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*Published in:*  
Disability and Rehabilitation

*DOI:*  
[10.3109/09638288.2011.607551](https://doi.org/10.3109/09638288.2011.607551)

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*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2012

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

de Vries, H. J., Reneman, M. F., Groothoff, J. W., Geertzen, J. H. B., & Brouwer, S. (2012). Factors promoting staying at work in people with chronic nonspecific musculoskeletal pain: a systematic review. *Disability and Rehabilitation*, 34(6), 443-458. DOI: 10.3109/09638288.2011.607551

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REVIEW PAPER

# Factors promoting staying at work in people with chronic nonspecific musculoskeletal pain: a systematic review

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**Purpose:** To identify determinants for staying at work (SAW) in workers with chronic musculoskeletal pain (CMP). **Method:** A systematic review of factors that promote SAW in workers with CMP. We searched the databases of PubMed, EMBASE, PsycInfo, CINAHL and the Cochrane Library. We included studies reporting on working subjects without present CMP-related sick leave. A quality assessment of GRADE criteria and evidence synthesis was performed. **Results:** We identified five cross-sectional studies and two qualitative studies reporting on factors associated with SAW in workers with CMP. Consistent association with SAW was found for low perceived physical disability and low emotional distress (low-level evidence). Duration of pain, catastrophizing, self-esteem and marital status were not associated with SAW (low-level evidence). Qualitative studies indicated that personal adjustments and workplace interventions are important determinants for SAW (evidence not graded). **Conclusions:** No high-level evidence for SAW determinants for workers with CMP was identified. Future interventions aimed at promoting SAW could consider reducing perceived physical disability and emotional distress, and promoting adjustment latitude at work, support from supervisors, and the workers' motivation and self-management skills. Further research is required because knowledge of SAW in workers with CMP is scarce, and the relevance of the subject is high.

**Keywords:** Chronic pain, musculoskeletal pain, staying at work, work status

## Introduction

The prevalence of chronic nonspecific musculoskeletal pain (CMP) in western societies is high, ranging from 30–70% of the population in different countries [1–4]. In the Netherlands, the prevalence of CMP is 44% in the population aged over 25, and has an impact on health, work and the use of healthcare

## Implications for Rehabilitation

- When modifiable factors that promote staying at work can be identified, interventions can be developed to support the ability of workers with chronic nonspecific musculoskeletal pain to stay at work.
- Consistent evidence of promoting staying at work was found for low emotional distress and perceived physical disability, while duration of pain, catastrophizing, self-esteem and marital status were consistently not associated.
- Future interventions aimed at promoting staying at work should consider reducing perceived physical disability and emotional distress.

services [4]. Many people with CMP report decreased levels of participation in work or incapacity [5–7]. These people become eligible for income support to compensate for their financial losses. Employers, insurance companies and society are confronted with considerable socioeconomic costs for incapacity claimants [8–10].

Although many people with CMP are confronted with decreased work participation, a majority stays at work (SAW) and reports no sick leave for pain reasons [1,2,4,5,11–14]. The factors that distinguish people who stay at work despite pain from those who do not are currently unknown. The majority of existing studies in the field of rehabilitation and occupational medicine investigated the perspectives of individuals who were no longer capable of doing their job or who had returned to work [15–21], which has significantly contributed to the secondary prevention of work disability [22–25]. However, this group is not representative of all people with CMP. Therefore, it is essential to also focus on people with CMP who are able to stay at work despite pain, and to discover

SAW determinants [22,23], because this could contribute to prevention of incapacity.

SAW is a relatively new concept, which is not uniformly defined in the literature. Several terms are used for working with pain, such as staying at work (SAW) [26,27], remaining or continuing a work role [28], working despite pain [29–31], continuing work with pain [32,33], remaining in employment [34], work maintenance [35], staying on the job [36], retaining work [26] and keeping on working [37]. For the purpose of this review, SAW was defined as sustained work participation despite CMP for at least 1 year, without present sick leave due to CMP. This strict definition was chosen because we aimed to focus on a successful group. When modifiable factors that promote SAW can be identified, interventions can be developed to support the ability of workers with CMP to stay at work. Specific attention to the people who stay at work despite CMP will contribute to broadening our views on chronic pain and work. It was assumed that lessons can be learned from this successful group of workers.

The objective of the present systematic review was to provide an overview of the evidence in the literature of SAW determinants for people with CMP, and to grade the level of evidence. It investigates the ‘positive side of the coin’, which represents an unusual viewpoint underrepresented in literature. To our knowledge, no systematic review assessing determinants for SAW with CMP has been conducted before. The International Classification of Functioning, Disability and Health (ICF) was used as a tool to frame the evidence [38]. All the factors identified and associated with SAW were classified under the various components of the ICF framework (health state, body functions/structures, activities and participation, and contextual factors such as personal and environmental factors), which could reveal gaps in our knowledge of SAW.

## Methods

### Search strategy

To identify studies of SAW in workers with CMP, an electronic search was performed of bibliographic literature databases (PubMed, EMBASE, PsycInfo, CINAHL and Cochrane) from the date of commencement to 1 October 2009. Controlled vocabulary search terms (MeSH terms, Emtree terms, PsycInfo Descriptors and CINAHL headings) and free text words were used. Two main categories—terms about work participation [39] and pain—were combined with the Boolean operator ‘AND’ to identify studies (Appendix 1). Letters to the editor, guidelines, case reports and editorials were excluded. No other study design exclusion criteria were used to ensure that no information on SAW determinants was missed. The search excluded all studies not aimed at working-age adults (19–64 years). We also contacted experts in the field of rehabilitation and occupational medicine for relevant studies and performed a manual search in the reference lists of studies selected for full-text reading.

### Selection of studies

The selection of studies on title was pilot tested ( $n=100$ ) by two reviewers (HdV, MR). The agreement of scoring the

studies on title was  $K=0.92$ , justifying that further selection on title could be performed by one reviewer (HdV). In doubtful cases, the article in question was included for further assessment using the abstract. The same two reviewers independently performed the screening of the abstracts and ultimately the full text of the studies to determine whether the studies met the inclusion criteria. Studies were excluded when both reviewers considered that they did not fulfil the inclusion criteria. In case of disagreement or doubt, consultation of a third reviewer (SB) was decisive. The reviewers were blinded for authors, affiliations, journal name and publication date. Only studies written in English or Dutch were included in the review.

## Inclusion criteria

### Subjects

We included studies reporting on working subjects with CMP. Chronic was defined as more than 3 months. Nonspecific was defined as pain without known underlying specific medical cause (e.g. infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis, fracture, neurological disorders, and serious spinal pathology). Musculoskeletal pain in the following locations was included—the back, the pelvic area, the neck, or the shoulders—and disorders such as widespread pain, fibromyalgia, whiplash and complaints of the arms, neck and shoulders. The subjects had to perform paid work and not be recorded as sick with CMP. Part-time work and full-time work were included.

### Outcome measures

Studies were included if at least one of the outcome measures was sick leave, SAW, sustained return to work (RTW), work participation, work disability or work status. SAW was operationalized as sustained work participation despite CMP for at least 1 year, without presenting sick leave due to CMP. Sustained RTW was considered as a relevant outcome in the present study when the RTW lasted longer than 6 months with no sick leave due to CMP. Studies with a negative outcome measure in terms of work participation—such as sick leave or incapacity—were only included when the control group consisted of a working group with CMP. In the present study, a person was considered to have a disability if he or she reported a limitation in working. All studies in which disability was not defined in terms of a limitation in working were excluded.

### Extraction of data

One reviewer (HdV) extracted the data from the selected studies using an extraction form. Accuracy was verified by a second reviewer (MR). The following characteristics of the included studies were extracted and described: study design, aim of the study, diagnosis, number of subjects, gender distribution, percentage of working subjects, outcome measures, investigated SAW factors, univariate and multivariate results, and association with SAW.

### Assessment of risk of bias

To assess the risk of bias of the included studies, two reviewers (HdV, MR) independently used an adapted version of the

checklist recommended in the Cochrane Handbook for Systematic Reviews of Interventions [40], also suitable for assessing observational studies. This checklist identified selection bias, performance bias, attrition bias, detection bias, use of valid measurements and appropriate statistics. The following criteria were assessed:

- Were the groups similar, except on the outcome (work status) being investigated?
- Were there systematic differences in the care provided to the participants in the comparison groups other than the intervention under investigation?
- Was loss to follow-up or response rate acceptable?
- Were the participants entered into the study based on knowledge of the outcome of interest?
- Were standardized and valid measurements used?
- Were the statistics used appropriate to answer the research question?

Risk of bias was considered to be low when all the criteria were unaffected or unlikely to seriously alter the results. Moderate risk of bias was determined when bias that could raise some doubt about the results was noted for one or more criteria. High risk of bias was determined when bias that seriously weakens confidence in the results was noted in one or more criteria. Consensus was reached by consultation, and if necessary by the decisive view of a third reviewer (SB). Information was obtained from corresponding authors when essential data was missing.

Assessment of qualitative studies was done using criteria derived from Cochrane [41–44]. This checklist identified credibility, transferability, dependability, confirmability and sampling method. The following criteria were assessed:

- Were the data collection and analysis procedures systematic (was an audit trail provided such that someone else could repeat each stage, including the analysis)?
- Was the method of data collection described in detail (did the method section provide information about data collection method, taping and transcribing interviews, the iterative analysis process, coding and saturation)?
- Were strategies used to validate the findings, e.g. triangulation, member checking?
- Did the researchers present a self-critical account of the research process, aware of personal experiences and biases?
- Did two researchers independently analyze the data?
- Was the context or setting adequately described so that the reader could relate the study findings to other settings?
- Was the sample adequate and sufficiently varied?

High quality was determined when all criteria were unlikely to seriously alter the results. Moderate quality was determined when flaws were identified in one or more criteria that raised some doubt about the results. Low quality was determined when flaws were identified in one or more criteria that seriously weakened confidence in the results. All criteria lists used for quality assessment were pilot tested in an assessment of three studies, which were not included in

the review, and further operationalized until consensus was reached.

### Grading the level of evidence

For grading the levels of evidence, we used the GRADE criteria [45,46], where the overall quality of evidence is based on four criteria presented in box 1. Qualitative studies were not considered in grading the evidence.

The design of the study prescribes the level of evidence in an important sense. The study quality was assessed as a secondary criterion. Studies with low risk of bias raise the level of evidence, whereas studies with a high risk of bias reduce the level of evidence. Consistency was assessed to be high when 75% or more of the studies found significant association of a factor in agreement.

### Data synthesis

The results of the quantitative and qualitative studies were synthesized separately, after which the findings were integrated according to the synthesizing process described by Thomas et al. [47].

## Results

### Selection of studies

The results of the literature search are presented in Figure 1. A total of 4658 studies were screened on title and abstract to yield 92 studies that possibly met the inclusion criteria. After a reference check, 151 studies remained for full-text assessment. After this full-text screening, 144 studies were excluded. The main reason for exclusion was unspecified duration of pain, which made it impossible to confirm the chronic pain inclusion criterion. Studies were also excluded because they did not concern nonspecific musculoskeletal pain, their sample contained only workers without pain or no working sample, or their outcomes were unrelated to work status. The third reviewer was consulted for the assessment of four studies, after which agreement was reached. We felt that it is necessary to contact the authors for additional information for 12 studies to allow us to decide on inclusion. Ultimately, seven studies met the inclusion criteria and were critically appraised by a risk of bias assessment [29,31,32,37,48–50].

### Study characteristics

No relevant (systematic) reviews or randomized controlled trials (RCT) were identified. Only observational studies were retrieved: five cross-sectional studies [29,31,48–50] and two qualitative studies [32,37]. The main characteristics of the studies are outlined in Tables Ia and Ib. SAW factors are presented, with corresponding univariate and multivariate results and confidence intervals if provided. For studies with qualitative design, only the direction of association is presented. In six out of seven studies, the main aim was to report on factors associated with SAW. In one article, SAW factors were reported as secondary outcomes [48]. Five cross-sectional studies reported overall on 78 (31 significant and 47 nonsignificant) associated SAW factors (Table Ia). Two qualitative studies reported on 34 SAW factors (Table Ib).

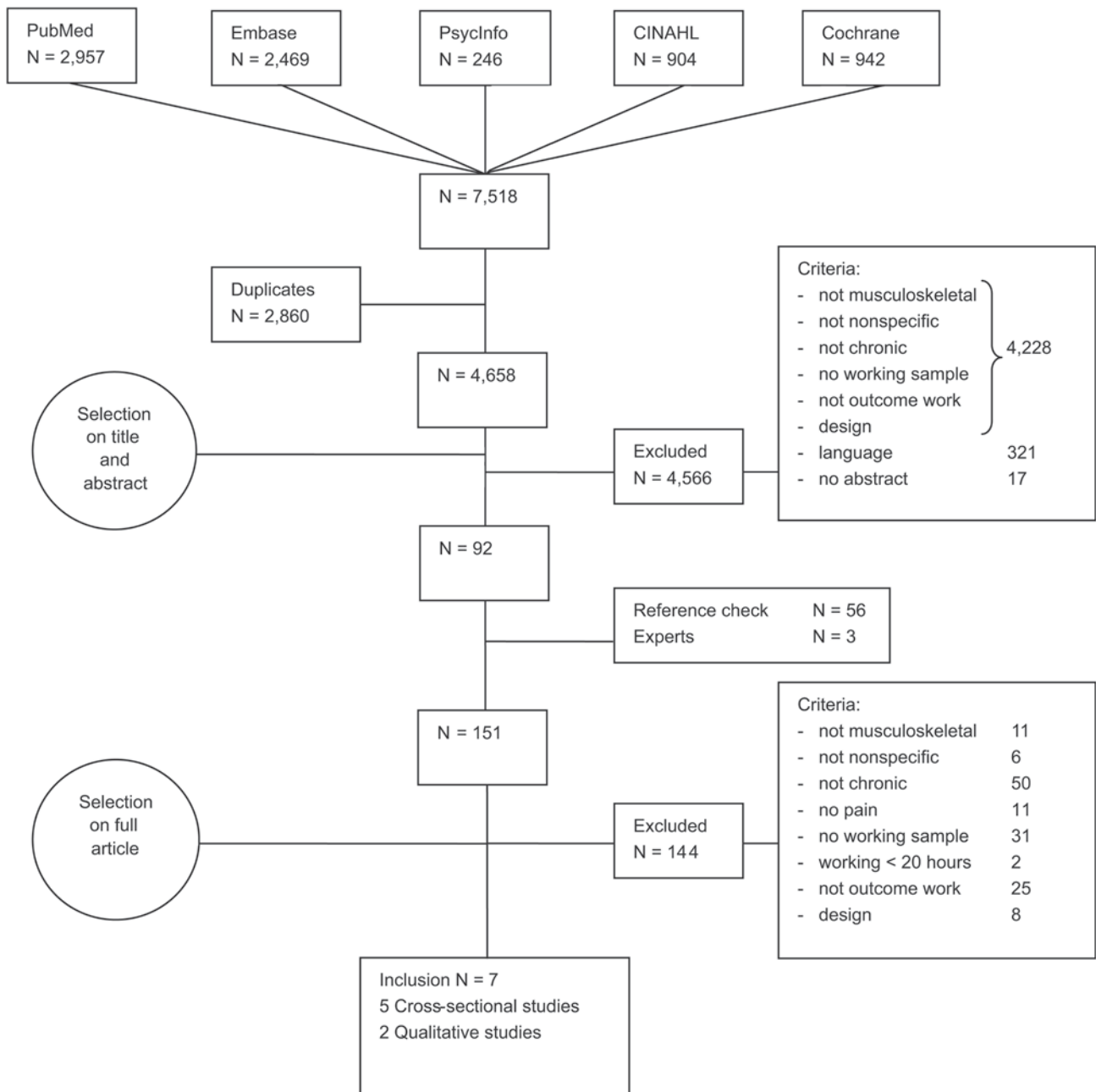


Figure 1. Flow diagram of the search process.

### Risk-of-bias analysis of quantitative studies

The results of the risk-of-bias analysis for each included article are presented in Table IIa. The agreement of the two reviewers on items A, B, C, D and F was high ( $K=1.00$ ). In the assessment of criterion E (valid measurement), agreement was initially low. There was a dispute about how to assess the dichotomous outcome of work status. After consultation with the third reviewer, we decided that if the nonworking group contained unemployed subjects or subjects on temporary sick leave of a few hours, E was rated as high risk of bias for the purpose of this review criterion.

The risk of bias of the quantitative studies ranged from low to high. No selection bias, performance bias or detection bias was noted, and the statistics used were appropriate. A risk of

attrition bias was noted in two studies because information about dropout or response rate was missing [49,50].

In two studies the work status was measured in a way that seriously weakened confidence in the results: the nonworking group contained unemployed subjects or subjects on temporary sick leave for a few hours a week [49,50]. The basis for distinguishing the working and nonworking groups remained unclear in one study, even after correspondence with the author [29]: we considered this unlikely to seriously alter the results. Three studies were rated with low [29,31,48] and two with high risk of bias [49,50].

### Risk-of-bias analysis of qualitative studies

The quality of the two included qualitative studies was rated as high (Table IIb). There was only one disagreement in the quality



Table Ia. Continued

| Author, year [Ref no.], country       | Study Design    | Aim of study  | Diagnosis                     | Subjects   | Outcome   | Factors investigated   | Univariate Results (crude estimates, significant differences or associations)  | Multivariate results (adjusted estimates and 95% CI)                          | Association with SAW |
|---------------------------------------|-----------------|---|-------------------------------|--|---|--|--|---|----------------------|
| Grotle et al. 2004 [48], Norway       | Cross-sectional | To assess the relationship of fear-avoidance beliefs and distress to disability and work loss in acute and chronic low back pain  | Low back pain                 | N = 233<br>Male 46%<br>Working 20%<br>Participants recruited from primary health care and specialist back clinic | Work loss, defined as patients who were on sick leave, rehabilitation or receiving disability pension due to LBP  | Age<br>Gender<br>Fingertip-floor distance high<br>Fear-avoidance beliefs<br>Emotional distress   | NS<br>F = 6.83 (p < 0.013)<br>F = 15.91 (p < 0.001)  | NS<br>NS<br>OR 1.04 [1.01-1.07]<br>OR 1.12 [1.07-1.17]<br>OR 3.69 [1.25-10.9] | -<br>-               |
| Kuijjer et al. 2005 [49], Netherlands | Cross-sectional | To explore which variables are related to work status in patients with chronic low back pain                                      | Low back pain                 | N = 92<br>Male 60%<br>Working 31%<br>Participants following multidisciplinary rehabilitation                     | Work status<br>Working: performed job without restrictions.<br>Nonworking: any restrictions as reduced hours, slower pace, less heavy work, not regular job, completely off work. | Low self-reported physical health<br>Low self-reported mental health<br>Physical fitness<br>Self reported limitations in ADL<br>Low educational level<br>Depressive symptoms<br>Psycho-neuroticism<br>Gender<br>Pain intensity<br>Performance of work related activities<br>Marital status           | t-test: p < 0.005<br>t-test: p < 0.005<br>X <sup>2</sup> : p < 0.005<br>t-test: p < 0.005<br>X <sup>2</sup> : p < 0.005<br>t-test: p < 0.005<br>X <sup>2</sup> : p = 0.03<br>NS<br>NS              | OR 0.91<br>OR 0.93<br><br>OR 0.08   | -<br>-               |
| Sardá et al. 2009 [50], Brazil        | Cross-sectional | To examine the contribution of demographic, pain and psychological factors to disability and work status in chronic pain patients | Chronic musculo-skeletal pain | N = 622<br>(311 Australia; 311 Brazil)<br>Male 82%<br>Working 59%<br>Participants attending pain clinics         | Disability and work status. Work status defined as being at work or on sick leave / being unemployed due to pain.   | Pain site (two or more) Aus<br>Age ≥45 years Bra<br>Level of education ≤11 years Bra<br>Level of education ≤12 years Aus<br>Physical disability score ≥16 Bra<br>Physical disability score ≤25 Bra<br>Self-efficacy score ≤51 Bra<br>Pain acceptance score ≤16 Aus<br>Catastrophizing score ≥3.3 Aus | OR 2.35 [1.24-4.47]<br>OR 0.39 [0.2-0.74]<br>OR 0.38 [0.2-0.7]<br>OR 3.49 [1.81-6.74]<br>OR 1.94 [1.06-3.56]<br>OR 2.75 [1.27-5.97]<br>NS<br>OR 2.52 [1.06-6.0]<br>NS<br>OR 2.53 [1.24-5.17]<br>NS | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-                                |                      |

NS, not significant.

OR, odds ratio.

+ = positive associated with staying at work.

- = negative associated with staying at work.

ADL, activities of daily living.

Bra, Brazilian sample.

Aus, Australian sample.

Table Ib. Characteristics of included qualitative studies.

| Author, year [ref no.], country           | Study design | Aim of study  | Diagnosis    | Subjects  | Outcome   | Determinants for SAW identified  | Association with SAW   |
|---|--------------|---|--------------|---|---|--|--|
| Liedberg and Henriksson 2002 [32], Sweden | Qualitative  | To examine which factors influence the decision to remain in a work role for women with fibromyalgia  | Fibromyalgia | N = 39<br>Male 0%<br>Working 49%<br>Participants following rehabilitation                       | Work disability defined as Working or Nonworking. The Working group included women working full-time or part-time. The Nonworking group included women who had left the labor market due to fibromyalgia and those who were on 100% long-term sickness benefits or sickness pension | Being highly motivated to work<br>Being a perfectionist<br>Having endurance<br>Increased workload<br>Adjustment of work<br>Decreasing working hours<br>Financial support from spouses<br>Commuting<br>Varied work posture<br>Change of work task<br>Retraining for another job<br>Social support at work<br>Support from supervisor<br>Put in one day rest during the week<br>Flextime working hours<br>Deciding own work schedule<br>Neglect leisure activities<br>Neglect housework<br>Taking rest<br>Giving priority to work<br>High age<br>Health problems | +<br>+<br>+<br>-<br>+<br>+<br>-<br>-<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>-<br>- |
| Löfgren et al. 2006 [37], Sweden          | Qualitative  | To explore, and obtain increased knowledge, of the strategies used by working women with fibromyalgia regarding control of pain, fatigue and other symptoms | Fibromyalgia | N = 12<br>Male 0%<br>Working 100%<br>Participants were recruited 6-8 years after rehabilitation | Coping strategies to keep on working with their symptoms  | Striving for a bodily balance in life<br>Relaxation<br>Positive thinking<br>Setting limits by prioritizing<br>Adapting life to one's limitations<br>Using pain as a guide<br>Improve ergonomics<br>Change work tasks during day<br>Flexible working hours<br>Plan everything in life with regard to work<br>Resting to manage the next working day/week<br>Support from working colleagues   | +<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+<br>+  |

+ = facilitator for staying at work.

- = barrier for staying at work.

assessment: the confirmability of one study [32] was unclear but was considered unlikely to seriously alter the results.

### Grading the evidence of factors promoting SAW

Table III outlines the graded level of evidence for factors associated with SAW [45,46], framed according to the ICF components. The design of the studies prescribed the initial level of evidence: the observational studies started with little evidence. Qualitative studies were not graded. After the assessment of risk of bias and consistency, the level of evidence was downgraded or upgraded. In rating consistency, the direction of association and the size and significance of association were assessed. No indirect evidence was noted, which meant that we found no reason to downgrade the evidence for indirectness. The highest level of evidence found for SAW factors was low-level evidence.

### Synthesis of quantitative studies

No meta-analysis could be performed because the included studies were clinically diverse and used different instruments to measure SAW factors. Most SAW factors in the five quantitative studies were determined by existing constructs from questionnaires or measurements which identified the characteristics (age, gender, duration of pain, education, distress, self-esteem, depression, catastrophizing, coping

style, etc.) of workers who stayed at work with CMP. These characteristics were largely covered by the ICF components Body functions and structures, personal factors, and personal work-related factors, shown in Figure 2 [38,51].

Perceived physical disability and emotional distress were factors consistently associated with SAW. Duration of pain, catastrophizing, self esteem, and marital status were consistently not associated. The findings were inconsistent with respect to better physical health, female gender, mental health, pain intensity, depressive symptoms, older age, educational level, coping, and self-efficacy. The evidence for educational level as a SAW factor was inconsistent (Table III). However, two of the three studies reporting on educational level [49,50] presented high estimates (OR 0.08 and 3.49), both indicating that lower educational level is a barrier for SAW.

### Synthesis of qualitative studies

Most determinants provided by the two qualitative studies linked to the Activities and Environmental work-related factors ICF components (Table III). Workers who stay at work despite CMP indicate that their success was based on adjustments made by themselves or by workplace interventions. To enable work the following day, adjustments were made in prioritizing daily activities, such as doing less or no housework



Table IIa. Risk-of-bias analysis of included quantitative studies.

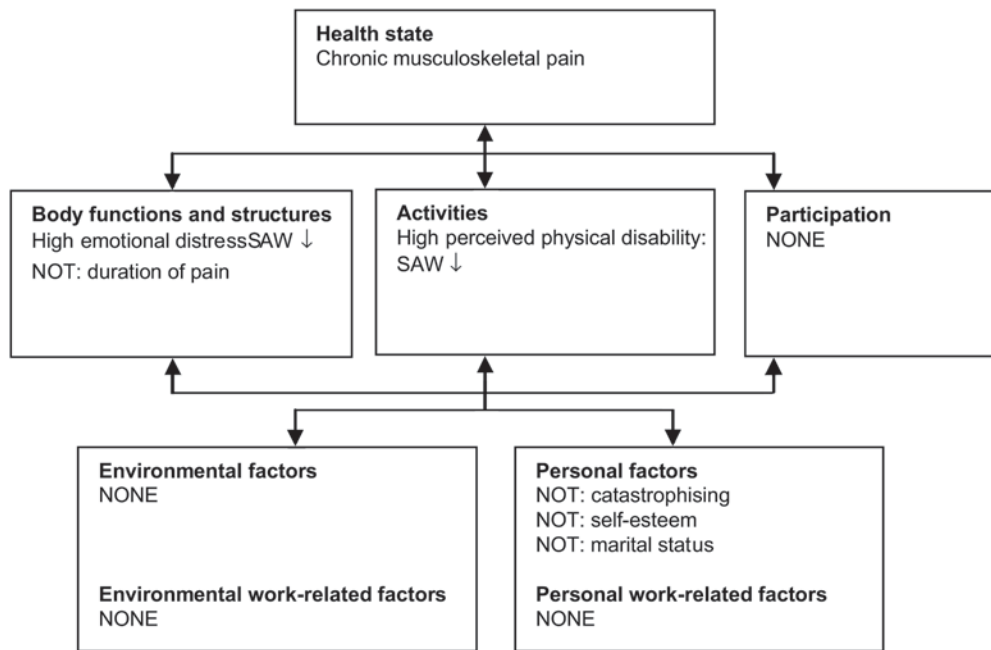
| 1st Author                    | Criteria of quality assessment |                    |                  |                  |                      |                          | Risk of bias |
|-------------------------------|--------------------------------|--------------------|------------------|------------------|----------------------|--------------------------|--------------|
|                               | A Selection bias               | B Performance bias | C Attrition bias | D Detection bias | E Valid measurements | F Appropriate statistics |              |
| Feuerstein and Theberge, 1991 | 1                              | 1                  | 1                | 1                | ?                    | 1                        | 1            |
| Linton and Buer, 1995         | 1                              | 1                  | 1                | 1                | 1                    | 1                        | 1            |
| Grotle et al., 2004           | 1                              | 1                  | 1                | 1                | 1                    | 1                        | 1            |
| Kuijjer et al., 2005          | 1                              | 1                  | 2                | 1                | 3                    | 1                        | 3            |
| Sarda et al., 2009            | 1                              | 1                  | 2                | 1                | 3                    | 1                        | 3            |

1 = low risk of bias detected.  
 2 = moderate risk of bias detected.  
 3 = high risk of bias detected.  
 ? = unclear.

Table IIb. Risk-of-bias analysis of included qualitative studies.

| 1st Author                    | Criteria of quality assessment |                   |                 |                  |                        | Quality |
|-------------------------------|--------------------------------|-------------------|-----------------|------------------|------------------------|---------|
|                               | G Credibility                  | H Transferability | I Dependability | J Confirmability | K Appropriate sampling |         |
| Liedberg and Henriksson, 2002 | 1                              | 1                 | 1               | ?                | 1                      | 1       |
| Löfgren et al., 2006          | 1                              | 1                 | 1               | 1                | 1                      | 1       |

1 = low risk of bias detected.  
 2 = moderate risk of bias detected.  
 3 = high risk of bias detected.  
 ? = unclear.



NOT = consistently no association was found between this item and SAW  
 NONE = no information was found within this component of the ICF model  
 SAW ↑ = factors positive associated with staying at work  
 SAW ↓ = factors negative associated with staying at work

Figure 2. Summary of evidence from quantitative studies classified according to International Classification of Functioning, Disability and Health (World Health Organization, 2001).

or leisure activities, or more relaxation [32,37]. Workplace interventions were decreased working hours, varied work postures, variable work tasks, flexible working hours, or improved ergonomics. Many of these workplace interventions could be achieved by effective communication with supervisors and support from colleagues and/or supervisors.

**Synthesis of results**

All the ICF components were covered by the identified SAW factors (Table III). The factors described in the quantitative studies were different from the factors noted in the qualitative studies. The five quantitative studies described certain characteristics of the successful worker, whereas the qualitative

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Table III. Level of evidence of factors associated with staying at work.

| Group (ICF domain)                              | Factors investigated                     | No. of articles (CSS– QS) | SAW associated | High quality | Low quality | Not SAW associated | High quality | Low quality | Consistency | Level of evidence |
|---|--|---------------------------|----------------|--------------|-------------|--------------------|--------------|-------------|-------------|-------------------|
| Health status                                   | Better physical health                   | 3 (2–1)                   | 2              | 1 QS         | 1 CSS       | 1                  | 1 CSS        |             | –           | Low               |
|   | Better mental health                     | 2 (2–0)                   | 1              |              | 1 CSS       | 1                  | 1 CSS        |             | –           | Very low          |
|   | Worse perceived overall health           | 1 (1–0)                   | 1              | 1 CSS        |             |                    |              |             |             | Low               |
| Body function and structures                    | Better social health                     | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | High pain Intensity                      | 2 (2–0)                   | 1              | 1 CSS        |             | 1                  |              | 1 CSS       | –           | Low               |
|   | Longer duration of pain                  | 2 (2–0)                   |                |              |             | 2                  | 1 CSS        | 1 CSS       | +           | Low               |
|   | Higher no. of pain locations             | 1 (1–0)                   | 1              |              | 1 CSS       |                    |              |             |             | Low               |
|   | Having endurance                         | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | More pain recurrences                    | 1 (1–0)                   |                |              |             | 1                  |              | 1 CSS       |             | Low               |
|   | Higher Physical fitness                  | 1 (1–0)                   | 1              |              | 1 CSS       |                    |              |             |             | Low               |
|   | Higher functional capacity               | 1 (1–0)                   |                |              |             | 1                  |              | 1 CSS       |             | Low               |
|   | Higher depressive symptoms               | 3 (3–0)                   | 2              | 1 CSS        | 1 CSS       | 1                  | 1 CSS        |             | –           | Low               |
|   | Diagnosis low back pain                  | 1 (1–0)                   | 1              | 1 CSS        |             |                    |              |             |             | Low               |
|   | Higher fingertip–floor distance          | 1 (1–0)                   | 1              | 1 CSS        |             |                    |              |             |             | Low               |
|   | Being an optimist (positive thinking)    | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | High pain cognition                      | 1 (1–0)                   |                |              |             | 1                  |              | 1 CSS       |             | Low               |
|   | Higher emotional distress                | 3 (3–0)                   | 3              | 3 CSS        |             |                    |              |             | +           | Low               |
| Activities                                      | Higher self-reported limitations in ADL  | 1 (1–0)                   | 1              |              | 1 CSS       |                    |              |             |             | Low               |
|   | Higher perceived physical disability     | 2 (2–0)                   | 2              | 1 CSS        | 1 CSS       |                    |              |             | +           | Low               |
|   | Higher perceived psychosocial disability | 1 (1–0)                   | 1              | 1 CSS        |             |                    |              |             |             | Low               |
|   | Commuting <sup>a</sup>                   | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Varied work posture                      | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Taking rest to manage next day working   | 2 (0–2)                   | 2              | 2 QS         |             |                    |              |             |             |                   |
|   | Neglect housework                        | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Neglect leisure activities               | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Relaxation                               | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Using pain as a guide                    | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Striving for bodily balanced life        | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Adapting life to one's limitations       | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Setting limits by prioritizing           | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
|   | Participation                            | Giving priority to work   | 1 (0–1)        | 1            | 1 QS        |                    |              |             |             |                   |
| Planning everything in life with regard to work |  | 1 (0–1)                   | 1              | 1 QS         |             |                    |              |             |             |                   |
| Personal factors                                | Older age                                | 6 (5–1)                   | 2              | 1 QS         | 1 CSS       | 4                  | 3 CSS        | 1 CSS       | –           | Low               |
|   | Female gender                            | 3 (3–0)                   | 1              |              | 1 CSS       | 2                  | 2 CSS        |             | –           | Low               |
|   | Lower educational level                  | 3 (3–0)                   | 2              |              | 2 CSS       | 1                  | 1 CSS        |             | –           | Low               |
|   | Higher pain acceptance                   | 1 (1–0)                   |                |              |             | 1                  |              | 1 CSS       |             | Low               |
|   | Diverting attention                      | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Reinterpretation <sup>b</sup>            | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Self-statements <sup>c</sup>             | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Ignoring <sup>d</sup>                    | 1 (1–0)                   | 1              | 1 CSS        |             |                    |              |             |             | Low               |
|   | Praying/hoping                           | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Increased behavioral activity            | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Pain behaviors                           | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Control <sup>e</sup>                     | 1 (1–0)                   |                |              |             | 1                  | 1 CSS        |             |             | Low               |
|   | Coping                                   | 2 (2–0)                   | 1              | 1 CSS        |             | 1                  |              | 1 CSS       | –           | Very low          |
|   | Higher pain catastrophizing <sup>f</sup> | 3 (3–0)                   |                |              |             | 3                  | 1 CSS        | 2 CSS       | +           | Low               |
|   | Higher fear of movement                  | 1 (1–0)                   |                |              |             | 1                  |              | 1 CSS       |             | Low               |
|   | Higher self-efficacy                     | 3 (2–1)                   | 1              |              | 1 CSS       | 2                  | 1 QS         | 1 CSS       | –           | Very low          |
|   | Higher self-esteem                       | 2 (2–0)                   |                |              |             | 2                  | 1 CSS        | 1 CSS       | +           | Low               |
| Higher anxiety                                  | 1 (1–0)                                  |                           |                |              | 1           | 1 CSS              |              |             | Low         |                   |
| Insurance coverage                              | 1 (1–0)                                  | 1                         | 1 CSS          |              |             |                    |              |             | Low         |                   |
| Higher psycho-neuroticism                       | 1 (1–0)                                  | 1                         |                | 1 CSS        |             |                    |              |             | Low         |                   |

(Continued)

Table III. (Continued)

| Group (ICF domain)            | Factors investigated                       | No. of articles (CSS- QS) | SAW associated | High quality  | Low quality | Not SAW associated | High quality | Low quality | Consistency | Level of evidence |
|-------------------------------|--|---------------------------|----------------|---------------|-------------|--------------------|--------------|-------------|-------------|-------------------|
| Personal work related factors | Being a perfectionist                      | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Time stability <sup>g</sup>                | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Seeing pain as a mystery                   | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Self-blame                                 | 1 (1-0)                   | 1              | 1 CSS         |             |                    |              |             |             | Low               |
|                               | Pain and Impairment relationship           | 1 (1-0)                   | 1              | 1 CSS         |             |                    |              |             |             | Low               |
|                               | Marital status                             | 2 (2-0)                   |                |               |             | 2                  | 2 CSS        |             | +           | Low               |
|                               | Higher involvement                         | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Deciding own work schedule                 | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Higher fear avoidance beliefs              | 1 (1-0)                   | 1              | 1 CSS         |             |                    |              |             |             | Low               |
|                               | Perceived work load high                   | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
| Personal work related factors | Being highly motivated to work             | 1 (0-1)                   |                |               |             | 1                  | 1 QS         |             |             |                   |
|                               | Retraining for other job                   | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Higher perceived peer cohesion             | 1 (1-0)                   | 1              | 1 CSS         |             |                    |              |             |             | Low               |
|                               | High perceived supervisor support          | 2 (1-1)                   | 2              | 1 CSS<br>1 QS |             |                    |              |             |             | Low               |
|                               | High perceived support colleagues          | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Higher perceived autonomy                  | 1 (1-0)                   | 1              | 1 CSS         |             |                    |              |             |             | Low               |
|                               | Higher perceived work pressure             | 2 (1-1)                   | 2              | 1 QS          |             |                    |              |             |             | Low               |
|                               | Higher perceived supervisor control        | 1 (1-0)                   | 1              | 1 CSS         |             |                    |              |             |             | Low               |
|                               | Higher perceived task orientation          | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Higher perceived pain clarity <sup>h</sup> | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
| Environmental factors         | Higher perceived innovative work           | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Higher perceived physical comfort          | 1 (1-0)                   |                |               |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Spouses disability pension                 | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Change of work tasks                       | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Less working hours                         | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Change work tasks during day               | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Improve ergonomics                         | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Adjustments of work                        | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
|                               | Higher social support work                 | 2 (1-1)                   | 1              | 1 QS          |             | 1                  | 1 CSS        |             |             | Low               |
|                               | Higher work load                           | 1 (0-1)                   | 1              | 1 QS          |             |                    |              |             |             |                   |
| Flexible working hours        | 2 (0-2)                                    | 2                         | 2 QS           |               |             |                    |              |             |             |                   |

CSS, cross-sectional study; QS, qualitative study.

ICF, International Classification of Functioning, Disability and Health.

SAW, staying at work.

+ = high consistency; - = low consistency.

High = Further research is very unlikely to change our confidence in the estimate.

Moderate = Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low = Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low = Any estimate of effect is very uncertain.

<sup>a</sup>Commuting = travelling from home to work.

<sup>b</sup>Reinterpretation = subscale of the Coping Strategies Questionnaire; type of coping strategy in which a new interpretation of the problem is sought.

<sup>c</sup>Self-statements = subscale of the Coping Strategies Questionnaire.

<sup>d</sup>Ignoring = subscale of the Coping Strategies Questionnaire.

<sup>e</sup>Control = subscale of the Coping Strategies Questionnaire; control over life (a measure of how well coping strategies work).

<sup>f</sup>Catastrophizing = 'over appraisal' of the negative aspects/consequences of pain.

<sup>g</sup>Time stability = subscale of the Pain Beliefs & Perceptions Inventory; time stability is referring to the stability of the pain over time.

<sup>h</sup>Pain clarity = subscale of the Pain Beliefs & Perceptions Inventory; the higher the Pain clarity, the lower pain is seen as a mystery.

studies revealed 'change' as a SAW factor: a change in personal behaviour, the behaviour of others, or a change in the workplace or work conditions. When the level of evidence was considered, the ICF components health state, participation, environmental factors, environmental work-related factors and personal work-related factors remained empty (Figure 2).

## Discussion

### Strength of the evidence

This systematic review focused on factors that promote or hinder SAW in workers with CMP. Our results indicate that a variety of factors are relevant to SAW: overall a total of 83

factors were identified. Consistent evidence of promoting SAW was found for emotional distress and perceived physical disability. Duration of pain, catastrophizing, self-esteem and marital status were consistently not associated with SAW. Because only seven studies were identified, and these were all observational or qualitative, the level of evidence found for factors associated with SAW ranged from low to very low. Although the quality of the included studies was generally high, this did not contribute to a higher level of evidence. In an uncontrolled environment such as the workplace, it is challenging to conduct prognostic studies or RCTs. In a review aimed at identifying RCTs by comparing sick leave due to musculoskeletal disorders with no sick leave, it was concluded that over 99% of all studies of sick leave were observational [52]. The amount of literature about SAW factors is limited. The reason for the scarcity of studies on SAW is not clear. People who stay at work with CMP often do not seek help from health care services, which decreases their accessibility for research. Moreover, people who stay at work do not immediately stand out as interesting study subjects, because common sense would suggest that they are experiencing no problems. As we know, the evidence for SAW determinants is limited, and this review should give direction to further research to fill the current gap in our knowledge.

### Applicability of evidence

Low emotional distress was identified in our review as a promoting factor for SAW. Other studies provided evidence that emotional distress is a predictor for RTW following treatment [53–55], and a modifiable risk factor for work disability [20,56,57]. Furthermore, our review provides low-level evidence that perceived physical disability is associated with SAW. Other studies found that low perceived physical disability predicted RTW [20,58,59]. Reducing emotional distress and perceived physical disability could be important targets in helping people to stay at work.

Catastrophizing has been identified as a determinant for RTW and disability [24,60–63]. By contrast, pain catastrophizing was consistently not associated with SAW in our review. A plausible explanation for this seemingly contradictory observation is currently unavailable.

In our review, quantitative and qualitative research supplemented each other in identifying SAW factors. The five quantitative studies particularly investigated personal and personal work-related characteristics of the successful worker, whereas the two qualitative studies found behavioural and other change and environmental factors to be important determinants: organizing adjustment latitude, workplace interventions, support from supervisor, motivation to work, and self-management skills to manage sustained work participation (Table Ib). It appears that quantitative studies inquire into themes different from those the workers themselves consider to be important. This is reflected in the mainly personal themes identified in the quantitative studies, in contrast to the mainly environmental themes identified in the qualitative studies. This is in line with recent studies of RTW, which stressed that in addition to personal factors, environmental factors particularly determine whether people return to work

or not [62,64,65]. Although qualitative studies are descriptive, the results may nevertheless be of value because they could indicate blind spots in quantitative research and should give direction for future research.

### Strengths and limitations of the review

Only seven studies were eligible for inclusion in this systematic review for various reasons. Firstly, in many studies with mixed pain duration samples, it was not possible to isolate the results for those subjects with chronic pain. By strict inclusion on the chronic pain criterion, studies with potential information about SAW were excluded. Secondly, in our review, we defined SAW as sustained work participation despite CMP for at least 12 months, without present sick leave. Two studies were excluded because the defined working group was sick listed considerably and therefore did not satisfy this criterion [27,66]. We also included studies with negative work-related outcome measures, such as work loss or incapacity [48,50]. Although inclusion of such studies may be regarded as improper study selection, we nevertheless regarded such studies eligible for inclusion, because these studies consisted of SAW control groups that did meet the inclusion criteria. Thirdly, the focus was on CMP in our review. All studies reporting on SAW in people with specific pain conditions, such as cancer pain, arthritis or clearly diagnosed back pain disorders were excluded. As a consequence, potentially interesting information on SAW was omitted. Most of the seven included studies did not differentiate between sick leave recorded by personnel departments and self-report. From the literature, it is known that self-reported sick leave data is less reliable than company recorded data [67]. Although presenteeism was one of the search terms in this review, all studies reporting on presenteeism in CMP were excluded because the subjects in these studies had significant sick leave and therefore did not satisfy the inclusion criteria for this review. Literature on presenteeism does indicate that production loss caused by presenteeism could exceed production loss caused by absenteeism [5,27,68]. It is possible that people who stay at work have low work productivity: SAW does not automatically mean work participation with sustained productive capacity. None of the studies included in this review controlled for effects of presenteeism.

Part-time employment could be considered as a factor that promotes SAW because it could provide more recovery time, which could play a major role in promoting capacity for work the following day. Because full-time or part-time employment was not considered separately in any of the included studies, we were not able to identify part-time employment as a success factor for SAW. The results of the included studies could be biased by not distinguishing between full- and part-time work. It is theoretically possible that people who stay at work were located in the part-time work subgroup. Decreased working hours was identified as a determinant for SAW [32], but part-time work itself does not guarantee more recovery time. The extra time gained could be spent on leisure activities, childcare or housework. In most of the studies included in this review, the findings were based on samples of people consuming healthcare. Only one study presented data for a

nonclinical group [31]. The generalizability of conclusions to nonclinical populations is therefore limited.

### Relevance

The results of our review show that little evidence is available for SAW. Many studies focused on sickness absence, RTW, incapacity or disability benefits claims for CMP reasons, but the people with CMP who stay at work are underrepresented in the literature. We may be able to learn something from this successful group by learning the determinants which support working with CMP, and finding tools for the prevention of incapacity. The focus of many researchers, clinicians and policymakers is on those people with CMP who are no longer able to successfully participate in work. That is perhaps to the detriment of those people with CMP who manage to work despite pain. Specific attention to the people who stay at work despite CMP will contribute to broadening our views on chronic pain and work. If we want to stimulate healthy behaviour, we need to know what healthy behaviour is. This shift in paradigm, focusing on successful, coping behaviour rather than on pain behaviour, could lead to new perspectives. A new focus on rehabilitation, occupational and insurance medicine will assist clinicians to identify successful ways of coping with CMP to stay at work. The effectiveness of vocational rehabilitation programmes could be increased if more SAW determinants are identified. Eventually, this could improve the quality of life and sustained work participation of many people living with CMP.

### Definition and terminology for SAW

The terminology used for people who stay at work despite pain was different across the studies, illustrating that the literature is ambiguous about work participation with chronic pain. The definition of SAW in our review was arbitrary, and considered SAW with CMP as a healthy coping behaviour which will help to maintain workers' quality of life. In our review, SAW was used differently than sickness presenteeism, which refers to the phenomenon where workers go to work despite health problems that should prompt them to rest and take sick leave [69]. The term presenteeism is usually used to describe a nondesirable behaviour, which could be harmful [70–72]. The use of the term SAW has one disadvantage: like RTW programmes aimed at helping people to return to work, SAW programmes also exist, allowing workers to stay at work on a part-time basis while still receiving partial disability benefits [73]. In these programmes, workers receive disability benefits, work fewer hours, do different work at a slower pace, have lower attendance requirements or are allowed to follow courses to find more suitable jobs. This is not SAW as defined in our review, and could lead to confusion. Consensus about terminology is important. Expert meetings or a Delphi study could help create agreement about SAW terminology.

### Conclusions and implications for practice and future research

In this review, we were unable to identify high-level evidence about SAW determinants for workers with chronic pain conditions. However, a limited number of low-level evidence determinants were identified. It is likely that future research will

reveal additional determinants with better evidence, which will increase our understanding of SAW. There is an urgent need for high quality prognostic studies that investigate SAW determinants. Such prognostic studies should strictly define successful work participation, targeting workers who actually stay at work despite pain, without present sick leave. It is recommended that future research focuses not only on clinical groups, but also on nonclinical groups. In addition, the role of presenteeism in these groups is an important issue to be studied.

## Appendix 1: Detailed search strategy of the literature

### Search history PubMed:

#### #1 Mesh terms related to work

“Work”[Mesh: NoExp] OR “Occupations”[Mesh] OR “Absenteeism”[Mesh] OR “Employment”[Mesh] OR “Sick Leave”[Mesh] OR “Occupational Health”[Mesh]

#### #2 Free text words related to work

“sickness absence”[tiab] OR “work status”[tiab] OR “occupational status”[tiab] OR “work ability”[tiab] OR “work disability”[tiab] OR “work attendance”[tiab] OR “work performance”[tiab] OR “occupationally active”[tiab] OR “job retention”[tiab] OR “work capacity”[tiab] OR presenteeism [tiab] OR “job status”[tiab] OR “stay at work”[tiab] OR “occupational ability”[tiab] OR “vocational status”[tiab] OR “vocational rehabilitation”[tiab] OR “employment status”[tiab] OR “return to work”[tiab] OR “Work participation”[tiab] OR “Occupation”[tiab] OR “Absenteeism”[tiab] OR “Employment”[tiab] OR “Sick Leave”[tiab] OR “Occupational Health”[tiab]

#### #3 Mesh terms related to pain

(“Pain”[Mesh] AND “Chronic disease” [Mesh]) OR “Back Pain”[Mesh] OR “Neck Pain”[Mesh] OR “Shoulder Pain”[Mesh] OR “Pelvic Pain”[Mesh] OR “Fibromyalgia”[Mesh] OR “Whiplash Injuries”[Mesh] OR “Tendinopathy”[Mesh:NoExp] OR “Musculoskeletal Diseases”[Mesh:NoExp] OR “Myofascial Pain Syndromes”[Mesh] OR “Joint Instability”[Mesh] OR “Cumulative Trauma Disorders”[Mesh:NoExp]

#### #4 Free text words related to pain

“Back Pain”[tiab] OR “Neck Pain”[tiab] OR “Shoulder Pain”[tiab] OR “Pelvic Pain”[tiab] OR Fibromyalgia[tiab] OR Whiplash[tiab] OR Tendinopathy[tiab] OR “Musculoskeletal pain”[tiab] OR “Myofascial Pain”[tiab] OR “Joint Instability”[tiab] OR “Cumulative Trauma Disorder”[tiab] OR “repetitive strain injury”[tiab] OR (complaints[tiab] AND (arm[tiab] OR neck[tiab] OR shoulder[tiab])) OR “chronic pain”[tiab] OR “widespread pain”[tiab] OR “work related pain”[tiab]

#### #5 #1 OR #2

#### #6 #3 OR #4

#### #7 #5 AND #6

#### #8 #5 AND #6 Limits: editorial, letter, practice guideline, case reports, guideline

#### #9 #7 NOT #8 Limits: Adult: 19-44 years, Middle Aged: 45-64 years

### Search history Embase:

#### #1 Emtree terms and free text words related to work

('work'/de OR 'occupation'/de OR 'absenteeism'/exp OR 'employment'/exp OR 'medical leave'/exp OR 'occupational health'/de OR 'sickness absence':ab,ti OR 'work status':ab,ti OR 'occupational status':ab,ti OR 'work ability':ab,ti OR 'work disability':ab,ti OR 'work attendance':ab,ti OR 'work performance':ab,ti OR 'occupationally active':ab,ti OR 'job retention':ab,ti OR 'work capacity':ab,ti OR presenteeism:ab,ti OR 'job status':ab,ti OR 'vocational status':ab,ti OR 'vocational rehabilitation':ab,ti OR 'employment status':ab,ti OR occupation:ab,ti OR absenteeism:ab,ti OR employment:ab,ti OR 'sick leave':ab,ti OR 'occupational health':ab,ti OR 'occupational ability':ab,ti OR 'stay at work':ab,ti OR 'return to work':ab,ti OR 'work participation':ab,ti)

## #2 Emtree terms and free text words related to pain

('pain'/de AND 'chronic disease'/exp OR 'backache'/exp OR 'shoulder pain'/exp OR 'neck pain'/exp OR 'pelvis pain syndrome'/exp OR 'fibromyalgia'/exp OR 'whiplash injury'/exp OR 'tendinitis'/de OR 'musculoskeletal disease'/de OR 'myofascial pain'/exp OR 'joint instability'/exp OR 'cumulative trauma disorder'/de OR fibromyalgia:ab,ti OR 'back pain':ab,ti OR 'neck pain':ab,ti OR 'shoulder pain':ab,ti OR 'pelvic pain':ab,ti OR whiplash:ab,ti OR tendinopathy:ab,ti OR 'myofascial pain':ab,ti OR 'joint instability':ab,ti OR 'cumulative trauma disorder':ab,ti OR 'repetitive strain injury':ab,ti OR (complaints:ab,ti AND (arm:ab,ti OR neck:ab,ti OR shoulder:ab,ti)) OR 'chronic pain':ab,ti OR 'widespread pain':ab,ti OR 'musculoskeletal pain':ab,ti OR 'work related pain':ab,ti)

#3 #1 AND #2

#4 #3 AND [adult]/limits

#5 #4 NOT ([editorial]/lim OR [letter]/lim OR 'case report'/exp)

## Search history CINAHL:

### #1 CINAHL heading terms and free text words related to work

(MH "Work") or (MH "Occupations and Professions") or (MH "Employment+") or (MH "Absenteeism") or (MH "Sick Leave") or (MH "Occupational Health") OR TI ("sickness absence" OR "work status" OR "occupational status" OR "work ability" OR "work disability" OR "work attendance" OR "work performance" OR "occupationally active" OR "job retention" OR "work capacity" OR presenteeism OR "job status" OR "vocational status" OR "vocational rehabilitation" OR "employment status" OR occupation OR absenteeism OR employment OR "sick leave" OR "occupational health" OR "occupational ability" OR "stay at work" OR "return to work" OR "work participation") or AB ("sickness absence" OR "work status" OR "occupational status" OR "work ability" OR "work disability" OR "work attendance" OR "work performance" OR "occupationally active" OR "job retention" OR "work capacity" OR presenteeism OR "job status" OR "vocational status" OR "vocational rehabilitation" OR "employment status" OR occupation OR absenteeism OR employment OR "sick leave" OR "occupational health" OR "occupational ability" OR "stay at work" OR "return to work" OR "work participation")

### #2 CINAHL heading terms and free text words related to pain

(MH "Chronic Pain") or (MH "Back Pain") or (MH "Neck Pain") or (MH "Shoulder Pain") or (MH "Pelvic Pain") or

(MH "Fibromyalgia") or (MH "Musculoskeletal Diseases") or (MH "Whiplash Injuries") or (MH "Tendinopathy") or (MH "Myofascial Pain Syndromes") or (MH "Joint Instability") or (MH "Cumulative Trauma Disorders") or TI (fibromyalgia OR "back pain" OR "neck pain" OR "shoulder pain" OR "pelvic pain" OR whiplash OR tendinopathy OR "myofascial pain" OR "joint instability" OR "cumulative trauma disorder" OR "repetitive strain injury" OR (complaints AND (arm OR neck OR shoulder)) OR "chronic pain" OR "widespread pain" OR "musculoskeletal pain" OR "work related pain") or AB (fibromyalgia OR "back pain" OR "neck pain" OR "shoulder pain" OR "pelvic pain" OR whiplash OR tendinopathy OR "myofascial pain" OR "joint instability" OR "cumulative trauma disorder" OR "repetitive strain injury" OR (complaints AND (arm OR neck OR shoulder)) OR "chronic pain" OR "widespread pain" OR "musculoskeletal pain" OR "work related pain")

#3 #1 AND #2

#4 #3 AND Age Groups: Adult, 19-44 years, Middle Age, 45-64 years

#5 #4 NOT Publication Type: Case Study, Editorial, Letter

## Search history PsycINFO:

### #1 Descriptor terms and free text words related to work

(DE "Employment Status" or DE "Employability" or DE "Employee Absenteeism") OR TI ("sickness absence" OR "work status" OR "occupational status" OR "work ability" OR "work disability" OR "work attendance" OR "work performance" OR "occupationally active" OR "job retention" OR "work capacity" OR presenteeism OR "job status" OR "vocational status" OR "vocational rehabilitation" OR "employment status" OR occupation OR absenteeism OR employment OR "sick leave" OR "occupational health" OR "occupational ability" OR "stay at work" OR "return to work" OR "work participation") or AB ("sickness absence" OR "work status" OR "occupational status" OR "work ability" OR "work disability" OR "work attendance" OR "work performance" OR "occupationally active" OR "job retention" OR "work capacity" OR presenteeism OR "job status" OR "vocational status" OR "vocational rehabilitation" OR "employment status" OR occupation OR absenteeism OR employment OR "sick leave" OR "occupational health" OR "occupational ability" OR "stay at work" OR "return to work" OR "work participation")

### #2 Descriptor terms and free text words related to pain

(DE "Chronic Pain" or DE "Back Pain" or DE "Myofascial Pain" or DE "Fibromyalgia" or DE "Musculoskeletal Disorders" or DE "Whiplash" OR DE "Pain") OR TI (fibromyalgia OR "back pain" OR "neck pain" OR "shoulder pain" OR "pelvic pain" OR whiplash OR tendinopathy OR "myofascial pain" OR "joint instability" OR "cumulative trauma disorder" OR "repetitive strain injury" OR (complaints AND (arm OR neck OR shoulder)) OR "chronic pain" OR "widespread pain" OR "musculoskeletal pain" OR "work related pain") or AB (fibromyalgia OR "back pain" OR "neck pain" OR "shoulder pain" OR "pelvic pain" OR whiplash OR tendinopathy OR "myofascial pain" OR "joint instability" OR "cumulative trauma disorder" OR "repetitive strain injury" OR (complaints AND (arm OR neck OR shoulder)) OR "chronic pain" OR

“widespread pain” OR “musculoskeletal pain” OR “work related pain”)  
**#3** #1 AND #2  
**#4** #3 AND Age Groups: Young Adulthood (18-29 yrs), Thirties (30-39 yrs), Middle Age (40-64 yrs)  
**#5** #4 NOT Methodology: CLINICAL CASE STUDY; Document Type: Comment/Reply, Editorial, Letter; Exclude Dissertations

**Search history Cochrane Library:**

**#1** MeSH descriptor Back Pain explode all trees  
**#2** MeSH descriptor Neck Pain explode all trees  
**#3** MeSH descriptor Shoulder Pain explode all trees  
**#4** MeSH descriptor Pelvic Pain explode all trees  
**#5** MeSH descriptor Fibromyalgia explode all trees  
**#6** MeSH descriptor Tendinopathy explode all trees  
**#7** MeSH descriptor Musculoskeletal Diseases, this term only  
**#8** MeSH descriptor Myofascial Pain Syndromes explode all trees  
**#9** MeSH descriptor Joint Instability explode all trees  
**#10** MeSH descriptor Cumulative Trauma Disorders explode all trees  
**#11** MeSH descriptor Work, this term only  
**#12** MeSH descriptor Occupations explode all trees  
**#13** MeSH descriptor Absenteeism explode all trees  
**#14** MeSH descriptor Employment explode all trees

**#15** MeSH descriptor Sick Leave explode all trees  
**#16** MeSH descriptor Occupational Health explode all trees  
**#17** MeSH descriptor Chronic Disease explode all trees  
**#18** MeSH descriptor Pain explode all trees  
**#19** (#17 AND #18)  
**#20** “sickness absence” OR “work status” OR “occupational status” OR “work ability” OR “work disability” OR “work attendance” OR “work performance” OR “occupationally active” OR “job retention” OR “work capacity” OR presenteeism OR “job status” OR “stay at work” OR “occupational ability” OR “vocational status” OR “vocational rehabilitation” OR “employment status” OR “return to work” OR “Work participation” OR “Occupation” OR “Absenteeism” OR “Employment” OR “Sick Leave” OR “Occupational Health”:ti,ab,kw  
**#21** “Back Pain” OR “Neck Pain” OR “Shoulder Pain” OR “Pelvic Pain” OR Fibromyalgia OR Whiplash OR Tendinopathy OR “Musculoskeletal pain” OR “Myofascial Pain” OR “Joint Instability” OR “Cumulative Trauma Disorder” OR “repetitive strain injury” OR (complaints AND (arm OR neck OR shoulder)) OR “chronic pain” OR “widespread pain” OR “work related pain”:ti,ab,kw  
**#22** (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #19 OR #21)  
**#23** (#11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #20)  
**#24** (#22 AND #23)

**Box 1. Criteria for assigning grade of evidence.**

**A. Study design**

Randomized trial = high-quality evidence  
 Observational study = low-quality evidence  
 Any other evidence = very low-quality evidence

*lower if*

study quality  
 -1 serious limitation  
 -2 very serious limitations  
 -1 important inconsistency  
 -1 indirect evidence  
 -1 sparse data  
 -1 high probability of reporting bias

**B. Study quality (risk of bias)**

low = plausible bias unlikely to seriously alter the results  
 moderate = plausible bias that raises some doubt about the results  
 high = plausible bias that seriously weakens confidence in the results

**C. Consistency**

Differences in direction of effect/association, the size and significance of these differences lead to the conclusion whether inconsistency exists

*raise if*

+1 strong association OR>2 (<0.5) based on consistent evidence from two or more observational studies  
 +2 very strong association OR>5 (<0.2) based on direct evidence with no major threats to validity  
 +1 evidence of a dose response gradient  
 +1 all plausible confounders would have reduced the effect

**D. Directness**

Were participants, interventions and outcome measures similar to those defined in the inclusion criteria of the review?

High = Further research is very unlikely to change our confidence in the estimate  
 Moderate = Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate  
 Low = Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate  
 Very low = Any estimate of effect is very uncertain

## Acknowledgements

We wish to acknowledge Truus van Ittersum for her contribution in the search procedure.

**Declaration of interest:** This review was funded by Stichting Instituut Gak, grant number 2006479.

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