews (disability benefit claimants and significant others were interviewed separately)	To explore the illness perceptions of individuals with disabling back pain and those of their significant others promoting work participation	10 participants, of whom 5 participants were disability benefit claimants diagnosed with non-specific back pain and 5 participants were a significant other of one of the claimants. Most claimants were male (N = 4) and all significant others were female (N = 5). The mean age of the claimants was 41.0 years (ranging from 29 to 54 years).	Spouse, parent or child	Return to work	Believing that work caused the illness and the complaints	-
						Believing that return to work will lead to subsequent complaints	-
						Believing that the consequences of the illness on work participation are permanent	-
						Having a sceptical attitude about the availability of suitable work and sympathy from employers	-
						Validating the claimant's statements of incapacity and self-limiting behaviour	-
						Helping the claimant in their everyday lives, with high levels of routine dependency	-
						A shared understanding and high degree of empathy with claimants	-
McCluskey, Brooks, King, and Burton 2014[4] England (UK)	Individual semi-structured interviews (disability benefit claimants and significant others were interviewed separately)	To explore the wider psychosocial obstacles involved in recovery and continued work participation for individuals with persistent low back pain	18 participants, of whom 9 participants were diagnosed with persistent low back pain (5 male) and 9 participants were a significant other of the claimants (6 female). The mean age of the claimants was 48.1 years (ranging from 29 to 63 years) and of the significant others 49.7 years (ranging from 21 to 68 years). All claimants were unfit for work for a period ranging from six months to 11 years. With one exception, all claimants had previously worked in	Spouse, parent or child	Return to work	Believing that return to work is dependent on a cure	-
						Waiting for a better cure or treatment which would then allow them to return to work	-
						Pessimistic attitude about their relative's condition and their level of control in their relative's recovery and return to work.	-
						Believing that patients had not yet received a 'correct' diagnosis, and that the 'real' problem remained undiscovered and therefore untreated, and that this required further medical investigations before being able to return to work	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
			unskilled/manual occupations, and none had continued their education past high school.				
Duijts, van Egmond, Gits, van der Beek, and Bleiker 2016[44] The Netherlands	Semi-structured one-to-one telephone interviews. A face-to-face interview only if more convenient for the participant	To explore the perspectives and experiences of cancer survivors regarding behavioural determinants of RTW and continuation of work	28 participants (14 women) diagnosed with breast, colorectal or head or neck cancer one to two years prior to the study. The mean age of the participants was 52 years (range: 28–62 years). Participants had either returned to work (68%) or were not working (32%). The majority had an upper vocational or university level of education (54%).	Family and friends	Return to work	Pressuring the patient not to return to work, to take it easy for a while	-
Main, Nowels, Cavender, Etschmaier, and Steiner 2005[48] USA	Semi-structured face-to-face interviews	To describe work issues and work return among a diverse group of cancer survivors who were working at the time of diagnosis and to explore factors influencing decisions about work and work return and describe the work experiences of these survivors after cancer diagnosis and treatment	28 participants (14 women) diagnosed with various types of cancer with a mean age of 42.6 years (ranging from 24 to 63 years). All participants were working in a paid job prior to the cancer diagnosis.	Family and friends	Return to work	Encouraging the patient to work	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Nilsson, Olsson, Wennman-Larsen, Petersson, and Alexander-son 2011[46] Sweden	Focus group study with an interview guide	To gain knowledge about women's experiences of encounters with stakeholders regarding RTW during and after breast cancer trajectory	23 female participants diagnosed with breast cancer with a mean age of 53 years (ranging from 37 to 62 years). All participants worked prior to diagnosis.	Family and friends	Return to work	Practical support (e.g. transportation)	+
						Friends with personal experience of cancer sharing information about possible cognitive problems and rehabilitation options	+
						Expressing positive attitudes towards sickness absence (e.g. encouraging or pressuring the patient to refrain from work)	-
Rubenson, Svensson, Linddahl, and Bjorklund 2007[42] Sweden	Individual semi-structured interviews	To explore the experiences of returning to work after rehabilitation from the viewpoint of people with acquired brain injury	8 participants (3 women) diagnosed with acquired brain injury, with a mean age of 39 years (ranging from 23 to 63 years). All participants had professions within the areas of health- and medical care, computer business/ information technology, transport, forwarding, marketing, production and management, pedagogies, and technical work.	Family and relatives	Return to work	Showing understanding for the patient's situation	+
						Providing practical help (taking greater responsibility for the housework, providing transportation)	+
						Showing an exaggerated protective attitude	-
Svensson, Müssener, and Alexanderson 2010[40] Sweden	Focus group interviews	To explore and analyse participants' accounts of social interactions and relationships with family, workmates, and friends that seemed to involve positive and negative self-evaluative aspects, and therefore may be important to self-conception and self-esteem, and possibly to return to work	18 participants (13 women) diagnosed with back, neck or shoulder pain, ranging in age from 25 to 34 years. Participants either had a low level of sickness absence (an annual sick leave of 60 days or less) or a high level of sickness absence (an annual sick leave of 60 days or more).	Family	Return to work (through self-evaluation and self-esteem)	Family members' encouraging and supporting attitude towards the situation as well as the patient's coping	+
						Practical help in the household from the spouse and family members	+
						Negative attitude of the spouse towards the patient (thinking of the patient as a nuisance)	-
						Negative attitudes of close relatives towards the patient	-
						Distrusting the severity of the patients problems	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Tamminga, de Boer, Verbeek, and Frings-Dresen 2012[47] The Netherlands	Semi-structured interviews	Identifying factors that have been experienced as barriers to or facilitators of the initial and post RTW processes	12 female participants diagnosed with breast cancer, with a mean age of 42 (SD = 7, age ranging from 31 to 51 years). All participants were working at the time of diagnosis.	Friends and family	Return to work	Providing practical support	+
						Encouraging the patient (to return to work)	+
						Enabling discussion about return to work	+
Tan, Loh, Su, Veloo, and Ng 2012[10] Malaysia	Focus groups	To explore the perception of barriers and facilitators to return to work, in a group of multi-ethnic women with breast cancer	40 female participants diagnosed with stage 1-3 breast cancer. Participants had either returned to work or not. The age range for participants who had returned to work was 21 to 54 years and for participants who had not returned to work 40-58 years.	Family, husband, spouse, children	Return to work	Encouraging the patient to return to work	+
						Restricting the patient to return to work	-
Gagnon, Lin, and Stergiou-Kita 2016[41] Canada	In-depth semi-structured in-person or telephone interviews with family members of traumatic brain injury survivors	To gain an in-depth understanding of the experiences of immediate adult family members when supporting traumatic brain injury survivors' return to productive occupations	14 immediate adult family members (10 women) of patients diagnosed with traumatic brain injury (TBI). Participants had a mean age of 51 (age ranging from 25 to 60 years).	Parents (6), spouses (7) and siblings (1)	Return to productive occupations (meaningful activities, school and community activities, volunteer work and paid part- or full-time employment)	Educating others regarding the implications of TBI to promote acceptance of the patient in community and work contexts	+
						Exploring social, community, rehabilitation services and resources that could benefit the patient; searching and locating information regarding the diagnosis, prognosis, functional implications and relevant treatments; collecting the necessary information to prepare themselves for future expectations and to adapt to the changes they were experiencing	+
						Endorsing survivors' rights to medical and therapy services, access to community resources, and awareness of implications of the illness in the community	+
						Engaging in logistical tasks (e.g. coordinating appointments, planning ahead for services, accessing resources, initiating and maintaining contact with the health care team)	+
						Initiating leisure or therapeutic activities	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
						Providing personal advice and guidance in relation to future planning	+
						Active listening, empathizing with the patient's position, empowering and motivating them to return to their activities of choice	+
						Encourage and motivate the patient to return to their activities of choice	+
						Keep it upbeat and positive	+
						Assisting the patient with their daily activities (e.g. cooking, transportation and toileting)	+

+ = facilitator for studied work outcome - = barrier for studied work outcome

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplement: Text 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5 + Supplement: Text 1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	NA
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6-7

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	7-7
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	11-12
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	9-10 + supplement: Table S3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	18-19
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	19-20
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20-21
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	See application

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

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Influence of significant others on work participation of individuals with chronic diseases: a systematic review

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Influence of significant others on work participation of individuals with chronic diseases: a systematic review

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ABSTRACT

Objective It is widely recognized that significant others (SOs), such as a partner, family member or friend, can influence health outcomes of individuals with a chronic disease. However, not much is known about which specific cognitions (i.e. illness perceptions and expectation of work ability) and behaviours (e.g. emotional and practical support) of SOs influence work participation. Therefore, we aimed to identify cognitions and behaviours of SOs that are related to work participation of individuals with a chronic disease.

Design A systematic review and thematic synthesis.

Data sources PubMed, Embase, PsycINFO, SocINDEX and Web of Science were searched until 28 March 2017.

Eligibility criteria for selecting studies We included studies reporting on cognitions and behaviours of SOs related to work participation in populations with various chronic diseases.

Data extraction and synthesis Two independent reviewers extracted the data and performed a quality assessment using the Quality Assessment Tool for Quantitative Studies from the Effective Public Health Practice Project 2007 and a checklist for assessment of qualitative studies derived from the Cochrane Supplemental Handbook Guidance. Evidence was thematically synthesised.

Results Out of 5,168 articles, 18 were included (15 qualitative and 3 quantitative) of moderate to high quality. Studies were on cancer, chronic pain, brain injuries and mental health disorders. After thematic synthesis 27 factors could be distinguished. Consistent evidence was found that SOs' positive and encouraging attitudes regarding work participation, encouragement and motivating behaviour, and open communication with patients are facilitators for work participation. Consistently reported barriers were SOs' positive attitudes towards sickness absence and advise, encouragement or pressure to refrain from work.

Conclusions Our findings show that several cognitions and behaviours of SOs can facilitate or hinder work participation of individuals with a chronic disease. Intervening on these factors by involving SOs in disability prevention and return to work intervention strategies may be beneficial. More prognostic studies are needed, as the current evidence is mostly based on qualitative studies.

Strengths and limitations of this study

- To our knowledge this is the first systematic review that has investigated cognitions and behaviour of significant others that may influence work participation of individuals with a chronic disease.
- The present systematic review was based on a comprehensive search of the literature in five relevant databases, with an additional reference check.
- We used quality assessment tools recommended by Cochrane to assess the quality of the evidence.
- This review is limited to English articles; articles in languages other than English were excluded.
- The small number of quantitative studies rendered a meta-analysis impossible; therefore, no statistical analyses were performed.

INTRODUCTION

Cognitions and behaviours of significant others (SOs) in the personal environment, such as a partner, family member or friend, can play an important role in health outcomes of individuals with a chronic disease[1–6]. In the clinical setting it has been shown that the behaviour of SOs can have either detrimental or favourable effects on perceived symptoms and behaviour of individuals with a chronic disease, thereby influencing recovery, treatment effects, quality of life and disability[3–5]. Although it is widely recognized that SOs can also influence work participation of individuals with a chronic disease, for instance through social support[7–11], research on the influence of SOs on work outcomes is scarce. Despite increasing evidence that beliefs and behaviours of SOs are important for work outcomes[7–11], not much is known about which specific cognitions or behaviours of SOs influence work participation of their relatives and friends.

A rationale for the influence of SOs on work participation can be found in cognitive behavioural models, which propose that a person's cognitions with regard to the disease and work, i.e. thoughts, beliefs, attitudes and expectations[12–15], generate behavioural and emotional responses to illness events and guide coping strategies[3,16–18]. There is evidence that behaviours of SOs influence the behaviour and consequently health and work outcome of individuals with a chronic disease[19–21]. Illness perceptions held by SOs–consisting of perceptions and beliefs concerning the disease–have been proposed to be a mechanism through which SOs may influence work participation[19,21]. In this context, several studies have described that SOs can reinforce an individual's unhelpful cognitions about illness, such as beliefs about limitations due to the disease, mistaken beliefs about the nature of illness, pessimistic beliefs regarding the outcome of treatment, and the unlikelihood of returning to work[22,23].

In occupational health care, there is a growing notice that the social context plays an important role in return-to-work processes and that it can be beneficial to address social factors such as responses of SOs[24,25]. As there is evidence that clinical health care interventions in which SOs are involved are more effective than care as usual where SOs are not involved[26–29], this may also prove to be beneficial in occupational health care. Consequently, various multidisciplinary guidelines recommend (occupational) health professionals to address social factors and involve significant others such as family members in treatment and care[30–35].

In recent years, the focus in health care has shifted to self-management and adapting to a disease[36], which requires a more supportive role for (occupational) health professionals[37]. Aside from facilitating and supporting the return to work (RTW) process of sick-listed workers, occupational health professionals have the responsibility to support workers to cope with problems due to disease and to empower them to manage their own health and wellbeing to prevent sickness absence[36,37]. In this context, professionals should support workers to use their own resources to successfully adapt to a disease and to enable them to work[36]. One resource that may be used to support individuals with a chronic disease to participate in work is their network of SOs.

Although it is recognized that SOs can influence workers' recovery and work outcome[1,30,38], more research is needed to determine which specific cognitive behavioural factors in the social environment influence work participation and should therefore be taken into account in occupational health care. Therefore, in this systematic review we aim to identify cognitions and behaviours of SOs that are related to work participation of individuals with a chronic disease. Investigating which SO-related factors are associated with work participation of individuals with a chronic disease may increase our understanding of staying at work and RTW processes, which can be applied in occupational health interventions to facilitate work participation.

METHOD

Search strategy

We conducted a search in PubMed, Embase, PsycINFO, SocINDEX and Web of Science (inception of databases until 28 March 2017). When available, subject headings such as MeSH terms in PubMed were used, in addition to free text words. Four main categories (1. chronic illness, 2. work participation, 3. SOs and 4. SOs' cognitions and behaviours) were combined with the Boolean operator 'AND' to identify studies (Supplementary file: Text S1). We included terms on the following chronic diseases: diabetes mellitus, cancer, chronic pain, chronic fatigue, cardiovascular diseases, pulmonary diseases, musculoskeletal disorders, brain injuries, and depressive disorder. Additionally, we included broader search terms such as "chronic disease" and "disabled persons". In addition to the search, we conducted a reference check to identify additional studies not retrieved through database searching.

Selection of studies

The article selection was performed in three phases by two independent reviewers (NS, HdV). In the first phase, articles were excluded based on title. Secondly, articles were excluded based on abstract. In the third phase the reviewers selected articles for final inclusion based on full text appraisal. To be included, articles had to meet the following criteria: (i) the study population consisted of subjects with a chronic illness or their SOs; (ii) the subjects were 18-67 years old (working population); (iii) the study examined sickness absence, work disability, unemployment, RTW or staying at work as the outcome; (iv) at least one of the independent variables investigated concerned cognitions or behaviour of a SO (a close family member, close friend, spouse or partner) and (v) the article was written in English.

In this study, we were interested in SOs' cognitions such as their perceptions and interpretations of the causes and consequences of their close other's illness and work ability, in this study defined as thoughts, beliefs, attitudes and expectations[12–15]. Furthermore, with regard to behaviour, studies were included if they reported on specific supportive or obstructive behaviours of SOs (e.g. giving advice, showing empathy, taking over household chores, pressuring their close other to rest). As we aimed to find specific behaviours of SOs related to work outcomes, only studies in which constructs such as social support or emotional support were defined as actual provided or received behaviour were included. Studies reporting on satisfaction with support or experienced support from SOs, without providing information on specific provided or received behaviours of SOs, were excluded. Finally, we included both self-reported cognitions and behaviours by SOs and cognitions and behaviours of SOs as perceived by individuals with a chronic disease, as both perspectives are relevant for the research question in this review[39].

Studies were excluded when both reviewers considered that these did not fulfil the inclusion criteria. Disagreements regarding inclusion were resolved by consensus. If no consensus was reached or in case of doubt, the article was screened by the other authors and discussed to reach consensus.

Data extraction

Two reviewers (NS, HdV) independently extracted the data from all selected studies using an adapted version of the Cochrane Data collection form for intervention reviews on RCTs and non-RCTs[40]. The following information was extracted from every included study: study design; study objectives; diagnosed condition; general description of subjects including age, gender and additional details; outcome measures; type of SO; investigated or identified cognitions or behaviour of SOs; and relation with the studied work outcome.

Assessment of quality

The quality of included quantitative studies was assessed using the Quality Assessment Tool for Quantitative Studies from the Effective Public Health Practice Project 2007, recommended by Cochrane[41,42]. This tool is suitable for assessment of studies of any quantitative design. Two reviewers (NS, HdV) used this tool to rate studies on selection bias, study design, confounders, blinding, data collection method and withdrawals and dropouts (Supplementary file: Table S1). Based on these criteria, quality was rated as low when two or more components had weak ratings, moderate when one component had a weak rating and strong if there were no weak ratings.

The quality of included qualitative studies was independently assessed by two reviewers (NS, HdV) using a checklist with criteria for assessment of qualitative studies derived from the Cochrane Supplemental Handbook Guidance[43]. This checklist identified credibility, transferability, dependability and confirmability (Supplementary file: Table S2). Based on these criteria, studies were rated as having high quality if all criteria were met; moderate if flaws were identified in one or more criteria that raised some doubt about the results; and low when flaws were identified in one or more criteria that seriously weakened confidence in the results.

Evidence grading

For each individual outcome, the body of evidence was assessed using the GRADE approach[42]. In grading the evidence, qualitative studies were not considered. The initial level of evidence was determined by study design, after which the level of evidence may have been downgraded depending on the presence of five factors or upgraded depending on the effect size (Supplementary file: Box S1).

Data synthesis

As it was expected that most studies would be of qualitative nature, a thematic synthesis[44] was conducted, with a separate synthesis of results for quantitative and qualitative studies. This method is often used to analyse data in primary qualitative research to integrate the findings of multiple qualitative studies. The thematic analysis consisted of three stages: line-by-line extraction of the data, developing descriptive themes, and generating analytical themes. In the first stage, the relevant findings of the studies were extracted, including the association with the studied work outcome. In the second stage, the findings were grouped together to form various descriptive themes. Finally, in the third stage, the descriptive themes were grouped together by type of factor, based on whether it concerns SOs' cognitions or behaviours. Furthermore, as prior research has found moderate correlations between self-reports and informant reporting[39,45–47], a distinction was made between self-reported cognitions and behaviours versus cognitions and behaviours of SOs as perceived by individuals with a chronic disease.

To give an overall overview of the results, we summarized for each factor: (i) the total number of studies reporting on the factor, (i) the number of studies of low, moderate and high quality reporting on the factor, and (iii) whether the factor was consistently reported as either a facilitator or barrier for work participation of individuals with a chronic disease across studies.

RESULTS

Selection of studies

The search of the databases identified 5,168 articles, excluding duplicates (Figure 1). After screening on titles and abstracts, 117 articles remained for possible inclusion. Reference checks identified 18 additional studies, resulting in a total of 135 articles for full-text assessment. After full-text screening, 117 studies were excluded. The main reason for exclusion was that no cognitions or behaviours of SOs were identified or discussed. Other reasons for exclusion were that studies did not examine any work outcome; did not focus on workers with a chronic disease; or the study population was not of working age. Five articles were discussed within the team in order to reach consensus. The first author of one article was contacted for additional information to allow making a decision. Finally, 18 articles met the criteria for inclusion and were assessed for quality.

Figure 1: Flow diagram of the search process.

Study characteristics

The main characteristics of the included quantitative and qualitative studies are respectively presented in Tables 1 and S3 (Supplementary file). The reported cognitions and behaviours of SOs are presented with the direction of its association with the studied work outcome. We aimed to provide a comprehensive overview of participant characteristics of each study, including information on age, gender, ethnicity, education and chronic disease(s). Unfortunately, not all the desired information was available across articles and could therefore not be consistently reported in Tables 1 and S3. For example, as most studies did not include information about participants' ethnicity, this information is only included for the studies that did report on participants' ethnicity.

Studies with various populations were included, mostly involving somatic diseases including various types of cancer, chronic pain and brain injuries. However, one study focused on individuals with severe and persistent mental illnesses. Within the included studies, participants' age ranged from their early twenties to their late sixties.

Three quantitative studies (one cross-sectional, one retrospective and one prospective cohort study) and 15 qualitative studies were included. One quantitative study focused primarily on the influence of behaviours of SOs on work participation of individuals with a chronic disease, while in the other two studies the influence of behaviours and cognitions of SOs on work participation was one of several factors being investigated. In all three studies, the study population consisted of individuals with a chronic disease, in which participants reported about perceived cognitions and behaviours of their SOs. Of the qualitative studies, seven studies focused primarily on the role of SOs regarding work participation of individuals with a chronic disease. In four of these studies, interviews were conducted with both SOs who reflected on their own behaviour and individuals with a chronic disease who reported about perceived cognitions and behaviours of their SOs. In one study, the study population consisted of SOs only and in two studies the study population consisted only of individuals with a chronic disease. Aside from those studies with a primary focus on the influence of SOs on work outcome, eight qualitative studies did include findings on this topic, but did not primarily focus on the influence of SOs on work outcomes. In these studies, only interviews with individuals with a chronic disease were conducted.

Table 1. Characteristics of included quantitative studies

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Balswick 1970[50] USA, Iowa	Cross-sectional	To examine the relationship between spouse companionship support and the degree of vocational rehabilitation success on the part of a handicapped spouse	245 predominantly white participants diagnosed with a physical or mental handicap, a mean age of 36 years and an average education of 12 years	Spouse	Employment success (proportion of time that the patient was employed fulltime during the previous year)	Participation of the spouse in the patient's life outside the job (only for those patients having had twelve or more years of education) χ^2=6.34 (p<0.01)[a] More “dubious” support from the spouse: expressing concern about the handicap, encouraging the patient in work, talking with the patient about goals and plans (among those subjects with an education under 12 years) χ^2=4.57 (p<0.05)[a]	+ -
Kong et al. 2012[48] China	Retrospective cohort study	To predict the RTW outcome and optimize the intervention scheme of a case management program initiated in China	335 participants with work-related injuries–mostly fractures (61.8%) or another limb injury (75.8%)– with a mean age of 36.3 years (SD = 9.7 years). Most participant were male (86.0%), married (75.8%), migrant workers (60.3%), with middle school education (82.7%) 261 participants (77.9%) were successful at RTW. For those who were not currently employed, 45 workers (60.8%) were under sick leave until the end of follow-up, 23 (31.1%) failed to find suitable jobs, 3 (4.1%) did not intend to work again, and 3 (4.1%) retired early because of age	Family members	Successful return to work (sustained work for at least 3 months during follow-up period) and shorter absence duration (period between discharge from the rehabilitation center and resuming work)	Positive family attitude towards return to work (RTW: p<0.05, HR = 4.0, absence duration: p<0.01)[a]	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Sandström & Esbjornsson 1986[49] Sweden	Prospective cohort study with follow-up at 1 and 4 year	To determine the significance of the patient's own prediction as to whether he/she would, or would not, return to work after vocational rehabilitation	52 participants with non-specific low back pain. Male participants (N = 35) had a mean age of 41 years (range 27-49) and female participants (N = 17) had a mean age of 38 years (range 29-49) Twelve men and six women were unemployed at the start of the study	Close relatives	Return to work (study I: sick listed for 25 days or less, study II: sick listed for six months or less)	Opinion of closest relatives that the patient is too ill to return to work ($p<0.05$)[a] Worries of closest relatives regarding deterioration of the patient's condition if returning to work ($p<0.01$ comparing sick listed persons with workers with less than 25 sick days during one year, $p<0.05$ comparing sick listed persons with workers with less than 6 months of sick leave during one year)[a]	- -

[a] = reported by individuals with a chronic disease

+ = facilitator for studied work outcome - = barrier for studied work outcome

Quality assessment

The results of the quality assessment of quantitative studies are presented in Table 2. In all studies the data collection method was rated as weak because the data collection tools were not shown to be reliable and/or valid or this was unclear. However, as this was the only weak rating in every study, the overall quality was moderate for all studies.

The results of the quality assessment of qualitative studies are presented in Table 3. The quality of the included qualitative studies ranged from moderate to high. The agreement of the two reviewers was high on credibility, transferability and dependability and moderate on confirmability. The confirmability was unclear for multiple studies, often due to lack of information; however, we considered it unlikely that this would seriously alter the results.

Table 2. Quality assessment of quantitative studies

Author(s)	Selection bias	Study design	Confounders	Blinding	Data collection method	Withdrawals and dropouts	Quality
Balswick , 1970[50]	2	2	2	2	3	4	2
Kong et al., 2012[48]	1	2	1	2	3	2	2
Sandstrom and Esbjornsson, 1986[49]	2	2	2	2	3	1	2

1 = strong rating   2 = moderate rating   3 = weak rating   4 = not applicable

Table 3. Quality analysis of qualitative studies

Author(s)	Credibility	Transferability	Dependability	Confirmability	Quality
Auerbach and Richardson, 2005[52]	1	1	1	?	2
Brooks et al., 2013[19]	1	1	1	?	2
Dorland et al., 2016[57]	1	1	1	1	1
Duijts et al., 2016[58]	1	1	1	?	2
Frederiksen et al., 2015[59]	1	1	1	?	2
Gagnon et al., 2016[55]	1	1	1	1	1
Main et al., 2005[62]	1	1	1	1	1
McCluskey et al., 2011[51]	1	1	1	1	1
McCluskey et al., 2014[4]	1	1	1	?	2
McCluskey et al., 2015[53]	1	1	1	?	2
Nilsson et al., 2011[60]	1	1	1	1	1
Rubenson et al., 2007[56]	1	1	1	?	2
Svensson et al., 2010[54]	1	1	1	1	1
Tamminga et al., 2012[61]	1	1	1	1	1
Tan et al., 2012[10]	1	1	1	?	2

1 = high   2 = moderate   3 = low   ? = unclear

Grading the evidence of SO factors in quantitative studies

The results of the level of evidence assessment of quantitative studies are presented in Table 4. All three studies were observational; therefore all studied factors initially had a low level of evidence. We found no reasons to downgrade the level of evidence of any of the factors. The level of evidence of one factor (positive family attitude towards RTW) was upgraded to moderate because a large effect was found (HR = 4.0)[48]. The five factors assessed for level of evidence were each found in only one quantitative study. Although many factors were not studied in quantitative studies and could therefore not be graded, various factors were reported in multiple qualitative studies (Table 5).

Synthesis of quantitative studies

In the three quantitative studies five SO factors were reported, which are described in the sections below. In these studies, all factors were reported by individuals with a chronic disease.

Significant others' cognitions

Beliefs of SOs regarding the consequences of the disease and RTW were found to be related with RTW. The opinion of close relatives that patients were too ill to return to work and worries that the condition would deteriorate if patients would return to work were both negatively related to RTW[49]. Additionally, positive attitudes of family towards RTW was found to be strongly related to a shorter duration of sickness absence and a higher chance of RTW[48].

Significant others' behaviours

Participatory support from a spouse–measured by a combination of engaging in relaxing activities together, attending events together and sharing meals–was found to be significantly associated with more employment success (the proportion of time the patient was employed full-time during the past year)[50]. However, this was only true for patients with twelve or more years of education[50]. On the other hand, the degree of what the authors defined as "dubious support" from a spouse had a negative relationship with employment success among lower educated patients[50]. In that study dubious support was measured with three questions in which participants had to indicate how much their spouse was concerned about the participant's handicap, how much their spouses encouraged them in their work, and the number of times participants talked over their goals and plans with their spouses[50]. The authors reasoned that spouses should be less concerned about the handicap when participants were more adjusted in their work, and that more adjusted participants would need less encouragement and had less need to talk over life goals and plans. The authors state that positive responses on dubious support could therefore not only be a sign of healthy companionship support, but could also be an indication of oversupport[50].

Table 4: Level of evidence of SO factors studied in quantitative studies

Factor	Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence
Participating in the patient's life outside the job[50]	1	Cross-sectional study	Not serious	Not serious	Not serious	Not serious	None	Low
“Dubious” support[50]	1	Cross-sectional study	Not serious	Not serious	Not serious	Not serious	None	Low
Positive family attitude towards return to work[48]	1	Retrospective cohort study	Not serious	Not serious	Not serious	Not serious	Strong association	Moderate
Opinion of closest relatives that the patient is too ill to return to work[49]	1	Prospective cohort study	Not serious	Not serious	Not serious	Not serious	None	Low
Worries of closest relatives regarding deterioration of the patient’s condition if returning to work[49]	1	Prospective cohort study	Not serious	Not serious	Not serious	Not serious	None	Low

Table 5: Overview of evidence found for SO factors associated with work participation

Type of factor	Factors investigated	Number & type of articles^a	High quality^a	Moderate quality^a	Consistency^b	Reported by
Cognitions	Work as cause of the disease[51]	1 QS	1 QS		n/a	SOs
	Working is not possible due to disease (ability to work depends on a cure)[4,49]	1 PCS, 1 QS		1 PCS, 1 QS	+	Individuals with a chronic disease & SOs
	Consequences of the disease are permanent[19,51]	2 QS	1 QS	1 QS	+	SOs
	Believing that return to work will lead to deterioration of condition[49,51]	1 PCS, 1 QS	1 QS	1 PCS	+	Individuals with a chronic disease & SOs
	Perceiving that patient has no rights with regard to previous employment[19]	1 QS		1 QS	n/a	SOs
	Perceived low level of control over the patient’s employment[4,19]	2 QS		2 QS	+	SOs
	Positive and encouraging attitudes/outlook in general and with regard to return to work[48,53–55]	1 RCS, 3 QS	2 QS	1 RCS, 1QS	+	Individuals with a chronic disease & SOs
	Positive attitude about the patient and his abilities (viewing the patient as not being disabled or a victim)[19,52]	2 QS		2 QS	+	Individuals with a chronic disease & SOs
	Negative attitudes about the availability of suitable work[51]	1 QS	1 QS		n/a	SOs
	Distrust towards the patient and the severity of the complaints and disease[54]	1 QS	1 QS		n/a	Individuals with a chronic disease
	Exaggerated protective attitude[56]	1 QS		1 QS	n/a	Individuals with a chronic disease
	Positive attitudes towards sickness absence[57–60]	4 QS	2 QS	2 QS	+	Individuals with a chronic disease
Behaviours	Enabling discussion about return to work, talking with, and listening to the patient[52,53,55,61]	4 QS	2 QS	2 QS	+	Individuals with a chronic disease & SOs
	Sharing information[60]	1 QS	1 QS		n/a	Individuals with a chronic disease
	Giving feedback, advice and guidance with regard to future planning[52,55]	2 QS	1 QS	1 QS	+	Individuals with a chronic disease & SOs
	Showing understanding and empathy[51,53,55,56]	4 QS	2 QS	2 QS	-	Individuals with a chronic disease & SOs
	Emphasizing what a patient can still do[19]	1 QS		1 QS	n/a	SOs
	Highlighting beneficial consequences of employment[19]	1 QS		1 QS	n/a	SOs
	Encouraging and motivating the patient[10,52,53,55,57,61,62]	7 QS	4 QS	3 QS	+	Individuals with a chronic disease & SOs

Type of factor	Factors investigated	Number & type of articles[a]	High quality[a]	Moderate quality[a]	Consistency[b]	Reported by
	Emphasizing the negative consequences of the disease[19]	1 QS		1 QS	n/a	SOs
	Waiting on a cure[4]	1 QS		1 QS	n/a	SOs
	Validating patients' statements of incapacity and self-limiting behaviour[19,51]	2 QS	1 QS	1 QS	+	SOs
	Advising, encouraging and pressuring the patients to refrain from work or not return to work[10,57–60]	5 QS	2 QS	3 QS	+	Individuals with a chronic disease
	Helping with daily activities, household tasks and transportation[51,54–56,60,61]	6 QS	5 QS	1 QS	-	Individuals with a chronic disease & SOs
	Exploring and accessing beneficial services and resources (both at and outside of work)[19,55]	2 QS	1 QS	1 QS	+	SOs
	Participation in the patient's life, doing joint activities/initiating activities[50,53]	1 CSS, 2 QS	1 QS	1 CSS, 1 QS	+	Individuals with a chronic disease & SOs
	Providing dubious support[50]	1 CSS		1 CSS	n/a	Individuals with a chronic disease

[a] QS = Qualitative study CSS = Cross-sectional study PCS = Prospective cohort study RCS = Retrospective cohort study

[b] + = consistently reported as either a facilitator or barrier for work participation across studies n/a = not applicable (reported in only one study)

- = not consistently reported as either a facilitator or barrier for work participation across studies

Synthesis of qualitative studies

The 15 qualitative studies reported on 60 factors (including duplicate factors). After thematic synthesis 26 factors remained, the results of which are described below. Of these factors, 13 were reported by SOs, five by workers with a chronic disease, and eight by both workers with a chronic disease and SOs.

Significant others' cognitions

Negative beliefs of SOs regarding the causes and consequences of the disease were reported to be a barrier for work participation. Beliefs that work was the cause of the disease or complaints and that RTW would lead to subsequent complaints were both found to be barriers for RTW[51]. Additionally, beliefs that the consequences of the illness (on work) were permanent[19,51] and that return to work depended on a cure for the disease[4] were found to be present in SOs of patients that were not able to remain in employment and return to work. Finally, perceptions that patients had no rights with regard to their previous employment[19] and that SOs had a low level of personal control over patients' illness, recovery, work situation, and employment[4,19] were reported to be barriers for patients' ability to remain in employment and RTW. However, factors concerning SOs' perceived negative consequences of the disease (for work) and lack of control over the disease and employment were only mentioned by SOs, not by individuals with a chronic disease.

Additionally, positive, encouraging and supportive attitudes from SOs were reported as a determinant of patients' ability to remain in employment[19], job retention[52], staying at work[53], and RTW[54] and productive occupations[55]. In these cases, SOs remained positive both about patients and their abilities and viewed patients as not being disabled or victims[19,52]. On the other hand, negative and pessimistic attitudes of SOs were reported to negatively affect patients' ability to stay at work[54] and return to work[51]. SOs' negative attitudes were directed at the availability of suitable work[54] and consisted of distrust towards the severity of patients' complaints and disease. Finally, exaggerated protective attitudes[56] and expressing positive attitudes towards sickness absence[57–60] were reported to be barriers for work functioning and RTW. Although SOs' positive attitudes towards sickness absence was frequently reported as a barrier for work participation by individuals with a chronic disease, it was not mentioned by SOs.

Significant others' behaviours

Maintaining open communication with patients was reported as a behavioural determinant of job retention[52], staying at work[53], and RTW[60,61] and productive occupations[55]. This communication included talking with and actively listening to patients; sharing information; enabling discussion about return to work; and giving feedback, advice and guidance.

There are contradicting findings with regard to showing understanding and empathy. On the one hand, patients and SOs emphasized the importance of understanding and sympathy from SOs with regard to patients' ability to stay at work[53] and return to work[56] and productive activities[55]. On the other hand, in one study patients who had not successfully returned to work reported a high degree of sympathy from their SOs in combination with SOs validating their incapacity and self-limiting behaviour[51]. The authors hypothesized that these behaviours may have acted as obstacles for RTW, as SOs reinforced patients' unhelpful beliefs concerning for example the chance of re-injury or the likelihood of RTW[51].

Empowering, encouraging and motivating behaviour from SOs was also reported as a behavioural determinant of a patient's ability to remain in employment[19], job retention[52], staying at work[53], work functioning[57] and return to work[10,61,62] and productive occupations[55]. SOs emphasized what patients could still do despite their illness and highlighted beneficial consequences of employment. Furthermore, they encouraged and motivated patients to have a positive outlook and to keep active or return to activities and work. On the other hand, SOs of patients who were not able to remain in employment or return to work emphasized the negative consequences of the disease and seemed to validate patients' statements of incapacity and self-limiting behaviour[19,51]. Furthermore, SOs of patients with a disability claim expressed that they were waiting on a cure in order for the patient to be able to return to work[4]. Additionally, advising, encouraging and pressuring patients to refrain from working or returning to work were reported as barriers for work functioning[57] and RTW[10,58,60], and could lead patients to take sickness absence days[59]. Although pressure from SOs not to (return to) work was frequently reported as a barrier for work participation by individuals with a chronic disease, this was not mentioned by SOs.

Furthermore, practical support was reported to be a facilitator for patients' ability to remain in employment[19] and for RTW[54,56,60,61] and productive occupations[55]. Practical support in this context varied from providing practical help with daily activities, household tasks and transportation, to exploring and accessing beneficial services and resources. However, one study reported that help with everyday activities and high levels of routine dependency could be a barrier for RTW[51].

Finally, initiating activities and doing joint activities were seen as facilitators of returning to productive occupations[55] and staying at work[53] by patients and SOs.

Synthesis of overall results

After thematic synthesis, a total of 27 factors were distinguished (Table 5). Ten out of 27 (37%) factors were reported both by individuals with a chronic disease and SOs, of which eight were consistently reported as either a facilitator or barrier for work participation. The results indicate that SOs' cognitions and behaviours potentially can facilitate or hinder work participation of workers with a chronic disease. A positive attitude of SOs towards RTW, and activity participation outside work were found to be facilitators for work participation in both qualitative and quantitative studies. Overall, there is consistent evidence that positive, encouraging and supportive attitudes; maintaining open communication; and encouraging and motivating behaviour of SOs were facilitators for work participation (i.e. staying at work, a shorter duration of sickness absence, job retention and RTW). There is also consistent evidence that negative perceptions, beliefs and attitudes regarding the causes and consequences of the disease and overprotective behaviour were barriers for work participation (i.e. employment success, work functioning, ability to remain in employment and RTW). Evidence regarding the influence of practical support and showing understanding and empathy on work participation is inconsistent.

DISCUSSION

Within our knowledge, this is the first systematic review that aims to identify cognitions and behaviours of significant others, like relatives and friends, that are related to work participation of individuals with a chronic disease. Although the possible influence of SOs on work participation is recognized in occupational health care[1,2], research focusing primarily on relevant cognitions and behaviours of SOs in the context of work participation is scarce. This review aimed to address this research gap, with some promising results.

We included 18 studies with various populations, consisting of patients with cancer, chronic pain, brain injuries, and in one study patients with severe and persistent mental illnesses. Seven qualitative studies focused primarily on the role of SOs regarding work participation of individuals with a chronic disease[4,19,50,51,53–55]. The findings show that cognitions and behaviours of SOs may influence work participation of their relative or friend. Of the 27 identified factors, seven factors were reported in at least four studies.

First, there was consistent evidence that positive and encouraging attitudes of SOs regarding returning to work or staying at work can facilitate these outcomes[48,53–55]. Secondly, there was consistent evidence that encouragement and motivating behaviour from SOs may facilitate job retention, work functioning, staying at work and RTW[10,52,53,55,57,61,62]. Maintaining open communication–e.g. to enable discussion on return to work and have conversations with patients about the illness and (return to) work–was also reported to be a facilitator for job retention, staying at work and RTW[52,53,55,61]. On the other hand, SOs’ positive attitudes towards sickness absence and their advice, encouragement or pressure to refrain from work were consistently found to be barriers for staying at work, work functioning and RTW[10,57–60]. Finally, there is some evidence that practical help with daily activities and empathy and understanding from SOs can facilitate work participation[53–56,60,61]. However, the evidence for these factors is not consistent, as each factor has once been reported as a possible barrier for staying at work and RTW[51]. These contradicting findings can be explained by underlying processes, such as interaction between cognitions and behaviours of patients and SOs. For example, practical help from SOs could enable patients to stay at or return to work which would otherwise not be possible due to fatigue or pain[54,56,61]. On the other hand, practical help could also be indicative of overprotection in which SOs may reinforce patients' unhelpful beliefs and encourage or pressure patients to limit activities and not to return to work[51].

The findings in this review are consistent with findings of studies on the influence of cognitions and behaviours of SOs on other patient outcomes (e.g. health outcomes, symptom severity, quality of life, self-management behaviour, functioning)[20,21,63–66]. For instance, SOs' beliefs on the causes and consequences of the disease and symptoms and their own and patients' personal control of the disease have been shown to be related to patient outcomes[20,21,64]. Furthermore, various behaviours of SOs–such as encouraging patients to rest, discouraging patients from activities, expressing concern, encouraging activities, initiating and participating in activities, taking over tasks, maintaining open communication and talking with patients–have also been found to be related to various outcomes[20,63,66].

With regard to the results of this systematic review it should be noted that, with the exception of one study, all included studies focused on populations with somatic chronic diseases, i.e. cancer, chronic pain and brain injuries. It remains unclear whether the processes involved are similar for populations with other somatic or mental diseases, as the role of significant others –for example concerning beliefs and type of support–may differ between these groups. Research on illness perceptions about health outcomes has shown that the respective importance of the five dimensions of patients' illness representations–causes, duration, consequences, symptoms and controllability or curability of the disease–differ between diseases[67,68]. Thus, instead of a generic importance of cognitions and behaviours, specific maladaptive cognitions and behaviours may be more common or of more importance in some diseases than in others[69]. Finally, as work outcome studied in the included studies varied widely, it was impossible to determine whether cognitions and behaviours of SOs differ across work outcomes. The majority of studies focused on RTW, while research on other work outcomes such as staying at work, job retention and work functioning is scarce.

Limitations

A limitation of this study is that articles in languages other than English were excluded. As a consequence, some useful and relevant studies might have been missed. In addition, all included studies were from high-income countries except for two studies from upper middle-income countries, restricting the generalizability of the results. Generalizability of results is also restricted due to the limited amount of quantitative studies that were available on this topic. Most of the included studies were of qualitative design, with relatively small study samples. Thus, although various cognitions and behaviours of SOs were reported as being important with respect to work participation, most of these factors were not confirmed in quantitative studies. In addition, the small number of quantitative studies rendered a meta-analysis impossible. Therefore, no statistical analyses were performed.

Finally, we identified multiple qualitative studies exploring facilitators and/or barriers for work performance or RTW that did not report on any cognitions or behaviours of SOs. Thus, not all individuals with a chronic disease report their social environment as being a relevant factor for work participation. There are various possible explanations why individuals may not mention their SOs when discussing facilitators and barriers for work participation[70]. For instance, participants may not relate their disease and ability to work to circumstances in their social environment[70] or they may be unaware of how SOs may influence their cognitions, behaviours and work participation.

Implications and recommendations for future research

Our findings support the hypothesis that cognitions and behaviours of SOs can influence work participation of individuals with chronic diseases such as cancer, chronic pain, brain injuries and mental health disorders. As there is growing evidence that clinical health care interventions in which SOs are involved in treatment are more effective than care as usual where SOs are not involved in treatment[26–29], this may also prove to be beneficial in the work context of occupational health care. However, with the limited amount of studies on this topic with regard to work participation more research is needed for which several recommendations can be made.

First, our review shows that quantitative research on cognitions and behaviours of SOs with regard to work participation of individuals with a chronic disease is scarce. We identified only three quantitative studies in which specific cognitions or behaviours of SOs were investigated in relation to work participation[48–50]. More qualitative research is available in this context, in which cognitions and behaviours of SOs are identified that may be important with regard to work participation. Therefore, future research should focus on quantitatively confirming these findings, thus providing a higher level of evidence.

Second, future studies should explore which cognitions and behaviours of SOs are most strongly related to work participation and determine if these relationships are disease generic or disease specific. This could result in valuable insights into which of these factors would be most promising to take into account in occupational health care to facilitate return to work of workers on sick leave and prevent work disability of individuals with a chronic disease.

Finally, future prognostic studies may focus on the relationship between dyadic agreement of patients with a chronic disease and their SOs and work participation, as dyadic agreement has been shown to influence other patient outcomes such as wellbeing[71] and may also influence work participation.

Conclusions

In this review, we identified 27 cognitions and behaviours of SOs that were reported as determinants for work participation of individuals with a chronic disease. Our findings show that several cognitive behavioural factors of SOs can facilitate or hinder work participation. Aside from one factor (positive family attitude towards return to work) for which moderate-level evidence was found, all factors were of low-level evidence. Despite the overall low level of evidence, our review indicates that involving SOs in occupational health care and intervening on these factors may be beneficial. High quality prognostic studies are needed that investigate cognitive behavioural factors of SOs in relation to work participation to confirm our findings. Future studies could for example focus on exploring which cognitions and behaviours of SOs are most strongly related to duration of sick leave and RTW.

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Contributors All authors contributed to the conception and design of the study. NS developed the search strategy with support from an information specialist (acknowledged); all authors reviewed the search terms. NS and HdV performed the literature search, study selection, data extraction and interpretation of the data and drafted the manuscript. NS, HdV, SvdB, MH and SB have contributed to revising the article critically for important intellectual content. The final version of this manuscript has been approved by all the authors.

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Figure legends

Figure 1: Flow diagram of the search process.

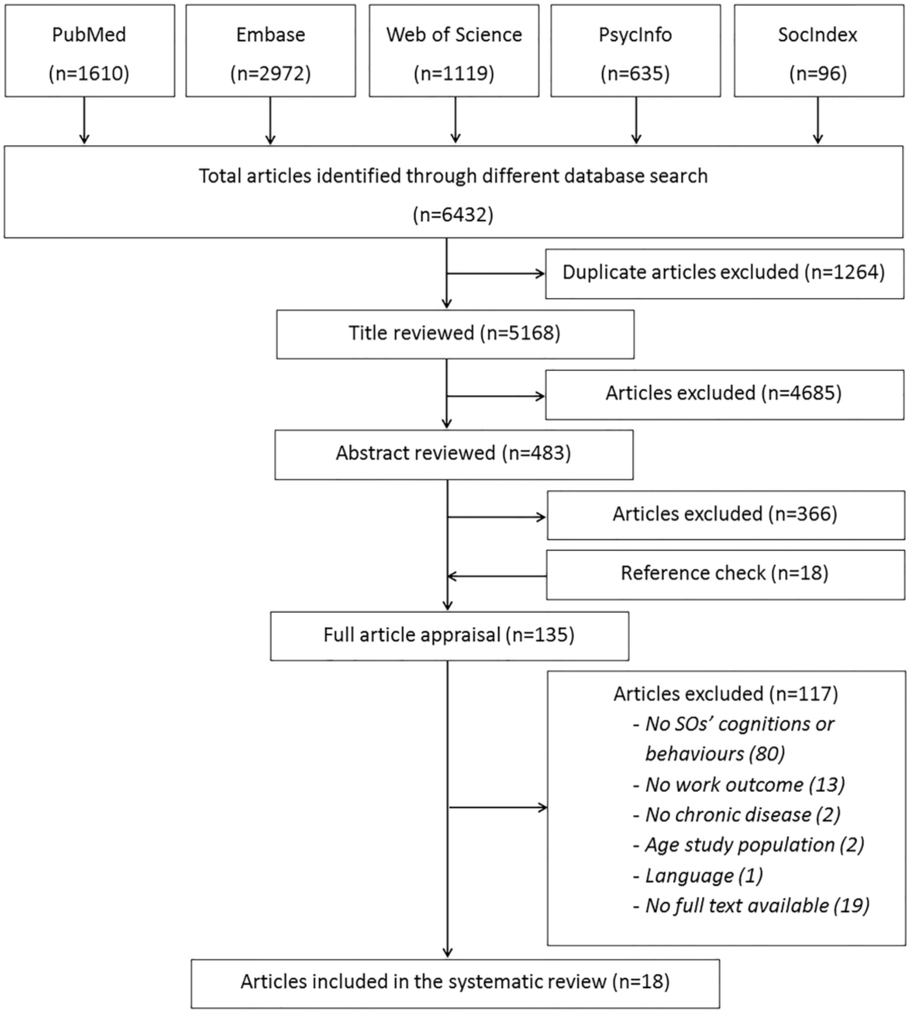

Figure 1: Flow diagram of the search process.

299x329mm (300 x 300 DPI)

SUPPLEMENTARY FILES

Text S1: detailed search strategy of the literature

Search history PubMed:

#1 Mesh terms and free text words related to chronic illness

"Chronic Disease"[Mesh] OR "Disabled Persons"[Mesh] OR "Chronic Pain"[Mesh] OR "Diabetes Mellitus"[Mesh] OR "Neoplasms"[Mesh] OR "Fatigue Syndrome, Chronic"[Mesh] OR "Musculoskeletal Diseases"[Mesh] OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Cardiovascular Diseases"[Mesh] OR "Brain Injuries"[Mesh] OR "Back Pain"[Mesh] OR "Depressive Disorder"[Mesh] OR chronic disease[tiab] OR chronic diseases[tiab] OR disabled person[tiab] OR disabled persons[tiab] OR Chronic pain [tiab] OR Chronic fatigue [tiab] OR Diabetes mellitus [tiab] OR Neoplasm [tiab] OR Neoplasms [tiab] OR Cancer [tiab] OR pulmonary disease[tiab] OR pulmonary diseases[tiab] OR COPD [tiab] OR Cardiovascular [tiab] OR Musculoskeletal [tiab] OR back pain [tiab] OR heart disease[tiab] OR heart diseases[tiab] OR brain injuries[tiab] OR brain injury[tiab]

#2 Mesh and free text terms related to work

“Employment” [MESH] OR “sick leave” [MESH] OR employed[tiab] OR employment[tiab] OR Return to work [tiab] OR Back to work [tiab] OR Sickness absence [tiab] OR work disabled[tiab]

#3 Mesh and free text terms related to significant others

“Family”[MESH] OR “Interpersonal relations”[MESH] OR Family [tiab] OR interpersonal relation[tiab] OR interpersonal relations[tiab] OR interpersonal relationship[tiab] OR interpersonal relationships[tiab] OR spouse[tiab] OR Husband [tiab] OR Wife [tiab] OR partner[tiab] OR significant other[tiab] OR significant others[tiab] OR close communities[tiab] OR close community[tiab]

#4 Mesh and free text terms related to significant others’ cognitions, beliefs, attitudes or behaviour

"Communication"[Mesh] OR belief[tiab] OR beliefs[tiab] OR support[tiab] OR supported[tiab] OR attitude[tiab] OR attitudes[tiab] OR cognition[tiab] OR cognitions[tiab]

#1 AND #2 AND #3 AND #4

Search history Embase:

#1 Emtree terms and free text words related to chronic illness

'chronic disease'/exp OR 'disabled person'/exp OR 'chronic pain'/exp OR 'diabetes mellitus'/exp OR 'neoplasm'/exp OR 'chronic fatigue syndrome'/exp OR 'musculoskeletal disease'/exp OR 'chronic obstructive lung disease'/exp OR 'cardiovascular disease'/exp OR 'brain injury'/exp OR 'backache'/exp OR

'depression'/exp OR ‘Chronic disease’:ti,ab OR ‘Chronic diseases’:ti,ab OR ‘Disabled person’:ti,ab OR ‘Disabled persons’:ti,ab OR ‘Chronic pain’:ti,ab OR ‘Chronic fatigue’:ti,ab OR ‘Diabetes mellitus’:ti,ab OR Neoplasm:ti,ab OR Neoplasms:ti,ab OR Cancer:ti,ab OR ‘Pulmonary disease’:ti,ab OR ‘Pulmonary diseases’:ti,ab OR COPD:ti,ab OR Cardiovascular:ti,ab OR Musculoskeletal:ti,ab OR ‘back pain’:ti,ab OR ‘Heart disease’:ti,ab OR ‘Heart diseases’:ti,ab OR ‘Brain injuries’:ti,ab OR ‘Brain injury’:ti,ab

#2 Emtree terms and free text words related to work

'employment'/exp OR 'medical leave'/exp OR employed:ti,ab OR employment:ti,ab OR 'return to work':ti,ab OR 'back to work':ti,ab OR 'sickness absence':ti,ab OR 'work disabled':ti,ab

#3 Emtree terms and free text words related to significant others

'family'/exp OR 'human relation'/exp OR Family:ti,ab OR ‘interpersonal relation’:ti,ab OR ‘interpersonal relations’:ti,ab OR ‘interpersonal relationship’:ti,ab OR ‘interpersonal relationships’:ti,ab OR spouse:ti,ab OR Husband:ti,ab OR Wife:ti,ab OR partner:ti,ab OR ‘significant other’:ti,ab OR ‘significant others’:ti,ab OR ‘close communities’:ti,ab OR ‘close community’:ti,ab

#4 Emtree terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

'interpersonal communication'/exp OR Belief:ti,ab OR Beliefs:ti,ab OR Support:ti,ab OR Supported:ti,ab OR Attitude:ti,ab OR Attitudes:ti,ab OR cognition:ti,ab OR cognitions:ti,ab

#1 AND #2 AND #3 AND #4

Search history PsycINFO:

#1 Descriptor terms and free text words related to chronic illness

DE "Chronic Illness" OR DE "Disorders" OR DE "Chronic Mental Illness" OR DE "Chronic Fatigue Syndrome" OR DE "Chronic Pain” OR DE "Disabilities" OR DE "Illness Behavior" OR DE "Disabled Personnel" OR DE "Diabetes Mellitus" OR DE "Type 2 Diabetes" OR DE "Diabetes" OR DE "Diabetes Insipidus" OR DE "Neoplasms" OR DE "Musculoskeletal Disorders" OR DE "Physical Disorders" OR DE "Lung Disorders" OR DE "Cardiovascular Disorders" OR DE "Traumatic Brain Injury" OR DE "Back Pain" OR DE "Major Depression" OR DE "Depression (Emotion)" OR TI ”chronic disease” OR AB ”chronic disease” OR TI ”chronic diseases” OR AB ”chronic diseases” OR TI ”disabled person” OR AB ”disabled person” OR TI ”disabled persons” OR AB ”disabled persons” OR TI ”Chronic pain” OR AB ”Chronic pain” OR TI ”Chronic fatigue” OR AB ”Chronic fatigue” OR TI ”Diabetes mellitus” OR AB ”Diabetes mellitus” OR TI ”Neoplasm” OR AB ”Neoplasm” OR TI ”Neoplasms” OR AB ”Neoplasms” OR TI ”Cancer” OR AB ”Cancer” OR TI ”pulmonary disease” OR AB ”pulmonary disease” OR TI ”pulmonary diseases” OR AB ”pulmonary

diseases” OR TI ”COPD” OR AB ”COPD” OR TI ”Cardiovascular” OR AB ”Cardiovascular” OR TI ”Musculoskeletal” OR AB ”Musculoskeletal” OR TI ”back pain” OR AB ”back pain” OR TI ”heart disease” OR AB ”heart disease” OR TI ”heart diseases” OR AB ”heart diseases” OR TI ”brain injuries” OR AB ”brain injuries” OR TI ”brain injury” OR AB ”brain injury”

#2 Descriptor terms and free text words related to work

DE "Employment Status" OR DE "Unemployment" OR DE "Employability" OR DE "Reemployment" OR DE "Employee Retention" OR DE "Employee Leave Benefits" OR DE "Employee Benefits" OR TI ”employed” OR AB ”employed” OR TI ”employment” OR AB ”employment” OR TI ”Return to work” OR AB ”Return to work” OR TI ”Back to work” OR AB ”Back to work” OR TI ”Sickness absence” OR AB ”Sickness absence” OR TI ”work disabled” OR AB ”work disabled”

#3 Descriptor terms and free text words related to significant others

DE "Spouses" OR DE "Family" OR DE "Significant Others" OR DE "Family Members" OR DE "Marital Relations" OR DE "Interpersonal Relationships" OR DE "Husbands" OR DE "Wives" OR DE "Spouses"OR TI ”Family” OR AB ”Family” OR TI ”interpersonal relation” OR AB ”interpersonal relation” OR TI ”interpersonal relations” OR AB ”interpersonal relations” OR TI ”interpersonal relationship” OR AB ”interpersonal relationship” OR TI ”interpersonal relationships” OR AB ”interpersonal relationships” OR TI ”spouse” OR AB ”spouse” OR TI ”Husband” OR AB ”Husband” OR TI ”Wife” OR AB ”Wife” OR TI ”partner” OR AB ”partner” OR TI ”significant other” OR AB ”significant other” OR TI ”significant others” OR AB ”significant others” OR TI ”close communities” OR AB ”close communities” OR TI ”close community” OR AB ”close community”

#4 Descriptor terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

DE "Communication" OR DE "Interpersonal Communication" OR DE "Nonverbal Communication" OR TI ”belief” OR AB ”belief” OR TI ”beliefs” OR AB ”beliefs” OR TI ”support” OR AB ”support” OR TI ”supported” OR AB ”supported” OR TI ”attitude” OR AB ”attitude” OR TI ”attitudes” OR AB ”attitudes” OR TI ”cognition” OR AB ”cognition” OR TI ”cognitions” OR AB ”cognitions”

#1 AND #2 AND #3 AND #4

Search history SocINDEX:

#1 Descriptor terms and free text words related to chronic illness

DE "CHRONIC diseases" OR DE "CHRONIC diseases -- Psychological aspects" OR DE "CHRONIC diseases -- Social aspects" OR DE "PEOPLE with disabilities" OR DE "SICK" OR DE "PEOPLE with disabilities --

Employment" OR DE "CHRONIC fatigue syndrome" OR DE "DIABETES" OR DE "CANCER" OR DE "CANCER -- Psychological aspects" OR DE "CANCER -- Social aspects" OR DE "LUNGS -- Cancer" OR DE "HEART diseases" OR DE "PAIN" OR DE "MENTAL depression" OR TI ”chronic disease” OR AB ”chronic disease” OR TI ”chronic diseases” OR AB ”chronic diseases” OR TI ”disabled person” OR AB ”disabled person” OR TI ”disabled persons” OR AB ”disabled persons” OR TI ”Chronic pain” OR AB ”Chronic pain” OR TI ”Chronic fatigue” OR AB ”Chronic fatigue” OR TI ”Diabetes mellitus” OR AB ”Diabetes mellitus” OR TI ”Neoplasm” OR AB ”Neoplasm” OR TI ”Neoplasms” OR AB ”Neoplasms” OR TI ”Cancer” OR AB ”Cancer” OR TI ”pulmonary disease” OR AB ”pulmonary disease” OR TI ”pulmonary diseases” OR AB ”pulmonary diseases” OR TI ”COPD” OR AB ”COPD” OR TI ”Cardiovascular” OR AB ”Cardiovascular” OR TI ”Musculoskeletal” OR AB ”Musculoskeletal” OR TI ”back pain” OR AB ”back pain” OR TI ”heart disease” OR AB ”heart disease” OR TI ”heart diseases” OR AB ”heart diseases” OR TI ”brain injuries” OR AB ”brain injuries” OR TI ”brain injury” OR AB ”brain injury”

#2 Descriptor terms and free text words related to work

DE "EMPLOYMENT (Economic theory)" OR DE "SICK leave" OR DE "ABSENTEEISM (Labor)" OR DE "LEAVE of absence" OR TI ”employed” OR AB ”employed” OR TI ”employment” OR AB ”employment” OR TI ”Return to work” OR AB ”Return to work” OR TI ”Back to work” OR AB ”Back to work” OR TI ”Sickness absence” OR AB ”Sickness absence” OR TI ”work disabled” OR AB ”work disabled”

#3 Descriptor terms and free text words related to significant others

DE "FAMILIES" OR DE "FAMILY relations" OR DE "INTERPERSONAL relations" OR DE "HUSBAND & wife" OR DE "WIVES" OR DE "SPOUSES" OR DE "HUSBANDS" OR TI ”Family” OR AB ”Family” OR TI ”interpersonal relation” OR AB ”interpersonal relation” OR TI ”interpersonal relations” OR AB ”interpersonal relations” OR TI ”interpersonal relationship” OR AB ”interpersonal relationship” OR TI ”interpersonal relationships” OR AB ”interpersonal relationships” OR TI ”spouse” OR AB ”spouse” OR TI ”Husband” OR AB ”Husband” OR TI ”Wife” OR AB ”Wife” OR TI ”partner” OR AB ”partner” OR TI ”significant other” OR AB ”significant other” OR TI ”significant others” OR AB ”significant others” OR TI ”close communities” OR AB ”close communities” OR TI ”close community” OR AB ”close community”

#4 Descriptor terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

DE "COMMUNICATION" OR DE "COGNITION " OR DE "PERCEPTION" OR DE "FAMILY communication" OR TI ”belief” OR AB ”belief” OR TI ”beliefs” OR AB ”beliefs” OR TI ”support” OR AB ”support” OR TI ”supported” OR AB ”supported” OR TI ”attitude” OR AB ”attitude” OR TI ”attitudes” OR AB ”attitudes” OR TI ”cognition” OR AB ”cognition” OR TI ”cognitions” OR AB ”cognitions”

#1 AND #2 AND #3 AND #4

Search history Web of Science:

#1 Topic terms and free text words related to chronic illness

TS="Depressive Disorder" OR TS="Depressive Disorders" OR TS="Depression" OR TS=”chronic disease” OR TS=”chronic diseases” OR TS=”disabled person” OR TS=”disabled persons” OR TS=”Chronic pain” OR TS=”Chronic fatigue” OR TS=”Diabetes mellitus” OR TS=”Neoplasm” OR TS=”Neoplasms” OR TS=”Cancer” OR TS=”pulmonary disease” OR TS=”pulmonary diseases” OR TS=”COPD” OR TS=”Cardiovascular” OR TS=”Musculoskeletal” OR TS=”back pain” OR TS=”heart disease” OR TS=”heart diseases” OR TS=”brain injuries” OR TS=”brain injury”

#2 Topic terms and free text words related to work

TS=“sick leave” OR TS=”employed” OR TS=”employment” OR TS=”Return to work” OR TS=”Back to work” OR TS=”Sickness absence” OR TS=”work disabled”

#3 Topic terms and free text words related to significant others

TS=”Family” OR TS=”interpersonal relation” OR TS=”interpersonal relations” OR TS=”interpersonal relationship” OR TS=”interpersonal relationships” OR TS=”spouse” OR TS=”Husband” OR TS=”Wife” OR TS=”partner” OR TS=”significant other” OR TS=”significant others” OR TS=”close communities” OR TS=”close community”

#4 Topic terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

TS="Communication" OR TS=”belief” OR TS=”beliefs” OR TS=”support” OR TS=”supported” OR TS=”attitude” OR TS=”attitudes” OR TS=”cognition” OR TS=”cognitions”

#1 AND #2 AND #3 AND #4

Supplementary data

Table S1: Overview of quality assessment criteria for quantitative studies (from the Effective Public Health Practice Project)[41]

Component	Strong rating	Moderate rating	Weak rating
Selection bias	The study sample was very likely to be representative of the target population and the participation rate was more than 80%	The study sample was somewhat likely to be representative of the target population and the participation rate was 60-79%	All other responses or not stated
Design	Randomized controlled trial or controlled clinical trial	Cohort studies, case control, or an interrupted time series	All other study designs
Confounders	Controlled for at least 80% of confounders	Controlled for 60-79% of confounders	Controlled for less than 60% of confounders, or not stated.
Blinding	Outcome assessor(s) and study participants were blinded to intervention status and/or research question	Blinding of either outcome assessor(s) or study participants	No blinding of either outcome assessor(s) or study participants
Data collection methods	Tools are shown to be valid and reliable	Tools are shown to be valid, but reliability is not described	No evidence of validity or reliability
Withdrawals and dropouts	The follow up rate was more than 80% of participants	The follow up rate was 60-79% of participants	The follow-up rate was less than 60% of participants or withdrawals and dropouts were not described

Table S2: Overview of quality assessment criteria for qualitative studies (derived from Cochrane)[43]

Criteria	Questions for assessment
Credibility	Were techniques used to validate the findings of the study, such as: member checks, verbatim quotes or triangulation, independent analysis of the data by more than one researcher?
Transferability	Were details provided about the setting, context and study sample, such that the readers can evaluate to what extent the research findings are transferable to other settings?
Dependability	Was information provided about the data collection method, saturation, taping and transcribing interviews and analysis procedures, with a self-critical account of the research process?
Confirmability	Were techniques used to assure that findings are qualitatively confirmable, such as: use of an audit trail such that each research stage could be repeated or assessing the effects of the researcher(s) due to background, education, personal experiences, and perspective?

Underlying methodology	**Quality rating**
Randomized trials; or double-upgraded observational studies	High
Downgraded randomized trials; or upgraded observational studies	Moderate
Observational studies or double-downgraded randomized trials	Low
Triple-downgraded randomized trials; or downgraded observational studies; or case series/case reports	Very low

Downgrade if

-1 serious risk of bias
-2 very serious risk of bias
-1 serious inconsistency of results
-2 very serious inconsistency of results of unexplained heterogeneity
-1 serious indirectness of evidence
-2 very serious indirectness of evidence
-1 serious imprecision of results
-2 very serious imprecision of results
-1 likely publication bias
-2 very likely publication bias

Upgrade if

+1 large effect (RR/HR > 2 or RR < 0.5 with no plausible confounders)
+2 very large effect (RR/HR > 5 or RR < 0.2 with no major threats to validity)
+1 Presence of a dose-response gradient
+1 All plausible confounding would reduce a demonstrated effect
+1 All plausible confounding would suggest a spurious effect when results show no effect

Definition of level of evidence

High = we are very confident that the true effect lies close to that of the estimate of the effect
Moderate = we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low = our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low = we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect

Box S1: Criteria for assessing the level of evidence[42]

Table S3. Characteristics of included qualitative studies

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
Auerbach & Richardson 2005[52] USA, California	Semi-structured interviews	To investigate the work experiences of individuals with SMI to determine their perspectives on the processes involved in working	6 participants (4 women) diagnosed with severe and persistent mental illness (SMI), with an age range of 21-60 years. All participants worked in competitive employment for at least 18 months during the previous 3 years	Peers, family and friends	Job retention	Peers, family and friends encouraging the patient to work[a]	+
						Peers, family and friends talking with and giving feedback to the patient[a]	+
						Peers, family and friends believing in the patient[a]	+
						Peers, family and friends letting the patient know that the illness doesn't identify the patient[a]	+
McCluskey, de Vries, Reneman, Brooks, and Brouwer 2015[49] UK & The Netherlands	Semi-structured interviews & open-ended questions. Patients and significant others were interviewed separately	To examine the extent and nature of support provided by significant others	62 participants, of whom 31 participants were diagnosed with chronic musculoskeletal pain and 31 participants were a significant other of one of the patients. The mean age of patients was 49.2 years in the UK and 49.0 years in the Netherlands and of the significant others 36.6 years and 50.2 years respectively. All patient participants had managed to stay at work	Significant other, partner/ spouse	Staying at work	Significant other, partner or spouse helping the patient to cope with the illness by maintaining communication about the pain, listening to the patient and showing understanding[c]	+
						Significant other, partner or spouse encouraging the patient to keep active[C]	+
						Significant other, partner or spouse supporting the worker in their management of pain by doing joint activities[C]	+
						Significant other, partner or spouse maintaining a positive attitude in general[C]	+
						Significant other, partner or spouse encouraging a positive outlook in patients[C]	+
Frederiksen, Karsten, Indahl, and Bendix 2015[59] Denmark	Three semi-structured focus group interviews	To explore and obtain knowledge of factors that challenge/help manual workers to cope with back pain at work, and factors influencing their decision to call in sick	20 participants (5 women) who had reported back pain at least once during follow up of an RCT study. Participants had a mean age of 53.5 years (SD = 7.0). All participants had daily physically demanding work. 3 participants also functioned as a trade union, safety	Spouse	Sickness absence (calling in sick)	Spouse trying to talk the patient out of going to work[a]	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)$^{a-c}$	Association with work outcome
			or working environment representative, involving half-day administrative work				
Dorland, Abma, Roelen, Smink, Ranchor, and Bültmann 2016[57] The Netherlands	Focus group study, with semi-structured interview schedules (three groups)	To explore barriers and facilitators of work functioning from the perspectives of cancer survivors and occupational health professionals	22 participants (15 women) with various cancer diagnoses; the majority of them had breast cancer (n=10). The mean age of participants was 47.2 years (SD=7.4). Participants had a high (68%) or medium (32%) level of education, had returned to work within the three years prior to the study and were working at least 12 hours per week.	Family and friends	Work functioning (varying from working without any problems to not working at all)	Family and friends encouraging the cancer survivor to go back to work or to stay at work^{a}	+
						Family and friends advising against return to work due to concern^{a}	-
Brooks, McCluskey, King and Burton 2013[19] England (UK)	Individual semi-structured interviews	To explore whether the illness beliefs of significant others differed depending on their relative's working status, and to make some preliminary identification of how significant others may facilitate or hinder work participation for those with persistent back pain	18 participants, of whom 9 participants diagnosed with non-specific low back pain of at least twelve weeks duration and 9 participants were a significant other of one of the patients. Participants were either working (N = 5) or were not working due to back problems (N = 4). Working patients had a mean age of 49.2 years (range 45-52 years) and patients who were not working had a mean age of 57 years (range 51-63 years).	Spouse (7) child (2)	Ability to remain in employment	Spouse or child emphasizing what the patient could do despite their back problem, rather than what they were unable to do^{b}	+
						Spouse or child being involved in negotiating and maintaining necessary concessions at work^{b}	+
						Spouse or child highlighting beneficial consequences of employment^{b}	+
						Spouse or child rejecting any notion of the patient being disabled by their condition^{b}; not seeing the patient as a victim^{b}	+
						Spouse or child emphasizing the far-reaching consequences of the back pain^{b}; Spouse or child 'catastrophizing' regarding potential rather than actual consequences of the condition^{C}	-
						Spouse or child not perceiving the patient as having any rights or recourse to action in the context of his or her previous employment^{b}	-
							-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
						Spouse or child being resigned to the permanent effects of the patient's back problem on their employment status[b]; Spouse or child considering the patient as 'disabled'[b]	-
						Spouse or child defending the patients by railing against others' lack of understanding of the patient's condition[b]; Spouse or child viewing patients as unfairly stigmatized as potential malingerers[b]	-
						Spouse or child perceiving themselves as lacking in personal control over their –or their significant other's– employment situation[b]	
McCluskey, Brooks, King, and Burton 2011[51] England (UK)	Individual semi-structured interviews (disability benefit claimants and significant others were interviewed separately)	To explore the illness perceptions of individuals with disabling back pain and those of their significant others promoting work participation	10 participants, of whom 5 participants were disability benefit claimants diagnosed with non-specific back pain and 5 participants were a significant other of one of the claimants. Most claimants were male (N = 4) and all significant others were female (N = 5). The mean age of the claimants was 41.0 years (ranging from 29 to 54 years).	Spouse, parent or child	Return to work	Spouse or child believing that work caused the illness and the complaints[b]	-
						Spouse or child believing that return to work will lead to subsequent complaints[b]	-
						Spouse or child believing that the consequences of the illness on work participation are permanent[b]	-
						Spouse or child having a sceptical attitude about the availability of suitable work and sympathy from employers[b]	-
						Spouse or child validating the claimant's statements of incapacity and self-limiting behaviour[b]	-
						Spouse or child helping the claimant in their everyday lives, with high levels of routine dependency[b]	-
						Spouse or child having a shared understanding and high degree of empathy with claimants[b]	-
McCluskey, Brooks, King, and Burton	Individual semi-structured	To explore the wider psychosocial obstacles involved in recovery and	18 participants, of whom 9 participants were diagnosed with persistent low back pain (5 male)	Spouse, parent or child	Return to work	Spouse or child believing that return to work is dependent on a cure[b]	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
2014[4] England (UK)	interviews (disability benefit claimants and significant others were interviewed separately)	continued work participation for individuals with persistent low back pain	and 9 participants were a significant other of the claimants (6 female). The mean age of the claimants was 48.1 years (ranging from 29 to 63 years) and of the significant others 49.7 years (ranging from 21 to 68 years). All claimants were unfit for work for a period ranging from six months to 11 years. With one exception, all claimants had previously worked in unskilled/manual occupations, and none had continued their education past high school.			Spouse or child waiting for a better cure or treatment which would then allow them to return to work[b]	-
						Pessimistic attitude of the spouse or child about their relative's condition and their level of control in their relative's recovery and return to work[b]	-
						Spouse or child believing that patients had not yet received a 'correct' diagnosis, and that the 'real' problem remained undiscovered and therefore untreated, and that this required further medical investigations before being able to return to work[b]	-
Duijts, van Egmond, Gits, van der Beek, and Bleiker 2016[58] The Netherlands	Semi-structured one-to-one telephone interviews. A face-to-face interview only if more convenient for the participant	To explore the perspectives and experiences of cancer survivors regarding behavioural determinants of RTW and continuation of work	28 participants (14 women) diagnosed with breast, colorectal or head or neck cancer one to two years prior to the study. The mean age of the participants was 52 years (range: 28–62 years). Participants had either returned to work (68%) or were not working (32%). The majority had an upper vocational or university level of education (54%).	Family and friends	Return to work	Family and friends pressuring the patient not to return to work, to take it easy for a while[a]	-
Main, Nowels, Cavender, Etschmaier, and Steiner 2005[62] USA	Semi-structured face-to-face interviews	To describe work issues and work return among a diverse group of cancer survivors who were working at the time of diagnosis and to explore factors influencing decisions about work and work return and describe the work experiences of these survivors after	28 participants (14 women) diagnosed with various types of cancer with a mean age of 42.6 years (ranging from 24 to 63 years). All participants were working in a paid job prior to the cancer diagnosis.	Family and friends	Return to work	Family and friends encouraging the patient to work[a]	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
		cancer diagnosis and treatment					
Nilsson, Olsson, Wennman-Larsen, Petersson, and Alexander-son 2011[60] Sweden	Focus group study with an interview guide	To gain knowledge about women's experiences of encounters with stakeholders regarding RTW during and after breast cancer trajectory	23 female participants diagnosed with breast cancer with a mean age of 53 years (ranging from 37 to 62 years). All participants worked prior to diagnosis.	Family and friends	Return to work	Practical support from family and friends (e.g. transportation)[a]	+
						Friends with personal experience of cancer sharing information about possible cognitive problems and rehabilitation options[a]	+
						Family and friends expressing positive attitudes towards sickness absence (e.g. encouraging or pressuring the patient to refrain from work)[a]	-
Rubenson, Svensson, Linddahl, and Bjorklund 2007[56] Sweden	Individual semi-structured interviews	To explore the experiences of returning to work after rehabilitation from the viewpoint of people with acquired brain injury	8 participants (3 women) diagnosed with acquired brain injury, with a mean age of 39 years (ranging from 23 to 63 years). All participants had professions within the areas of health- and medical care, computer business/ information technology, transport, forwarding, marketing, production and management, pedagogies, and technical work.	Family and relatives	Return to work	Family and relatives showing understanding for the patient's situation[a]	+
						Family and relatives providing practical help (taking greater responsibility for the housework, providing transportation)[a]	+
						Family and relatives showing an exaggerated protective attitude[a]	-
Svensson, Müssener, and Alexanderson 2010[54] Sweden	Focus group interviews	To explore and analyse participants' accounts of social interactions and relationships with family, workmates, and friends that seemed to involve positive and negative self-evaluative aspects, and therefore may be important to self-conception and self-esteem, and possibly to return to work	18 participants (13 women) diagnosed with back, neck or shoulder pain, ranging in age from 25 to 34 years. Participants either had a low level of sickness absence (an annual sick leave of 60 days or less) or a high level of sickness absence (an annual sick leave of 60 days or more).	Family	Return to work (through self-evaluation and self-esteem)	Family members' encouraging and supporting attitude towards the situation as well as the patient's coping[a]	+
						Practical help in the household from the spouse and family members[a]	+
						Negative attitude of the spouse towards the patient (thinking of the patient as a nuisance)[a]	-
						Negative attitudes of close relatives towards the patient[a]	-
						Close relatives distrusting the severity of the patients problems[a]	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)$^{a-c}$	Association with work outcome
Tamminga, de Boer, Verbeek, and Frings-Dresen 2012[61] The Netherlands	Semi-structured interviews	Identifying factors that have been experienced as barriers to or facilitators of the initial and post RTW processes	12 female participants diagnosed with breast cancer, with a mean age of 42 (SD = 7, age ranging from 31 to 51 years). All participants were working at the time of diagnosis.	Friends and family	Return to work	Friends and family providing practical support[a]	+
						Friends and family encouraging the patient (to return to work)[a]	+
						Friends and family enabling discussion about return to work[a]	+
Tan, Loh, Su, Veloo, and Ng 2012[10] Malaysia	Focus groups	To explore the perception of barriers and facilitators to return to work, in a group of multi-ethnic women with breast cancer	40 female participants diagnosed with stage 1-3 breast cancer. Participants had either returned to work or not. The age range for participants who had returned to work was 21 to 54 years and for participants who had not returned to work 40-58 years.	Family, husband, spouse, children	Return to work	Family members (e.g. husband, spouse, children) encouraging the patient to return to work[a]	+
						Family members (e.g. husband, spouse, children) restricting the patient to return to work[a]	-
Gagnon, Lin, and Stergiou-Kita 2016[55] Canada	In-depth semi-structured in-person or telephone interviews with family members of traumatic brain injury survivors	To gain an in-depth understanding of the experiences of immediate adult family members when supporting traumatic brain injury survivors' return to productive occupations	14 immediate adult family members (10 women) of patients diagnosed with traumatic brain injury (TBI). Participants had a mean age of 51 (age ranging from 25 to 60 years).	Parents (6), spouses (7) and siblings (1)	Return to productive occupations (meaningful activities, school and community activities, volunteer work and paid part- or full-time employment)	Family members educating others regarding the implications of TBI to promote acceptance of the patient in community and work contexts[b]	+
						Family members exploring social, community, rehabilitation services and resources that could benefit the patient; searching and locating information regarding the diagnosis, prognosis, functional implications and relevant treatments; Family members collecting the necessary information to prepare themselves for future expectations and to adapt to the changes they were experiencing[b]	+
						Family members endorsing survivors' rights to medical and therapy services, access to community resources, and awareness of implications of the illness in the community[b]	+
						Family members engaging in logistical tasks (e.g. coordinating appointments, planning ahead for services,	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
						accessing resources, initiating and maintaining contact with the health care team)[b]	
						Family members initiating leisure or therapeutic activities[b]	+
						Family members providing personal advice and guidance in relation to future planning[b]	+
						Active listening, empathizing with the patient’s position, empowering and motivating them to return to their activities of choice by family members[b]	+
						Family members encouraging and motivating the patient to return to their activities of choice[b]	+
						Family members keeping it upbeat and positive[b]	+
						Family members assisting the patient with their daily activities (e.g. cooking, transportation and toileting)[b]	+

[a] = reported by individuals with a chronic disease [b] = reported by SOs [c] = reported by individuals with a chronic disease and SOs

\+ = facilitator for studied work outcome - = barrier for studied work outcome

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplement: Text 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-6
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5-6 + Supplement: Text 1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6-7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	NA
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	7

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8-9
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	12-13
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10 + supplement: Table S3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	13-18
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	18-19
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	19-20
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20-21
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	See application

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Influence of significant others on work participation of individuals with chronic diseases: a systematic review

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ABSTRACT

Objective It is widely recognized that significant others (SOs), such as a partner, family member or friend, can influence health outcomes of individuals with a chronic disease. However, not much is known about which specific cognitions (i.e. illness perceptions and expectation of work ability) and behaviours (e.g. emotional and practical support) of SOs influence work participation. Therefore, we aimed to identify cognitions and behaviours of SOs that are related to work participation of individuals with a chronic disease.

Design A systematic review and thematic synthesis.

Data sources PubMed, Embase, PsycINFO, SocINDEX and Web of Science were searched until 28 March 2017.

Eligibility criteria for selecting studies We included studies reporting on cognitions and behaviours of SOs related to work participation in populations with various chronic diseases.

Data extraction and synthesis Two independent reviewers extracted the data and performed a quality assessment using the Quality Assessment Tool for Quantitative Studies from the Effective Public Health Practice Project 2007 and a checklist for assessment of qualitative studies derived from the Cochrane Supplemental Handbook Guidance. Evidence was thematically synthesised.

Results Out of 5,168 articles, 18 were included (15 qualitative and 3 quantitative) of moderate to high quality. Studies were on cancer, chronic pain, brain injuries and mental health disorders. After thematic synthesis 27 factors could be distinguished. Consistent evidence was found that SOs' positive and encouraging attitudes regarding work participation, encouragement and motivating behaviour, and open communication with patients are facilitators for work participation. Consistently reported barriers were SOs' positive attitudes towards sickness absence and advise, encouragement or pressure to refrain from work.

Conclusions Our findings show that several cognitions and behaviours of SOs can facilitate or hinder work participation of individuals with a chronic disease. Intervening on these factors by involving SOs in disability prevention and return to work intervention strategies may be beneficial. More prognostic studies are needed, as the current evidence is mostly based on qualitative studies.

Strengths and limitations of this study

- To our knowledge, this is the first systematic review that has investigated cognitions and behaviours of significant others that may influence work participation of individuals with a chronic disease.
- The present systematic review was based on a comprehensive search of the literature in five relevant databases, with an additional reference check.
- We used quality assessment tools recommended by Cochrane to assess the quality of the evidence.
- This review is limited to English articles; articles in languages other than English were excluded.
- The small number of quantitative studies rendered a meta-analysis impossible; therefore, no statistical analyses were performed.

INTRODUCTION

Cognitions and behaviours of significant others (SOs) in the personal environment, such as a partner, family member or friend, can play an important role in health outcomes of individuals with a chronic disease[1–6]. In the clinical setting it has been shown that the behaviour of SOs can have either detrimental or favourable effects on perceived symptoms and behaviour of individuals with a chronic disease, thereby influencing recovery, treatment effects, quality of life and disability[3–5]. Although it is widely recognized that SOs can also influence work participation of individuals with a chronic disease, for instance through social support[7–11], research on the influence of SOs on work outcomes is scarce. Despite increasing evidence that beliefs and behaviours of SOs are important for work outcomes[7–11], not much is known about which specific cognitions or behaviours of SOs influence work participation of their relatives and friends.

A rationale for the influence of SOs on work participation can be found in cognitive behavioural models, which propose that a person's cognitions with regard to the disease and work, i.e. thoughts, beliefs, attitudes and expectations[12–15], generate behavioural and emotional responses to illness events and guide coping strategies[3,16–18]. There is evidence that behaviours of SOs influence the behaviour and consequently health and work outcome of individuals with a chronic disease[19–21]. Illness perceptions held by SOs–consisting of perceptions and beliefs concerning the disease–have been proposed to be a mechanism through which SOs may influence work participation[19,21]. In this context, several studies have described that SOs can reinforce an individual's unhelpful cognitions about the illness, such as beliefs about limitations due to the disease, mistaken beliefs about the nature of illness, pessimistic beliefs regarding the outcome of treatment, and the unlikelihood of returning to work[22,23].

In occupational health care, there is a growing notice that the social context plays an important role in return-to-work processes and that it can be beneficial to address social factors such as responses of SOs[24,25]. As there is evidence that clinical health care interventions in which SOs are involved are more effective than care as usual where SOs are not involved[26–29], this may also prove to be beneficial in occupational health care. Consequently, various multidisciplinary guidelines recommend (occupational) health professionals to address social factors and involve significant others such as family members in treatment and care[30–35].

In recent years, the focus in health care has shifted to self-management and adapting to a disease[36], which requires a more supportive role for (occupational) health professionals[37]. Aside from facilitating and supporting the return to work (RTW) process of sick-listed workers, occupational health professionals have the responsibility to support workers to cope with problems due to disease and to empower them to manage their own health and wellbeing to prevent sickness absence[36,37]. In this context, professionals should support workers to use their own resources to successfully adapt to a disease and to enable them to work[36]. One resource that may be used to support individuals with a chronic disease to participate in work is their network of SOs.

Although it is recognized that SOs can influence workers' recovery and work outcome[1,30,38], more research is needed to determine which specific cognitive behavioural factors in the social environment influence work participation and should therefore be taken into account in occupational health care. Therefore, in this systematic review we aim to identify cognitions and behaviours of SOs that are related to work participation of individuals with a chronic disease. Investigating which SO-related factors are associated with work participation of individuals with a chronic disease may increase our understanding of staying at work and RTW processes, which can be applied in occupational health interventions to facilitate work participation.

METHOD

Search strategy

We conducted a search in PubMed, Embase, PsycINFO, SocINDEX and Web of Science (inception of databases until 28 March 2017). When available, subject headings such as MeSH terms in PubMed were used, in addition to free text words. Four main categories (1. chronic illness, 2. work participation, 3. SOs and 4. SOs' cognitions and behaviours) were combined with the Boolean operator 'AND' to identify studies (Supplementary file: Text S1). We included terms on the following chronic diseases: diabetes mellitus, cancer, chronic pain, chronic fatigue, cardiovascular diseases, pulmonary diseases, musculoskeletal disorders, brain injuries, and depressive disorder. Additionally, we included broader search terms such as "chronic disease" and "disabled persons". In addition to the search, we conducted a reference check to identify additional studies not retrieved through database searching.

Selection of studies

The article selection was performed in three phases by two independent reviewers (NS, HdV). In the first phase, articles were excluded based on title. Secondly, articles were excluded based on abstract. In the third phase the reviewers selected articles for final inclusion based on full text appraisal. To be included, articles had to meet the following criteria: (i) the study population consisted of subjects with a chronic illness or their SOs; (ii) the subjects were 18-67 years old (working population); (iii) the study examined sickness absence, work disability, unemployment, RTW or staying at work as the outcome; (iv) at least one of the independent variables investigated concerned cognitions or behaviour of a SO (a close family member, close friend, spouse or partner) and (v) the article was written in English.

In this study, we were interested in SOs' cognitions such as their perceptions and interpretations of the causes and consequences of their close other's illness and work ability, in this study defined as thoughts, beliefs, attitudes and expectations[12–15]. Furthermore, with regard to behaviour, studies were included if they reported on specific supportive or obstructive behaviours of SOs (e.g. giving advice, showing empathy, taking over household chores, pressuring their close other to rest). As we aimed to find specific behaviours of SOs related to work outcomes, only studies in which constructs such as social support or emotional support were defined as actual provided or received behaviour were included. Studies reporting on satisfaction with support or experienced support from SOs, without providing information on specific provided or received behaviours of SOs, were excluded. Finally, we included both self-reported cognitions and behaviours by SOs and cognitions and behaviours of SOs as perceived by individuals with a chronic disease, as both perspectives are relevant for the research question in this review[39].

Studies were excluded when both reviewers considered that these did not fulfil the inclusion criteria. Disagreements regarding inclusion were resolved by consensus. If no consensus was reached or in case of doubt, the article was screened by the other authors and discussed to reach consensus.

Data extraction

Two reviewers (NS, HdV) independently extracted the data from all selected studies using an adapted version of the Cochrane Data collection form for intervention reviews on RCTs and non-RCTs[40]. The following information was extracted from every included study: study design; study objectives; diagnosed condition; general description of subjects including age, gender and additional details; outcome measures; type of SO; investigated or identified cognitions or behaviour of SOs; and relation with the studied work outcome.

Assessment of quality

The quality of included quantitative studies was assessed using the Quality Assessment Tool for Quantitative Studies from the Effective Public Health Practice Project 2007, recommended by Cochrane[41,42]. This tool is suitable for assessment of studies of any quantitative design. Two reviewers (NS, HdV) used this tool to rate studies on selection bias, study design, confounders, blinding, data collection method and withdrawals and dropouts (Supplementary file: Table S1). Based on these criteria, quality was rated as low when two or more components had weak ratings, moderate when one component had a weak rating and strong if there were no weak ratings.

The quality of included qualitative studies was independently assessed by two reviewers (NS, HdV) using a checklist with criteria for assessment of qualitative studies derived from the Cochrane Supplemental Handbook Guidance[43]. This checklist identified credibility, transferability, dependability and confirmability (Supplementary file: Table S2). Based on these criteria, studies were rated as having high quality if all criteria were met; moderate if flaws were identified in one or more criteria that raised some doubt about the results; and low when flaws were identified in one or more criteria that seriously weakened confidence in the results.

Evidence grading

For each individual outcome, the body of evidence was assessed using the GRADE approach[42]. In grading the evidence, qualitative studies were not considered. The initial level of evidence was determined by study design, after which the level of evidence may have been downgraded depending on the presence of five factors or upgraded depending on the effect size (Supplementary file: Box S1).

Data synthesis

As it was expected that most studies would be of qualitative nature, a thematic synthesis[44] was conducted, with a separate synthesis of results for quantitative and qualitative studies. This method is often used to analyse data in primary qualitative research to integrate the findings of multiple qualitative studies. The thematic analysis consisted of three stages: line-by-line extraction of the data, developing descriptive themes, and generating analytical themes. In the first stage, the relevant findings of the studies were extracted, including the association with the studied work outcome. In the second stage, the findings were grouped together to form various descriptive themes. Finally, in the third stage, the descriptive themes were grouped together by type of factor, based on whether it concerns SOs' cognitions or behaviours. Furthermore, as prior research has found moderate correlations between self-reports and informant reporting[39,45–47], a distinction was made between self-reported cognitions and behaviours versus cognitions and behaviours of SOs as perceived by individuals with a chronic disease.

To give an overall overview of the results, we summarized for each factor: (i) the total number of studies reporting on the factor, (i) the number of studies of low, moderate and high quality reporting on the factor, and (iii) whether the factor was consistently reported as either a facilitator or barrier for work participation of individuals with a chronic disease across studies.

Patient involvement

In this systematic review, no patients were involved in setting the research question, the outcome measures, the design or conduct of the study. No patients were asked to advise on interpretation of results or to contribute to the writing or editing of this document. An advisory work group consisting of a patient representative and occupational health professionals will be consulted on dissemination of the study results.

RESULTS

Selection of studies

The search of the databases identified 5,168 articles, excluding duplicates (Figure 1). After screening on titles and abstracts, 117 articles remained for possible inclusion. Reference checks identified 18 additional studies, resulting in a total of 135 articles for full-text assessment. After full-text screening, 117 studies were excluded. The main reason for exclusion was that no cognitions or behaviours of SOs were identified or discussed. Other reasons for exclusion were that studies did not examine any work outcome; did not focus on workers with a chronic disease; or the study population was not of working age. Five articles were discussed within the team in order to reach consensus. The first author of one article was contacted for additional information to allow making a decision. Finally, 18 articles met the criteria for inclusion and were assessed for quality.

Figure 1: Flow diagram of the search process.

Study characteristics

The main characteristics of the included quantitative and qualitative studies are respectively presented in Tables 1 and S3 (Supplementary file). The reported cognitions and behaviours of SOs are presented with the direction of its association with the studied work outcome. We aimed to provide a comprehensive overview of participant characteristics of each study, including information on age, gender, ethnicity, education and chronic disease(s). Unfortunately, not all the desired information was available across articles and could therefore not be consistently reported in Tables 1 and S3. For example, as most studies did not include information about participants' ethnicity, this information is only included for the studies that did report on participants' ethnicity.

Studies with various populations were included, mostly involving somatic diseases including various types of cancer, chronic pain and brain injuries. However, one study focused on individuals with severe and persistent mental illnesses. Within the included studies, participants' age ranged from their early twenties to their late sixties.

Three quantitative studies (one cross-sectional, one retrospective and one prospective cohort study) and 15 qualitative studies were included. One quantitative study focused primarily on the influence of behaviours of SOs on work participation of individuals with a chronic disease, while in the other two studies the influence of behaviours and cognitions of SOs on work participation was one of several factors being investigated. In all three studies, the study population consisted of individuals with a chronic disease, in which participants reported about perceived cognitions and behaviours of their SOs. Of the qualitative studies, seven studies focused primarily on the role of SOs regarding work participation of individuals with a chronic disease. In four of these studies, interviews were conducted with both SOs who reflected on their own behaviour and individuals with a chronic disease who reported about perceived cognitions and behaviours of their SOs. In one study, the study population consisted of SOs only and in two studies the study population consisted only of individuals with a chronic disease. Aside from those studies with a primary focus on the influence of SOs on work outcome, eight qualitative studies did include findings on this topic, but did not primarily focus on the influence of SOs on work outcomes. In these studies, only interviews with individuals with a chronic disease were conducted.

Table 1. Characteristics of included quantitative studies

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Balswick 1970[48] USA, Iowa	Cross-sectional	To examine the relationship between spouse companionship support and the degree of vocational rehabilitation success on the part of a handicapped spouse	245 predominantly white participants diagnosed with a physical or mental handicap, a mean age of 36 years and an average education of 12 years	Spouse	Employment success (proportion of time that the patient was employed fulltime during the previous year)	Participation of the spouse in the patient's life outside the job (only for those patients having had twelve or more years of education) $\chi^2=6.34$ (p<0.01)[a] More “dubious” support from the spouse: expressing concern about the handicap, encouraging the patient in work, talking with the patient about goals and plans (among those subjects with an education under 12 years) $\chi^2=4.57$ (p<0.05)[a]	+ -
Kong et al. 2012[49] China	Retrospective cohort study	To predict the RTW outcome and optimize the intervention scheme of a case management program initiated in China	335 participants with work-related injuries–mostly fractures (61.8%) or another limb injury (75.8%)– with a mean age of 36.3 years (SD = 9.7 years). Most participant were male (86.0%), married (75.8%), migrant workers (60.3%), with middle school education (82.7%) 261 participants (77.9%) were successful at RTW. For those who were not currently employed, 45 workers (60.8%) were under sick leave until the end of follow-up, 23 (31.1%) failed to find suitable jobs, 3 (4.1%) did not intend to work again, and 3 (4.1%) retired early because of age	Family members	Successful return to work (sustained work for at least 3 months during follow-up period) and shorter absence duration (period between discharge from the rehabilitation center and resuming work)	Positive family attitude towards return to work (RTW: p<0.05, HR = 4.0, absence duration: p<0.01)[a]	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)	Association with work outcome
Sandström & Esbjornsson 1986[50] Sweden	Prospective cohort study with follow-up at 1 and 4 year	To determine the significance of the patient's own prediction as to whether he/she would, or would not, return to work after vocational rehabilitation	52 participants with non-specific low back pain. Male participants (N = 35) had a mean age of 41 years (range 27-49) and female participants (N = 17) had a mean age of 38 years (range 29-49) Twelve men and six women were unemployed at the start of the study	Close relatives	Return to work (study I: sick listed for 25 days or less, study II: sick listed for six months or less)	Opinion of closest relatives that the patient is too ill to return to work ($p<0.05$)[a] Worries of closest relatives regarding deterioration of the patient's condition if returning to work ($p<0.01$ comparing sick listed persons with workers with less than 25 sick days during one year, $p<0.05$ comparing sick listed persons with workers with less than 6 months of sick leave during one year)[a]	- -

[a] = reported by individuals with a chronic disease

\+ = facilitator for studied work outcome - = barrier for studied work outcome

Quality assessment

The results of the quality assessment of quantitative studies are presented in Table 2. In all studies the data collection method was rated as weak because the data collection tools were not shown to be reliable and/or valid or this was unclear. However, as this was the only weak rating in every study, the overall quality was moderate for all studies.

The results of the quality assessment of qualitative studies are presented in Table 3. The quality of the included qualitative studies ranged from moderate to high. The agreement of the two reviewers was high on credibility, transferability and dependability and moderate on confirmability. The confirmability was unclear for multiple studies, often due to lack of information; however, we considered it unlikely that this would seriously alter the results.

Table 2. Quality assessment of quantitative studies

Author(s)	Selection bias	Study design	Confounders	Blinding	Data collection method	Withdrawals and dropouts	Quality
Balswick , 1970[48]	2	2	2	2	3	4	2
Kong et al., 2012[49]	1	2	1	2	3	2	2
Sandstrom and Esbjornsson, 1986[50]	2	2	2	2	3	1	2

1 = strong rating 2 = moderate rating 3 = weak rating 4 = not applicable

Table 3. Quality analysis of qualitative studies

Author(s)	Credibility	Transferability	Dependability	Confirmability	Quality
Auerbach and Richardson, 2005[51]	1	1	1	?	2
Brooks et al., 2013[19]	1	1	1	?	2
Dorland et al., 2016[52]	1	1	1	1	1
Duijts et al., 2016[53]	1	1	1	?	2
Frederiksen et al., 2015[54]	1	1	1	?	2
Gagnon et al., 2016[55]	1	1	1	1	1
Main et al., 2005[56]	1	1	1	1	1
McCluskey et al., 2011[57]	1	1	1	1	1
McCluskey et al., 2014[4]	1	1	1	?	2
McCluskey et al., 2015[58]	1	1	1	?	2
Nilsson et al., 2011[59]	1	1	1	1	1
Rubenson et al., 2007[60]	1	1	1	?	2
Svensson et al., 2010[61]	1	1	1	1	1
Tamminga et al., 2012[62]	1	1	1	1	1
Tan et al., 2012[10]	1	1	1	?	2

1 = high 2 = moderate 3 = low ? = unclear

Grading the evidence of SO factors in quantitative studies

The results of the level of evidence assessment of quantitative studies are presented in Table 4. All three studies were observational; therefore all studied factors initially had a low level of evidence. We found no reasons to downgrade the level of evidence of any of the factors. The level of evidence of one factor (positive family attitude towards RTW) was upgraded to moderate because a large effect was found (HR = 4.0)[49]. The five factors assessed for level of evidence were each found in only one quantitative study. Although many factors were not studied in quantitative studies and could therefore not be graded, various factors were reported in multiple qualitative studies (Table 5).

Synthesis of quantitative studies

In the three quantitative studies five SO factors were reported, which are described in the sections below. In these studies, all factors were reported by individuals with a chronic disease.

Significant others' cognitions

Beliefs of SOs regarding the consequences of the disease and RTW were found to be related with RTW. The opinion of close relatives that patients were too ill to return to work and worries that the condition would deteriorate if patients would return to work were both negatively related to RTW[50]. Additionally, positive attitudes of family towards RTW was found to be strongly related to a shorter duration of sickness absence and a higher chance of RTW[49].

Significant others' behaviours

Participatory support from a spouse–measured by a combination of engaging in relaxing activities together, attending events together and sharing meals–was found to be significantly associated with more employment success (the proportion of time the patient was employed full-time during the past year)[48]. However, this was only true for patients with twelve or more years of education[48]. On the other hand, the degree of what the authors defined as "dubious support" from a spouse had a negative relationship with employment success among lower educated patients[48]. In that study dubious support was measured with three questions in which participants had to indicate how much their spouse was concerned about the participant's handicap, how much their spouses encouraged them in their work, and the number of times participants talked over their goals and plans with their spouses[48]. The authors reasoned that spouses should be less concerned about the handicap when participants were more adjusted in their work, and that more adjusted participants would need less encouragement and had less need to talk over life goals and plans. The authors state that positive responses on dubious support could therefore not only be a sign of healthy companionship support, but could also be an indication of oversupport[48].

Table 4: Level of evidence of SO factors studied in quantitative studies

Factor	Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence
Participating in the patient's life outside the job[48]	1	Cross-sectional study	Not serious	Not serious	Not serious	Not serious	None	Low
"Dubious" support[48]	1	Cross-sectional study	Not serious	Not serious	Not serious	Not serious	None	Low
Positive family attitude towards return to work[49]	1	Retrospective cohort study	Not serious	Not serious	Not serious	Not serious	Strong association	Moderate
Opinion of closest relatives that the patient is too ill to return to work[50]	1	Prospective cohort study	Not serious	Not serious	Not serious	Not serious	None	Low
Worries of closest relatives regarding deterioration of the patient's condition if returning to work[50]	1	Prospective cohort study	Not serious	Not serious	Not serious	Not serious	None	Low

Table 5: Overview of evidence found for SO factors associated with work participation

Type of factor	Factors investigated	Number & type of articles[a]	High quality[a]	Moderate quality[a]	Consistency[b]	Reported by
Cognitions	Work as cause of the disease[57]	1 QS	1 QS		n/a	SOs
	Working is not possible due to disease (ability to work depends on a cure)[4,50]	1 PCS, 1 QS		1 PCS, 1 QS	+	Individuals with a chronic disease & SOs
	Consequences of the disease are permanent[19,57]	2 QS	1 QS	1 QS	+	SOs
	Believing that return to work will lead to deterioration of condition[50,57]	1 PCS, 1 QS	1 QS	1 PCS	+	Individuals with a chronic disease & SOs
	Perceiving that patient has no rights with regard to previous employment[19]	1 QS		1 QS	n/a	SOs
	Perceived low level of control over the patient's employment[4,19]	2 QS		2 QS	+	SOs
	Positive and encouraging attitudes/outlook in general and with regard to return to work[49,55,58,61]	1 RCS, 3 QS	2 QS	1 RCS, 1QS	+	Individuals with a chronic disease & SOs
	Positive attitude about the patient and his abilities (viewing the patient as not being disabled or a victim)[19,51]	2 QS		2 QS	+	Individuals with a chronic disease & SOs
	Negative attitudes about the availability of suitable work[57]	1 QS	1 QS		n/a	SOs
	Distrust towards the patient and the severity of the complaints and disease[61]	1 QS	1 QS		n/a	Individuals with a chronic disease
	Exaggerated protective attitude[60]	1 QS		1 QS	n/a	Individuals with a chronic disease
	Positive attitudes towards sickness absence[52–54,59]	4 QS	2 QS	2 QS	+	Individuals with a chronic disease
Behaviours	Enabling discussion about return to work, talking with, and listening to the patient[51,55,58,62]	4 QS	2 QS	2 QS	+	Individuals with a chronic disease & SOs
	Sharing information[59]	1 QS	1 QS		n/a	Individuals with a chronic disease
	Giving feedback, advice and guidance with regard to future planning[51,55]	2 QS	1 QS	1 QS	+	Individuals with a chronic disease & SOs
	Showing understanding and empathy[55,57,58,60]	4 QS	2 QS	2 QS	-	Individuals with a chronic disease & SOs
	Emphasizing what a patient can still do[19]	1 QS		1 QS	n/a	SOs
	Highlighting beneficial consequences of employment[19]	1 QS		1 QS	n/a	SOs
	Encouraging and motivating the patient[10,51,52,55,56,58,62]	7 QS	4 QS	3 QS	+	Individuals with a chronic disease & SOs

Type of factor	Factors investigated	Number & type of articles[a]	High quality[a]	Moderate quality[a]	Consistency[b]	Reported by
	Emphasizing the negative consequences of the disease[19]	1 QS		1 QS	n/a	SOs
	Waiting on a cure[4]	1 QS		1 QS	n/a	SOs
	Validating patients' statements of incapacity and self-limiting behaviour[19,57]	2 QS	1 QS	1 QS	+	SOs
	Advising, encouraging and pressuring the patients to refrain from work or not return to work[10,52–54,59]	5 QS	2 QS	3 QS	+	Individuals with a chronic disease
	Helping with daily activities, household tasks and transportation[55,57,59–62]	6 QS	5 QS	1 QS	-	Individuals with a chronic disease & SOs
	Exploring and accessing beneficial services and resources (both at and outside of work)[19,55]	2 QS	1 QS	1 QS	+	SOs
	Participation in the patient's life, doing joint activities/initiating activities[48,58]	1 CSS, 2 QS	1 QS	1 CSS, 1 QS	+	Individuals with a chronic disease & SOs
	Providing dubious support[48]	1 CSS		1 CSS	n/a	Individuals with a chronic disease

[a] QS = Qualitative study CSS = Cross-sectional study PCS = Prospective cohort study RCS = Retrospective cohort study

[b] + = consistently reported as either a facilitator or barrier for work participation across studies n/a = not applicable (reported in only one study)

- = not consistently reported as either a facilitator or barrier for work participation across studies

Synthesis of qualitative studies

The 15 qualitative studies reported on 60 factors (including duplicate factors). After thematic synthesis 26 factors remained, the results of which are described below. Of these factors, 13 were reported by SOs, five by workers with a chronic disease, and eight by both workers with a chronic disease and SOs.

Significant others' cognitions

Negative beliefs of SOs regarding the causes and consequences of the disease were reported to be a barrier for work participation. Beliefs that work was the cause of the disease or complaints and that RTW would lead to subsequent complaints were both found to be barriers for RTW[57]. Additionally, beliefs that the consequences of the illness (on work) were permanent[19,57] and that return to work depended on a cure for the disease[4] were found to be present in SOs of patients that were not able to remain in employment and return to work. Finally, perceptions that patients had no rights with regard to their previous employment[19] and that SOs had a low level of personal control over patients' illness, recovery, work situation, and employment[4,19] were reported to be barriers for patients' ability to remain in employment and RTW. However, factors concerning SOs' perceived negative consequences of the disease (for work) and lack of control over the disease and employment were only mentioned by SOs, not by individuals with a chronic disease.

Additionally, positive, encouraging and supportive attitudes from SOs were reported as a determinant of patients' ability to remain in employment[19], job retention[51], staying at work[58], and RTW[61] and productive occupations[55]. In these cases, SOs remained positive both about patients and their abilities and viewed patients as not being disabled or victims[19,51]. On the other hand, negative and pessimistic attitudes of SOs were reported to negatively affect patients' ability to stay at work[61] and return to work[57]. SOs' negative attitudes were directed at the availability of suitable work[61] and consisted of distrust towards the severity of patients' complaints and disease. Finally, exaggerated protective attitudes[60] and expressing positive attitudes towards sickness absence[52–54,59] were reported to be barriers for work functioning and RTW. Although SOs' positive attitudes towards sickness absence was frequently reported as a barrier for work participation by individuals with a chronic disease, it was not mentioned by SOs.

Significant others' behaviours

Maintaining open communication with patients was reported as a behavioural determinant of job retention[51], staying at work[58], and RTW[59,62] and productive occupations[55]. This communication included talking with and actively listening to patients; sharing information; enabling discussion about return to work; and giving feedback, advice and guidance.

There are contradicting findings with regard to showing understanding and empathy. On the one hand, patients and SOs emphasized the importance of understanding and sympathy from SOs with regard to patients' ability to stay at work[58] and return to work[60] and productive activities[55]. On the other hand, in one study patients who had not successfully returned to work reported a high degree of sympathy from their SOs in combination with SOs validating their incapacity and self-limiting behaviour[57]. The authors hypothesized that these behaviours may have acted as obstacles for RTW, as SOs reinforced patients' unhelpful beliefs concerning for example the chance of re-injury or the likelihood of RTW[57].

Empowering, encouraging and motivating behaviour from SOs was also reported as a behavioural determinant of a patient's ability to remain in employment[19], job retention[51], staying at work[58], work functioning[52] and return to work[10,56,62] and productive occupations[55]. SOs emphasized what patients could still do despite their illness and highlighted beneficial consequences of employment. Furthermore, they encouraged and motivated patients to have a positive outlook and to keep active or return to activities and work. On the other hand, SOs of patients who were not able to remain in employment or return to work emphasized the negative consequences of the disease and seemed to validate patients' statements of incapacity and self-limiting behaviour[19,57]. Furthermore, SOs of patients with a disability claim expressed that they were waiting on a cure in order for the patient to be able to return to work[4]. Additionally, advising, encouraging and pressuring patients to refrain from working or returning to work were reported as barriers for work functioning[52] and RTW[10,53,59], and could lead patients to take sickness absence days[54]. Although pressure from SOs not to (return to) work was frequently reported as a barrier for work participation by individuals with a chronic disease, this was not mentioned by SOs.

Furthermore, practical support was reported to be a facilitator for patients' ability to remain in employment[19] and for RTW[59–62] and productive occupations[55]. Practical support in this context varied from providing practical help with daily activities, household tasks and transportation, to exploring and accessing beneficial services and resources. However, one study reported that help with everyday activities and high levels of routine dependency could be a barrier for RTW[57].

Finally, initiating activities and doing joint activities were seen as facilitators of returning to productive occupations[55] and staying at work[58] by patients and SOs.

Synthesis of overall results

After thematic synthesis, a total of 27 factors were distinguished (Table 5). Ten out of 27 (37%) factors were reported both by individuals with a chronic disease and SOs, of which eight were consistently reported as either a facilitator or barrier for work participation. The results indicate that SOs' cognitions and behaviours potentially can facilitate or hinder work participation of workers with a chronic disease. A positive attitude of SOs towards RTW, and activity participation outside work were found to be facilitators for work participation in both qualitative and quantitative studies. Overall, there is consistent evidence that positive, encouraging and supportive attitudes; maintaining open communication; and encouraging and motivating behaviour of SOs were facilitators for work participation (i.e. staying at work, a shorter duration of sickness absence, job retention and RTW). There is also consistent evidence that negative perceptions, beliefs and attitudes regarding the causes and consequences of the disease and overprotective behaviour were barriers for work participation (i.e. employment success, work functioning, ability to remain in employment and RTW). Evidence regarding the influence of practical support and showing understanding and empathy on work participation is inconsistent.

DISCUSSION

Within our knowledge, this is the first systematic review that aims to identify cognitions and behaviours of significant others, like relatives and friends, that are related to work participation of individuals with a chronic disease. Although the possible influence of SOs on work participation is recognized in occupational health care[1,2], research focusing primarily on relevant cognitions and behaviours of SOs in the context of work participation is scarce. This review aimed to address this research gap, with some promising results.

We included 18 studies with various populations, consisting of patients with cancer, chronic pain, brain injuries, and in one study patients with severe and persistent mental illnesses. Seven qualitative studies focused primarily on the role of SOs regarding work participation of individuals with a chronic disease[4,19,48,55,57,58,61]. The findings show that cognitions and behaviours of SOs may influence work participation of their relative or friend. Of the 27 identified factors, seven factors were reported in at least four studies.

First, there was consistent evidence that positive and encouraging attitudes of SOs regarding returning to work or staying at work can facilitate these outcomes[49,55,58,61]. Secondly, there was consistent evidence that encouragement and motivating behaviour from SOs may facilitate job retention, work functioning, staying at work and RTW[10,51,52,55,56,58,62]. Maintaining open communication–e.g. to enable discussion on return to work and have conversations with patients about the illness and (return to) work–was also reported to be a facilitator for job retention, staying at work and RTW[51,55,58,62]. On the other hand, SOs' positive attitudes towards sickness absence and their advice, encouragement or pressure to refrain from work were consistently found to be barriers for staying at work, work functioning and RTW[10,52–54,59]. Finally, there is some evidence that practical help with daily activities and empathy and understanding from SOs can facilitate work participation[55,58–62]. However, the evidence for these factors is not consistent, as each factor has once been reported as a possible barrier for staying at work and RTW[57]. These contradicting findings can be explained by underlying processes, such as interaction between cognitions and behaviours of patients and SOs. For example, practical help from SOs could enable patients to stay at or return to work which would otherwise not be possible due to fatigue or pain[60–62]. On the other hand, practical help could also be indicative of overprotection in which SOs may reinforce patients' unhelpful beliefs and encourage or pressure patients to limit activities and not to return to work[57].

The findings in this review are consistent with findings of studies on the influence of cognitions and behaviours of SOs on other patient outcomes (e.g. health outcomes, symptom severity, quality of life, self-management behaviour, functioning)[20,21,63–66]. For instance, SOs' beliefs on the causes and consequences of the disease and symptoms and their own and patients' personal control of the disease have been shown to be related to patient outcomes[20,21,64]. Furthermore, various behaviours of SOs–such as encouraging patients to rest, discouraging patients from activities, expressing concern, encouraging activities, initiating and participating in activities, taking over tasks, maintaining open communication and talking with patients–have also been found to be related to various outcomes[20,63,66].

With regard to the results of this systematic review it should be noted that, with the exception of one study, all included studies focused on populations with somatic chronic diseases, i.e. cancer, chronic pain and brain injuries. It remains unclear whether the processes involved are similar for populations with other somatic or mental diseases, as the role of significant others –for example concerning beliefs and type of support–may differ between these groups. Research on illness perceptions about health outcomes has shown that the respective importance of the five dimensions of patients' illness representations–causes, duration, consequences, symptoms and controllability or curability of the disease–differ between diseases[67,68]. Thus, instead of a generic importance of cognitions and behaviours, specific maladaptive cognitions and behaviours may be more common or of more importance in some diseases than in others[69]. Finally, as work outcome studied in the included studies varied widely, it was impossible to determine whether cognitions and behaviours of SOs differ across work outcomes. The majority of studies focused on RTW, while research on other work outcomes such as staying at work, job retention and work functioning is scarce.

Limitations

A limitation of this study is that articles in languages other than English were excluded. As a consequence, some useful and relevant studies might have been missed. In addition, all included studies were from high-income countries except for two studies from upper middle-income countries, restricting the generalizability of the results. Generalizability of results is also restricted due to the limited amount of quantitative studies that were available on this topic. Most of the included studies were of qualitative design, with relatively small study samples. Thus, although various cognitions and behaviours of SOs were reported as being important with respect to work participation, most of these factors were not confirmed in quantitative studies. In addition, the small number of quantitative studies rendered a meta-analysis impossible. Therefore, no statistical analyses were performed.

Finally, we identified multiple qualitative studies exploring facilitators and/or barriers for work performance or RTW that did not report on any cognitions or behaviours of SOs. Thus, not all individuals with a chronic disease report their social environment as being a relevant factor for work participation. There are various possible explanations why individuals may not mention their SOs when discussing facilitators and barriers for work participation[70]. For instance, participants may not relate their disease and ability to work to circumstances in their social environment[70] or they may be unaware of how SOs may influence their cognitions, behaviours and work participation.

Implications and recommendations for future research

Our findings support the hypothesis that cognitions and behaviours of SOs can influence work participation of individuals with chronic diseases such as cancer, chronic pain, brain injuries and mental health disorders. As there is growing evidence that clinical health care interventions in which SOs are involved in treatment are more effective than care as usual where SOs are not involved in treatment[26–29], this may also prove to be beneficial in the work context of occupational health care. However, with the limited amount of studies on this topic with regard to work participation more research is needed for which several recommendations can be made.

First, our review shows that quantitative research on cognitions and behaviours of SOs with regard to work participation of individuals with a chronic disease is scarce. We identified only three quantitative studies in which specific cognitions or behaviours of SOs were investigated in relation to work participation[48–50]. More qualitative research is available in this context, in which cognitions and behaviours of SOs are identified that may be important with regard to work participation. Therefore, future research should focus on quantitatively confirming these findings, thus providing a higher level of evidence.

Second, future studies should explore which cognitions and behaviours of SOs are most strongly related to work participation and determine if these relationships are disease generic or disease specific. This could result in valuable insights into which of these factors would be most promising to take into account in occupational health care to facilitate return to work of workers on sick leave and prevent work disability of individuals with a chronic disease.

Finally, future prognostic studies may focus on the relationship between dyadic agreement of patients with a chronic disease and their SOs and work participation, as dyadic agreement has been shown to influence other patient outcomes such as wellbeing[71] and may also influence work participation.

Conclusions

In this review, we identified 27 cognitions and behaviours of SOs that were reported as determinants for work participation of individuals with a chronic disease. Our findings show that several cognitive behavioural factors of SOs can facilitate or hinder work participation. Aside from one factor (positive family attitude towards return to work) for which moderate-level evidence was found, all factors were of low-level evidence. Despite the overall low level of evidence, our review indicates that involving SOs in occupational health care and intervening on these factors may be beneficial. High quality prognostic studies are needed that investigate cognitive behavioural factors of SOs in relation to work participation to confirm our findings. Future studies could for example focus on exploring which cognitions and behaviours of SOs are most strongly related to duration of sick leave and RTW.

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Figure legends

Figure 1: Flow diagram of the search process.

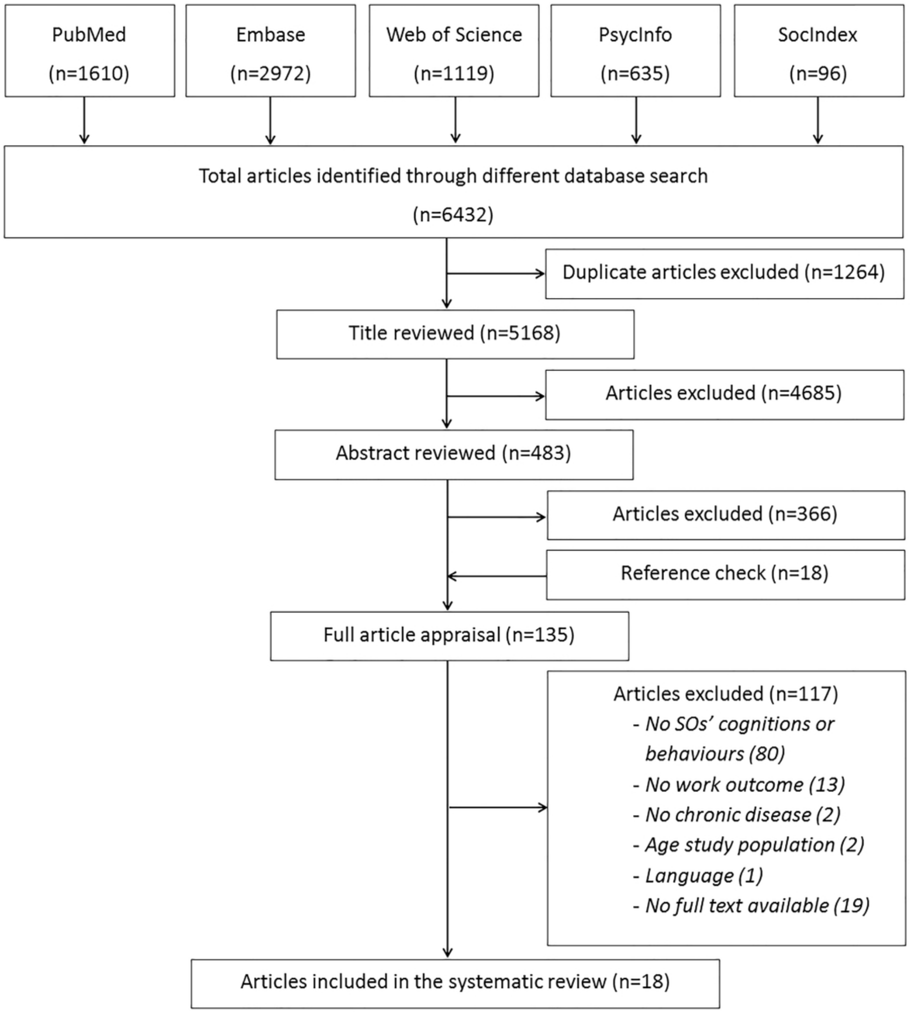

Figure 1: Flow diagram of the search process.

299x329mm (300 x 300 DPI)

SUPPLEMENTARY FILES

Text S1: detailed search strategy of the literature

Search history PubMed:

#1 Mesh terms and free text words related to chronic illness

"Chronic Disease"[Mesh] OR "Disabled Persons"[Mesh] OR "Chronic Pain"[Mesh] OR "Diabetes Mellitus"[Mesh] OR "Neoplasms"[Mesh] OR "Fatigue Syndrome, Chronic"[Mesh] OR "Musculoskeletal Diseases"[Mesh] OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Cardiovascular Diseases"[Mesh] OR "Brain Injuries"[Mesh] OR "Back Pain"[Mesh] OR "Depressive Disorder"[Mesh] OR chronic disease[tiab] OR chronic diseases[tiab] OR disabled person[tiab] OR disabled persons[tiab] OR Chronic pain [tiab] OR Chronic fatigue [tiab] OR Diabetes mellitus [tiab] OR Neoplasm [tiab] OR Neoplasms [tiab] OR Cancer [tiab] OR pulmonary disease[tiab] OR pulmonary diseases[tiab] OR COPD [tiab] OR Cardiovascular [tiab] OR Musculoskeletal [tiab] OR back pain [tiab] OR heart disease[tiab] OR heart diseases[tiab] OR brain injuries[tiab] OR brain injury[tiab]

#2 Mesh and free text terms related to work

“Employment” [MESH] OR “sick leave” [MESH] OR employed[tiab] OR employment[tiab] OR Return to work [tiab] OR Back to work [tiab] OR Sickness absence [tiab] OR work disabled[tiab]

#3 Mesh and free text terms related to significant others

“Family”[MESH] OR “Interpersonal relations”[MESH] OR Family [tiab] OR interpersonal relation[tiab] OR interpersonal relations[tiab] OR interpersonal relationship[tiab] OR interpersonal relationships[tiab] OR spouse[tiab] OR Husband [tiab] OR Wife [tiab] OR partner[tiab] OR significant other[tiab] OR significant others[tiab] OR close communities[tiab] OR close community[tiab]

#4 Mesh and free text terms related to significant others’ cognitions, beliefs, attitudes or behaviour

"Communication"[Mesh] OR belief[tiab] OR beliefs[tiab] OR support[tiab] OR supported[tiab] OR attitude[tiab] OR attitudes[tiab] OR cognition[tiab] OR cognitions[tiab]

#1 AND #2 AND #3 AND #4

Search history Embase:

#1 Emtree terms and free text words related to chronic illness

'chronic disease'/exp OR 'disabled person'/exp OR 'chronic pain'/exp OR 'diabetes mellitus'/exp OR 'neoplasm'/exp OR 'chronic fatigue syndrome'/exp OR 'musculoskeletal disease'/exp OR 'chronic obstructive lung disease'/exp OR 'cardiovascular disease'/exp OR 'brain injury'/exp OR 'backache'/exp OR

'depression'/exp OR ‘Chronic disease’:ti,ab OR ‘Chronic diseases’:ti,ab OR ‘Disabled person’:ti,ab OR ‘Disabled persons’:ti,ab OR ‘Chronic pain’:ti,ab OR ‘Chronic fatigue’:ti,ab OR ‘Diabetes mellitus’:ti,ab OR Neoplasm:ti,ab OR Neoplasms:ti,ab OR Cancer:ti,ab OR ‘Pulmonary disease’:ti,ab OR ‘Pulmonary diseases’:ti,ab OR COPD:ti,ab OR Cardiovascular:ti,ab OR Musculoskeletal:ti,ab OR ‘back pain’:ti,ab OR ‘Heart disease’:ti,ab OR ‘Heart diseases’:ti,ab OR ‘Brain injuries’:ti,ab OR ‘Brain injury’:ti,ab

#2 Emtree terms and free text words related to work

'employment'/exp OR 'medical leave'/exp OR employed:ti,ab OR employment:ti,ab OR 'return to work':ti,ab OR 'back to work':ti,ab OR 'sickness absence':ti,ab OR 'work disabled':ti,ab

#3 Emtree terms and free text words related to significant others

'family'/exp OR 'human relation'/exp OR Family:ti,ab OR ‘interpersonal relation’:ti,ab OR ‘interpersonal relations’:ti,ab OR ‘interpersonal relationship’:ti,ab OR ‘interpersonal relationships’:ti,ab OR spouse:ti,ab OR Husband:ti,ab OR Wife:ti,ab OR partner:ti,ab OR ‘significant other’:ti,ab OR ‘significant others’:ti,ab OR ‘close communities’:ti,ab OR ‘close community’:ti,ab

#4 Emtree terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

'interpersonal communication'/exp OR Belief:ti,ab OR Beliefs:ti,ab OR Support:ti,ab OR Supported:ti,ab OR Attitude:ti,ab OR Attitudes:ti,ab OR cognition:ti,ab OR cognitions:ti,ab

#1 AND #2 AND #3 AND #4

Search history PsycINFO:

#1 Descriptor terms and free text words related to chronic illness

DE "Chronic Illness" OR DE "Disorders" OR DE "Chronic Mental Illness" OR DE "Chronic Fatigue Syndrome" OR DE "Chronic Pain” OR DE "Disabilities" OR DE "Illness Behavior" OR DE "Disabled Personnel" OR DE "Diabetes Mellitus" OR DE "Type 2 Diabetes" OR DE "Diabetes" OR DE "Diabetes Insipidus" OR DE "Neoplasms" OR DE "Musculoskeletal Disorders" OR DE "Physical Disorders" OR DE "Lung Disorders" OR DE "Cardiovascular Disorders" OR DE "Traumatic Brain Injury" OR DE "Back Pain" OR DE "Major Depression" OR DE "Depression (Emotion)" OR TI ”chronic disease” OR AB ”chronic disease” OR TI ”chronic diseases” OR AB ”chronic diseases” OR TI ”disabled person” OR AB ”disabled person” OR TI ”disabled persons” OR AB ”disabled persons” OR TI ”Chronic pain” OR AB ”Chronic pain” OR TI ”Chronic fatigue” OR AB ”Chronic fatigue” OR TI ”Diabetes mellitus” OR AB ”Diabetes mellitus” OR TI ”Neoplasm” OR AB ”Neoplasm” OR TI ”Neoplasms” OR AB ”Neoplasms” OR TI ”Cancer” OR AB ”Cancer” OR TI ”pulmonary disease” OR AB ”pulmonary disease” OR TI ”pulmonary diseases” OR AB ”pulmonary

diseases” OR TI ”COPD” OR AB ”COPD” OR TI ”Cardiovascular” OR AB ”Cardiovascular” OR TI ”Musculoskeletal” OR AB ”Musculoskeletal” OR TI ”back pain” OR AB ”back pain” OR TI ”heart disease” OR AB ”heart disease” OR TI ”heart diseases” OR AB ”heart diseases” OR TI ”brain injuries” OR AB ”brain injuries” OR TI ”brain injury” OR AB ”brain injury”

#2 Descriptor terms and free text words related to work
DE "Employment Status" OR DE "Unemployment" OR DE "Employability" OR DE "Reemployment" OR DE "Employee Retention" OR DE "Employee Leave Benefits" OR DE "Employee Benefits" OR TI ”employed” OR AB ”employed” OR TI ”employment” OR AB ”employment” OR TI ”Return to work” OR AB ”Return to work” OR TI ”Back to work” OR AB ”Back to work” OR TI ”Sickness absence” OR AB ”Sickness absence” OR TI ”work disabled” OR AB ”work disabled”

#3 Descriptor terms and free text words related to significant others
DE "Spouses" OR DE "Family" OR DE "Significant Others" OR DE "Family Members" OR DE "Marital Relations" OR DE "Interpersonal Relationships" OR DE "Husbands" OR DE "Wives" OR DE "Spouses"OR TI ”Family” OR AB ”Family” OR TI ”interpersonal relation” OR AB ”interpersonal relation” OR TI ”interpersonal relations” OR AB ”interpersonal relations” OR TI ”interpersonal relationship” OR AB ”interpersonal relationship” OR TI ”interpersonal relationships” OR AB ”interpersonal relationships” OR TI ”spouse” OR AB ”spouse” OR TI ”Husband” OR AB ”Husband” OR TI ”Wife” OR AB ”Wife” OR TI ”partner” OR AB ”partner” OR TI ”significant other” OR AB ”significant other” OR TI ”significant others” OR AB ”significant others” OR TI ”close communities” OR AB ”close communities” OR TI ”close community” OR AB ”close community”

#4 Descriptor terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour
DE "Communication" OR DE "Interpersonal Communication" OR DE "Nonverbal Communication" OR TI ”belief” OR AB ”belief” OR TI ”beliefs” OR AB ”beliefs” OR TI ”support” OR AB ”support” OR TI ”supported” OR AB ”supported” OR TI ”attitude” OR AB ”attitude” OR TI ”attitudes” OR AB ”attitudes” OR TI ”cognition” OR AB ”cognition” OR TI ”cognitions” OR AB ”cognitions”

#1 AND #2 AND #3 AND #4

Search history SocINDEX:
#1 Descriptor terms and free text words related to chronic illness
DE "CHRONIC diseases" OR DE "CHRONIC diseases -- Psychological aspects" OR DE "CHRONIC diseases -- Social aspects" OR DE "PEOPLE with disabilities" OR DE "SICK" OR DE "PEOPLE with disabilities --

Employment" OR DE "CHRONIC fatigue syndrome" OR DE "DIABETES" OR DE "CANCER" OR DE "CANCER -- Psychological aspects" OR DE "CANCER -- Social aspects" OR DE "LUNGS -- Cancer" OR DE "HEART diseases" OR DE "PAIN" OR DE "MENTAL depression" OR TI ”chronic disease” OR AB ”chronic disease” OR TI ”chronic diseases” OR AB ”chronic diseases” OR TI ”disabled person” OR AB ”disabled person” OR TI ”disabled persons” OR AB ”disabled persons” OR TI ”Chronic pain” OR AB ”Chronic pain” OR TI ”Chronic fatigue” OR AB ”Chronic fatigue” OR TI ”Diabetes mellitus” OR AB ”Diabetes mellitus” OR TI ”Neoplasm” OR AB ”Neoplasm” OR TI ”Neoplasms” OR AB ”Neoplasms” OR TI ”Cancer” OR AB ”Cancer” OR TI ”pulmonary disease” OR AB ”pulmonary disease” OR TI ”pulmonary diseases” OR AB ”pulmonary diseases” OR TI ”COPD” OR AB ”COPD” OR TI ”Cardiovascular” OR AB ”Cardiovascular” OR TI ”Musculoskeletal” OR AB ”Musculoskeletal” OR TI ”back pain” OR AB ”back pain” OR TI ”heart disease” OR AB ”heart disease” OR TI ”heart diseases” OR AB ”heart diseases” OR TI ”brain injuries” OR AB ”brain injuries” OR TI ”brain injury” OR AB ”brain injury”

#2 Descriptor terms and free text words related to work

DE "EMPLOYMENT (Economic theory)" OR DE "SICK leave" OR DE "ABSENTEEISM (Labor)" OR DE "LEAVE of absence" OR TI ”employed” OR AB ”employed” OR TI ”employment” OR AB ”employment” OR TI ”Return to work” OR AB ”Return to work” OR TI ”Back to work” OR AB ”Back to work” OR TI ”Sickness absence” OR AB ”Sickness absence” OR TI ”work disabled” OR AB ”work disabled”

#3 Descriptor terms and free text words related to significant others

DE "FAMILIES" OR DE "FAMILY relations" OR DE "INTERPERSONAL relations" OR DE "HUSBAND & wife" OR DE "WIVES" OR DE "SPOUSES" OR DE "HUSBANDS" OR TI ”Family” OR AB ”Family” OR TI ”interpersonal relation” OR AB ”interpersonal relation” OR TI ”interpersonal relations” OR AB ”interpersonal relations” OR TI ”interpersonal relationship” OR AB ”interpersonal relationship” OR TI ”interpersonal relationships” OR AB ”interpersonal relationships” OR TI ”spouse” OR AB ”spouse” OR TI ”Husband” OR AB ”Husband” OR TI ”Wife” OR AB ”Wife” OR TI ”partner” OR AB ”partner” OR TI ”significant other” OR AB ”significant other” OR TI ”significant others” OR AB ”significant others” OR TI ”close communities” OR AB ”close communities” OR TI ”close community” OR AB ”close community”

#4 Descriptor terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

DE "COMMUNICATION" OR DE "COGNITION " OR DE "PERCEPTION" OR DE "FAMILY communication" OR TI ”belief” OR AB ”belief” OR TI ”beliefs” OR AB ”beliefs” OR TI ”support” OR AB ”support” OR TI ”supported” OR AB ”supported” OR TI ”attitude” OR AB ”attitude” OR TI ”attitudes” OR AB ”attitudes” OR TI ”cognition” OR AB ”cognition” OR TI ”cognitions” OR AB ”cognitions”

#1 AND #2 AND #3 AND #4

Search history Web of Science:

#1 Topic terms and free text words related to chronic illness

TS="Depressive Disorder" OR TS="Depressive Disorders" OR TS="Depression" OR TS=”chronic disease” OR TS=”chronic diseases” OR TS=”disabled person” OR TS=”disabled persons” OR TS=”Chronic pain” OR TS=”Chronic fatigue” OR TS=”Diabetes mellitus” OR TS=”Neoplasm” OR TS=”Neoplasms” OR TS=”Cancer” OR TS=”pulmonary disease” OR TS=”pulmonary diseases” OR TS=”COPD” OR TS=”Cardiovascular” OR TS=”Musculoskeletal” OR TS=”back pain” OR TS=”heart disease” OR TS=”heart diseases” OR TS=”brain injuries” OR TS=”brain injury”

#2 Topic terms and free text words related to work

TS=“sick leave” OR TS=”employed” OR TS=”employment” OR TS=”Return to work” OR TS=”Back to work” OR TS=”Sickness absence” OR TS=”work disabled”

#3 Topic terms and free text words related to significant others

TS=”Family” OR TS=”interpersonal relation” OR TS=”interpersonal relations” OR TS=”interpersonal relationship” OR TS=”interpersonal relationships” OR TS=”spouse” OR TS=”Husband” OR TS=”Wife” OR TS=”partner” OR TS=”significant other” OR TS=”significant others” OR TS=”close communities” OR TS=”close community”

#4 Topic terms and free text words related to significant others’ cognitions, beliefs, attitudes or behaviour

TS="Communication" OR TS=”belief” OR TS=”beliefs” OR TS=”support” OR TS=”supported” OR TS=”attitude” OR TS=”attitudes” OR TS=”cognition” OR TS=”cognitions”

#1 AND #2 AND #3 AND #4

Supplementary data

Table S1: Overview of quality assessment criteria for quantitative studies (from the Effective Public Health Practice Project)[41]

Component	Strong rating	Moderate rating	Weak rating
Selection bias	The study sample was very likely to be representative of the target population and the participation rate was more than 80%	The study sample was somewhat likely to be representative of the target population and the participation rate was 60-79%	All other responses or not stated
Design	Randomized controlled trial or controlled clinical trial	Cohort studies, case control, or an interrupted time series	All other study designs
Confounders	Controlled for at least 80% of confounders	Controlled for 60-79% of confounders	Controlled for less than 60% of confounders, or not stated.
Blinding	Outcome assessor(s) and study participants were blinded to intervention status and/or research question	Blinding of either outcome assessor(s) or study participants	No blinding of either outcome assessor(s) or study participants
Data collection methods	Tools are shown to be valid and reliable	Tools are shown to be valid, but reliability is not described	No evidence of validity or reliability
Withdrawals and dropouts	The follow up rate was more than 80% of participants	The follow up rate was 60-79% of participants	The follow-up rate was less than 60% of participants or withdrawals and dropouts were not described

Table S2: Overview of quality assessment criteria for qualitative studies (derived from Cochrane)[43]

Criteria	Questions for assessment
Credibility	Were techniques used to validate the findings of the study, such as: member checks, verbatim quotes or triangulation, independent analysis of the data by more than one researcher?
Transferability	Were details provided about the setting, context and study sample, such that the readers can evaluate to what extent the research findings are transferable to other settings?
Dependability	Was information provided about the data collection method, saturation, taping and transcribing interviews and analysis procedures, with a self-critical account of the research process?
Confirmability	Were techniques used to assure that findings are qualitatively confirmable, such as: use of an audit trail such that each research stage could be repeated or assessing the effects of the researcher(s) due to background, education, personal experiences, and perspective?

Underlying methodology	**Quality rating**
Randomized trials; or double-upgraded observational studies	High
Downgraded randomized trials; or upgraded observational studies	Moderate
Observational studies or double-downgraded randomized trials	Low
Triple-downgraded randomized trials; or downgraded observational studies; or case series/case reports	Very low

Downgrade if

-1 serious risk of bias
-2 very serious risk of bias
-1 serious inconsistency of results
-2 very serious inconsistency of results of unexplained heterogeneity
-1 serious indirectness of evidence
-2 very serious indirectness of evidence
-1 serious imprecision of results
-2 very serious imprecision of results
-1 likely publication bias
-2 very likely publication bias

Upgrade if

+1 large effect (RR/HR > 2 or RR < 0.5 with no plausible confounders)
+2 very large effect (RR/HR > 5 or RR < 0.2 with no major threats to validity)
+1 Presence of a dose-response gradient
+1 All plausible confounding would reduce a demonstrated effect
+1 All plausible confounding would suggest a spurious effect when results show no effect

Definition of level of evidence

High = we are very confident that the true effect lies close to that of the estimate of the effect
Moderate = we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low = our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low = we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect

Box S1: Criteria for assessing the level of evidence[42]

Table S3. Characteristics of included qualitative studies

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
Auerbach & Richardson 2005[51] USA, California	Semi-structured interviews	To investigate the work experiences of individuals with SMI to determine their perspectives on the processes involved in working	6 participants (4 women) diagnosed with severe and persistent mental illness (SMI), with an age range of 21-60 years. All participants worked in competitive employment for at least 18 months during the previous 3 years	Peers, family and friends	Job retention	Peers, family and friends encouraging the patient to work[a]	+
						Peers, family and friends talking with and giving feedback to the patient[a]	+
						Peers, family and friends believing in the patient[a]	+
						Peers, family and friends letting the patient know that the illness doesn't identify the patient[a]	+
McCluskey, de Vries, Reneman, Brooks, and Brouwer 2015[49] UK & The Netherlands	Semi-structured interviews & open-ended questions. Patients and significant others were interviewed separately	To examine the extent and nature of support provided by significant others	62 participants, of whom 31 participants were diagnosed with chronic musculoskeletal pain and 31 participants were a significant other of one of the patients. The mean age of patients was 49.2 years in the UK and 49.0 years in the Netherlands and of the significant others 36.6 years and 50.2 years respectively. All patient participants had managed to stay at work	Significant other, partner/ spouse	Staying at work	Significant other, partner or spouse helping the patient to cope with the illness by maintaining communication about the pain, listening to the patient and showing understanding[c]	+
						Significant other, partner or spouse encouraging the patient to keep active[C]	+
						Significant other, partner or spouse supporting the worker in their management of pain by doing joint activities[C]	+
						Significant other, partner or spouse maintaining a positive attitude in general[C]	+
						Significant other, partner or spouse encouraging a positive outlook in patients[C]	+
Frederiksen, Karsten, Indahl, and Bendix 2015[54] Denmark	Three semi-structured focus group interviews	To explore and obtain knowledge of factors that challenge/help manual workers to cope with back pain at work, and factors influencing their decision to call in sick	20 participants (5 women) who had reported back pain at least once during follow up of an RCT study. Participants had a mean age of 53.5 years (SD = 7.0). All participants had daily physically demanding work. 3 participants also functioned as a trade union, safety	Spouse	Sickness absence (calling in sick)	Spouse trying to talk the patient out of going to work[a]	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
			or working environment representative, involving half-day administrative work				
Dorland, Abma, Roelen, Smink, Ranchor, and Bültmann 2016[52] The Netherlands	Focus group study, with semi-structured interview schedules (three groups)	To explore barriers and facilitators of work functioning from the perspectives of cancer survivors and occupational health professionals	22 participants (15 women) with various cancer diagnoses; the majority of them had breast cancer (n=10). The mean age of participants was 47.2 years (SD=7.4). Participants had a high (68%) or medium (32%) level of education, had returned to work within the three years prior to the study and were working at least 12 hours per week.	Family and friends	Work functioning (varying from working without any problems to not working at all)	Family and friends encouraging the cancer survivor to go back to work or to stay at work[a]	+
						Family and friends advising against return to work due to concern[a]	-
Brooks, McCluskey, King and Burton 2013[19] England (UK)	Individual semi-structured interviews	To explore whether the illness beliefs of significant others differed depending on their relative's working status, and to make some preliminary identification of how significant others may facilitate or hinder work participation for those with persistent back pain	18 participants, of whom 9 participants diagnosed with non-specific low back pain of at least twelve weeks duration and 9 participants were a significant other of one of the patients. Participants were either working (N = 5) or were not working due to back problems (N = 4). Working patients had a mean age of 49.2 years (range 45-52 years) and patients who were not working had a mean age of 57 years (range 51-63 years).	Spouse (7) child (2)	Ability to remain in employment	Spouse or child emphasizing what the patient could do despite their back problem, rather than what they were unable to do[b]	+
						Spouse or child being involved in negotiating and maintaining necessary concessions at work[b]	+
						Spouse or child highlighting beneficial consequences of employment[b]	+
						Spouse or child rejecting any notion of the patient being disabled by their condition[b]; not seeing the patient as a victim[b]	+
						Spouse or child emphasizing the far-reaching consequences of the back pain[b]; Spouse or child 'catastrophizing' regarding potential rather than actual consequences of the condition[C]	-
						Spouse or child not perceiving the patient as having any rights or recourse to action in the context of his or her previous employment[b]	-
							-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
						Spouse or child being resigned to the permanent effects of the patient's back problem on their employment status[b]; Spouse or child considering the patient as 'disabled'[b]	-
						Spouse or child defending the patients by railing against others' lack of understanding of the patient's condition[b]; Spouse or child viewing patients as unfairly stigmatized as potential malingerers[b]	-
						Spouse or child perceiving themselves as lacking in personal control over their –or their significant other's– employment situation[b]	
McCluskey, Brooks, King, and Burton 2011[57] England (UK)	Individual semi-structured interviews (disability benefit claimants and significant others were interviewed separately)	To explore the illness perceptions of individuals with disabling back pain and those of their significant others promoting work participation	10 participants, of whom 5 participants were disability benefit claimants diagnosed with non-specific back pain and 5 participants were a significant other of one of the claimants. Most claimants were male (N = 4) and all significant others were female (N = 5). The mean age of the claimants was 41.0 years (ranging from 29 to 54 years).	Spouse, parent or child	Return to work	Spouse or child believing that work caused the illness and the complaints[b]	-
						Spouse or child believing that return to work will lead to subsequent complaints[b]	-
						Spouse or child believing that the consequences of the illness on work participation are permanent[b]	-
						Spouse or child having a sceptical attitude about the availability of suitable work and sympathy from employers[b]	-
						Spouse or child validating the claimant's statements of incapacity and self-limiting behaviour[b]	-
						Spouse or child helping the claimant in their everyday lives, with high levels of routine dependency[b]	-
						Spouse or child having a shared understanding and high degree of empathy with claimants[b]	-
McCluskey, Brooks, King, and Burton	Individual semi-structured	To explore the wider psychosocial obstacles involved in recovery and	18 participants, of whom 9 participants were diagnosed with persistent low back pain (5 male)	Spouse, parent or child	Return to work	Spouse or child believing that return to work is dependent on a cure[b]	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)$^{a-c}$	Association with work outcome
2014[4] England (UK)	interviews (disability benefit claimants and significant others were interviewed separately)	continued work participation for individuals with persistent low back pain	and 9 participants were a significant other of the claimants (6 female). The mean age of the claimants was 48.1 years (ranging from 29 to 63 years) and of the significant others 49.7 years (ranging from 21 to 68 years). All claimants were unfit for work for a period ranging from six months to 11 years. With one exception, all claimants had previously worked in unskilled/manual occupations, and none had continued their education past high school.			Spouse or child waiting for a better cure or treatment which would then allow them to return to work^{b}	-
						Pessimistic attitude of the spouse or child about their relative's condition and their level of control in their relative's recovery and return to work^{b}	-
						Spouse or child believing that patients had not yet received a 'correct' diagnosis, and that the 'real' problem remained undiscovered and therefore untreated, and that this required further medical investigations before being able to return to work^{b}	-
Duijts, van Egmond, Gits, van der Beek, and Bleiker 2016[53] The Netherlands	Semi-structured one-to-one telephone interviews. A face-to-face interview only if more convenient for the participant	To explore the perspectives and experiences of cancer survivors regarding behavioural determinants of RTW and continuation of work	28 participants (14 women) diagnosed with breast, colorectal or head or neck cancer one to two years prior to the study. The mean age of the participants was 52 years (range: 28–62 years). Participants had either returned to work (68%) or were not working (32%). The majority had an upper vocational or university level of education (54%).	Family and friends	Return to work	Family and friends pressuring the patient not to return to work, to take it easy for a while^{a}	-
Main, Nowels, Cavender, Etschmaier, and Steiner 2005[56] USA	Semi-structured face-to-face interviews	To describe work issues and work return among a diverse group of cancer survivors who were working at the time of diagnosis and to explore factors influencing decisions about work and work return and describe the work experiences of these survivors after	28 participants (14 women) diagnosed with various types of cancer with a mean age of 42.6 years (ranging from 24 to 63 years). All participants were working in a paid job prior to the cancer diagnosis.	Family and friends	Return to work	Family and friends encouraging the patient to work^{a}	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
		cancer diagnosis and treatment					
Nilsson, Olsson, Wennman-Larsen, Petersson, and Alexander-son 2011[59] Sweden	Focus group study with an interview guide	To gain knowledge about women's experiences of encounters with stakeholders regarding RTW during and after breast cancer trajectory	23 female participants diagnosed with breast cancer with a mean age of 53 years (ranging from 37 to 62 years). All participants worked prior to diagnosis.	Family and friends	Return to work	Practical support from family and friends (e.g. transportation)[a]	+
						Friends with personal experience of cancer sharing information about possible cognitive problems and rehabilitation options[a]	+
						Family and friends expressing positive attitudes towards sickness absence (e.g. encouraging or pressuring the patient to refrain from work)[a]	-
Rubenson, Svensson, Linddahl, and Bjorklund 2007[60] Sweden	Individual semi-structured interviews	To explore the experiences of returning to work after rehabilitation from the viewpoint of people with acquired brain injury	8 participants (3 women) diagnosed with acquired brain injury, with a mean age of 39 years (ranging from 23 to 63 years). All participants had professions within the areas of health- and medical care, computer business/ information technology, transport, forwarding, marketing, production and management, pedagogies, and technical work.	Family and relatives	Return to work	Family and relatives showing understanding for the patient's situation[a]	+
						Family and relatives providing practical help (taking greater responsibility for the housework, providing transportation)[a]	+
						Family and relatives showing an exaggerated protective attitude[a]	-
Svensson, Müssener, and Alexanderson 2010[61] Sweden	Focus group interviews	To explore and analyse participants' accounts of social interactions and relationships with family, workmates, and friends that seemed to involve positive and negative self-evaluative aspects, and therefore may be important to self-conception and self-esteem, and possibly to return to work	18 participants (13 women) diagnosed with back, neck or shoulder pain, ranging in age from 25 to 34 years. Participants either had a low level of sickness absence (an annual sick leave of 60 days or less) or a high level of sickness absence (an annual sick leave of 60 days or more).	Family	Return to work (through self-evaluation and self-esteem)	Family members' encouraging and supporting attitude towards the situation as well as the patient's coping[a]	+
						Practical help in the household from the spouse and family members[a]	+
						Negative attitude of the spouse towards the patient (thinking of the patient as a nuisance)[a]	-
						Negative attitudes of close relatives towards the patient[a]	-
						Close relatives distrusting the severity of the patients problems[a]	-

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)$^{a\text{-}c}$	Association with work outcome
Tamminga, de Boer, Verbeek, and Frings-Dresen 2012[62] The Netherlands	Semi-structured interviews	Identifying factors that have been experienced as barriers to or facilitators of the initial and post RTW processes	12 female participants diagnosed with breast cancer, with a mean age of 42 (SD = 7, age ranging from 31 to 51 years). All participants were working at the time of diagnosis.	Friends and family	Return to work	Friends and family providing practical support[a]	+
						Friends and family encouraging the patient (to return to work)[a]	+
						Friends and family enabling discussion about return to work[a]	+
Tan, Loh, Su, Veloo, and Ng 2012[10] Malaysia	Focus groups	To explore the perception of barriers and facilitators to return to work, in a group of multi-ethnic women with breast cancer	40 female participants diagnosed with stage 1-3 breast cancer. Participants had either returned to work or not. The age range for participants who had returned to work was 21 to 54 years and for participants who had not returned to work 40-58 years.	Family, husband, spouse, children	Return to work	Family members (e.g. husband, spouse, children) encouraging the patient to return to work[a]	+
						Family members (e.g. husband, spouse, children) restricting the patient to return to work[a]	-
Gagnon, Lin, and Stergiou-Kita 2016[55] Canada	In-depth semi-structured in-person or telephone interviews with family members of traumatic brain injury survivors	To gain an in-depth understanding of the experiences of immediate adult family members when supporting traumatic brain injury survivors' return to productive occupations	14 immediate adult family members (10 women) of patients diagnosed with traumatic brain injury (TBI). Participants had a mean age of 51 (age ranging from 25 to 60 years).	Parents (6), spouses (7) and siblings (1)	Return to productive occupations (meaningful activities, school and community activities, volunteer work and paid part- or full-time employment)	Family members educating others regarding the implications of TBI to promote acceptance of the patient in community and work contexts[b]	+
						Family members exploring social, community, rehabilitation services and resources that could benefit the patient; searching and locating information regarding the diagnosis, prognosis, functional implications and relevant treatments; Family members collecting the necessary information to prepare themselves for future expectations and to adapt to the changes they were experiencing[b]	+
						Family members endorsing survivors' rights to medical and therapy services, access to community resources, and awareness of implications of the illness in the community[b]	+
						Family members engaging in logistical tasks (e.g. coordinating appointments, planning ahead for services,	+

Author, year (Ref no.) Country	Study design	Aim of the study	Sample	Involved significant other(s)	Work outcome	Identified cognitions or behaviours of significant other(s)[a-c]	Association with work outcome
						accessing resources, initiating and maintaining contact with the health care team)[b]	
						Family members initiating leisure or therapeutic activities[b]	+
						Family members providing personal advice and guidance in relation to future planning[b]	+
						Active listening, empathizing with the patient's position, empowering and motivating them to return to their activities of choice by family members[b]	+
						Family members encouraging and motivating the patient to return to their activities of choice[b]	+
						Family members keeping it upbeat and positive[b]	+
						Family members assisting the patient with their daily activities (e.g. cooking, transportation and toileting)[b]	+

[a] = reported by individuals with a chronic disease [b] = reported by SOs [c] = reported by individuals with a chronic disease and SOs

+ = facilitator for studied work outcome - = barrier for studied work outcome

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplement: Text 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-6
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5-6 + Supplement: Text 1
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6-7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	NA
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	7

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8-9
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	12-13
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10 + supplement: Table S3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	13-18
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	18-19
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	19-20
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20-21
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	See application

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