



## Review

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## Common prognostic factors of work disability among employees with a chronic somatic disease: a systematic review of cohort studies

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**Objective** Based on prospective and retrospective disease cohort studies, the aim of this review was to determine common prognostic factors for work disability among employees with rheumatoid arthritis, asthma, chronic obstructive pulmonary disease, diabetes mellitus, and ischemic heart disease (IHD).

**Methods** A systematic literature search in Medline (1990–2008) and Embase (1990–2008) was carried out to identify relevant cohort studies using a well-defined list of inclusion and quality criteria.

**Results** We identified 43 relevant cohort studies with sufficient methodological quality (20 for rheumatoid arthritis, 3 for asthma and 20 for IHD). The common prognostic factors for work disability found in all the diseases were: perceived health complaints, limitation in daily physical activities caused by the disease (high versus low), heavy manual work, and female gender. The common positive prognostic factors for rheumatoid arthritis and IHD were age (high versus low) and sickness absence. The common negative factors for rheumatoid arthritis and IHD were education (high versus low) and ethnic origin (white versus non-white).

**Conclusions** As many prognostic factors for work disability are similar for employees with various chronic diseases, it is possible to detect high risk groups. This information supports the development and implementation of a general disability management intervention for employees suffering from a chronic disease to overcome health-related limitations at work.

**Key terms** chronic disease; risk factor; self-management; occupational health.

The percentage of the working-age population with a long-standing health problem or disability (including non-specific low back pain and mental disorders) varies widely among countries in Europe, with the highest percentage (32.2%) found in Finland and the lowest in Romania (5.8%) (1). Over the next 20 years, prognostic studies predict an increase in the incidence of chronic diseases in the working population, such as rheumatoid arthritis, chronic obstructive pulmonary disease (COPD), asthma, diabetes mellitus, and ischemic heart disease (IHD), merely due to the aging of the working population (2–3). Despite improvements in facilities and medical care for people with a chronic medical condition, the presence of chronic disease is still a major cause of long-term sickness absence and job loss in Europe.

Labor force participation in Europe is much lower for disabled people. For individuals with a chronic medical condition between 16–64 years of age, the unemployment rate is nearly twice as high as non-disabled individuals. Only one in six employees with a long-standing health problem or disability, who face work restrictions in Europe, is provided some assistance to work (1).

In the Netherlands, only one third of the people between 16–64 years of age with a chronic disease have a paid job in comparison to two thirds of the general population. Of those employees who have a chronic disease, 30% experience problems at the workplace related to the disease (4). The unemployment rate among the disabled is higher than that of the non-disabled for

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various reasons. One reason is probably the “discouraged worker” effect. Many disabled persons may believe that they are very unlikely to get a job, so they do not even attempt to find one and are, therefore, classified as inactive (5).

In studies of work disability due to rheumatoid arthritis, a relation has been found between becoming work disabled and variables such as: demanding physical work, low education, increasing age (>50 years), pain and self-reported functional status measured with the (modified) Health Assessment Questionnaire (HAQ), disease duration, and motivation to work (6–8). In studies on work disability due to asthma, a relation was found between work factors, education, general health, and motivation to work (9–11). Until now, no reviews have systematically evaluated the correspondence between prognostic factors of work disability among employees with a variety of chronic somatic diseases.

In a qualitative (concept mapping) study to explore the prerequisites for employees with a chronic somatic disease to function at work, working with employees and health professionals, we found relatively more disease-generic (ie, common) than disease-specific factors to enable employees to cope. These included: self-acceptance, self-efficacy, support from management and colleagues, and professional advice (12). It is important to search for evidence of common factors as this knowledge can be used to train health professionals in occupational and general health to become aware of employees who have an increased risk of becoming work disabled. Consequently, knowledge about these factors is needed to develop and implement evidence-based interventions to support patients/workers not only in retaining their jobs, but also for the purposes of rehabilitation and return-to-work programs. It might be postulated that many employees with a chronic disease (with the exception of specific work-related chronic diseases caused by occupational exposure) could continue working if they received support in coping with their disease at work. Such employees should be facilitated to continue any form of work participation. This includes the option to change jobs if the employee is not able to continue in his or her current job due to a disease-related limitation or continued occupational exposure. Occupational health services, primary health care, medical specialists, nurses, and allied health personnel can improve the quality of care by adjusting their actions to the needs of specific risk groups.

The objective of this study was to search for prognostic factors of work disability which are common to various chronic somatic diseases. A prognostic factor is a risk factor for becoming work disabled, which – when identified – can be used in training health professionals to recognize and support employees who are at risk. The identification of such prognostic factors also enables the

development and implementation of disability management interventions.

In this systematic review, we focused on rheumatoid arthritis, COPD, asthma, diabetes mellitus, and IHD as these diseases have a high prevalence in the Netherlands and in other countries (13). Our hypothesis was that several common personal, work- and disease-related factors predict work disability for a variety of chronic diseases. For the purpose of this study, we selected a number of frequently occurring chronic somatic diseases representing a wide variety of diseases in an effort to look for common prognostic factors.

## Methods

### Search strategy

In January 2007, with a follow-up in October 2008, we conducted a search in Medline (1990–2008) and Embase (1990–2008) using the following search terms both as MeSH term and text word in the title and abstract: (i) rheumatoid arthritis *or* diabetes mellitus *or* COPD *or* asthma *or* myocardial ischemia; *and* (ii) occupation *or* participation *or* sustainability *or* employment *or* unemployment *or* workplace *or* career mobility *or* rehabilitation, vocational *or* vocation *or* work *or* working *or* labor *or* job *or* jobs; *and* (iii) ability *or* abilities *or* disability *or* disabilities *or* return to work *or* continuing to work *or* functioning *or* performance *or* participation *or* work capacity *or* sick leave *or* absenteeism *or* vocation/disability *or* disability evaluation; *and* (iv) prognostic factors *or* predictive factors. The search strategy was formulated in NCBI (Medline) and was adapted for use in Webspirs (Embase). A combination of the words from (i), (ii), (iii), and (iv) above was used and, as limitation, only English publications were selected.

### Selection and methodological quality assessment

Two reviewers independently selected relevant abstracts from the articles retrieved from the search strategy. If abstracts provided insufficient information, the full text of each article was used. We applied two sets of criteria: the first set to select the study population and type of study, and the second set to screen the articles on quality. In the first screening round, studies were selected if they met all of the following criteria: (i) the study population consisted of subjects with rheumatoid arthritis, COPD, asthma, diabetes mellitus or IHD; (ii) the chronic diseases were not work-related (caused by work); (iii) the study examined work disability, return to work, or continuing to work as the outcome; (iv) the subjects were 18–65 years old (working population); (v) the subjects were employed at the start of the study;

(vi) the subjects were not fully work disabled and had not been absent from work for more than two years at the start of the study; (vii) the study must have been a cohort study (prospective/retrospective); and (viii) the study must have applied an appropriate statistical model (univariate or if available multivariate).

Following a reading of the abstract, the authors decided either to include or exclude each study; in some cases further discussion was needed to address

whether a study should be included (indecisive result). Disagreements regarding inclusion status were resolved by consensus. When no consensus was reached, the abstract or full text was screened by a third reviewer who then decided. The methodological quality of the selected studies was assessed using the criteria list of the Dutch Cochrane Centre for cohort studies (14) which is set out in table 1. Based on the aforementioned eight criteria, the studies were classified as being of "high

**Table 1.** Background information and quality criteria for the selected cohort studies. [P/R = prospective and retrospective study, P = prospective study, HQ = high quality (meets ≥7 criteria), MQ = medium quality (meets 5–6 criteria), LQ = low quality (meets <5 criteria)]

Studies	Design	Sample size	Duration of follow up in years	Study population fully described	Selection bias can be excluded	Prognostic factor described & method correctly described?	Outcome assessment (work disability) & method correctly described?	Outcome assessment blinded to prognostic factor?	Follow up of patients (>1 year)	Selected follow up loss be excluded	Appropriate design used <sup>a</sup>	Total quality score (0–8)	Quality label
<b>Cohort studies for employees with rheumatoid arthritis</b>													
Albers et al (38)	P/R	186	3	+	+	+	+	+	+	–	+	7	HQ
Barrett et al (39)	P	110–160	4.1–8.6	+	+	+	+	+	+	–	+	7	HQ
Borg et al (43)	P	83	2	+	+	+	+	+	+	–	–	7	HQ
Chung et al (25)	P	633	>3	+	–	+	+	+	+	–	+	7	HQ
Eberhardt & Fex (44)	P	106	4	+	–	+	+	+	+	–	+	6	MQ
Fex et al (42)	P	84	2	+	–	+	+	+	+	–	–	6	MQ
Holte et al (57)	P	3316	2	+	+	+	+	+	+	–	+	7	HQ
Jääntti et al (55)	P	103	1–20	+	–	+	+	+	+	–	+	6	MQ
Mancuso et al (8)	P	122	1	+	–	+	+	+	–	–	+	6	MQ
Mau et al (35)	P	73	6	+	–	+	+	+	+	–	–	6	MQ
Odegaard et al (54)	P	159	7	+	+	+	+	+	+	–	+	7	HQ
Puolakka et al (24)	P	162	5	+	+	+	+	+	+	–	+	8	HQ
Puolakka et al (23)	P	162	5	+	–	+	+	+	+	–	+	7	HQ
Reisine et al (22)	P	392	5	+	–	+	+	+	+	–	+	6	MQ
Reisine et al (7)	P	498	9	+	–	+	+	+	+	–	–	5	MQ
Reisine et al (41)	P	139	..	+	–	+	+	+	+	–	+	6	HQ
Sokka et al (40)	P	82	10	+	–	+	+	+	+	+	+	7	HQ
Straaton et al (37)	P	218	1	+	–	+	+	+	–	+	+	6	MQ
Wolfe & Hawley (36)	P	823	8	+	–	+	+	+	+	–	+	6	MQ
Young et al (26)	P	732	5	+	–	+	+	+	+	+	+	7	HQ

(continued)

Table 1. Continued.

Studies	Design	Sample size	Duration of follow up in years	Study population fully described	Selection bias can be excluded	Prognostic factor described & method correctly described?	Outcome assessment (work disability) & method correctly described?	Outcome assessment blinded to prognostic factor?	Follow up of patients (>1 year)	Selected follow up loss be excluded	Appropriate design used <sup>a</sup>	Total quality score (0–8)	Quality label
<b>Cohort studies for employees with asthma</b>													
Alexopoulos & Burdorf (21)	P	46	2	+	–	+	+	+	+	–	+	6	MQ
Blanc et al (10)	P	42	2	+	–	+	+	+	+	–	+	6	MQ
Yelin et al (11)	P	601	3	+	+	+	+	+	+	–	+	7	HQ
<b>Cohort studies for employees with ischemic heart disease</b>													
Abbas et al (20)	P	450 <sup>b</sup>	6 months	+	–	+	+	–	–	–	+	4	LQ
Abbott & Berry (46)	P	82 <sup>c</sup>	1	+	+	+	+	+	+	+	–	7	HQ
Agren et al (28)	P	25 <sup>b</sup>	5	+	+	+	+	+	+	+	–	7	HQ
Bhattacharyya et al, 2007 (30)	P	126 <sup>c</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Boudrez et al (40)	P	530 <sup>c</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Boudrez & De Backer (19)	P	137 <sup>b</sup> , 90 <sup>c</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Caine et al (53)	P	100 <sup>b</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Drory et al (34)	P	833 <sup>d</sup>	5	+	+	+	+	+	+	+	+	8	HQ
Earle et al (58)	P	289 <sup>c</sup>	3 months	+	+	+	+	+	–	+	+	7	HQ
Engblom et al (49)	P	201 <sup>b</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Froom et al (51)	P	216 <sup>d</sup>	2	+	+	+	+	+	+	+	+	8	HQ
Hlatky et al (31)	P	409 <sup>b</sup>	4	+	+	+	+	+	+	+	+	8	HQ
Lundbom et al (27)	P	250 <sup>b</sup>	19–52 months	+	+	+	+	+	+	+	–	7	HQ
Mark et al (32)	P	872 <sup>d</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Mittag et al (56)	P	132 <sup>d</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Munro (29)	P	79 <sup>b</sup>	1.5	+	+	+	+	+	+	+	–	7	HQ
Samkange et al (47)	P	751 <sup>d</sup>	1.5	+	+	+	+	+	+	–	+	7	HQ
Sellier et al (33)	P	530 <sup>b</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Soderman et al (48)	P	198 <sup>d</sup>	1	+	+	+	+	+	+	+	+	8	HQ
Soejima et al (45)	P	111 <sup>c</sup>	8 months	+	+	+	+	+	–	+	+	7	HQ
Speziale et al (52)	P	550 <sup>b</sup>	0.5	+	+	+	+	+	–	+	+	7	HQ

<sup>a</sup> Controlled for confounding, appropriate statistical model used, univariate / multivariate, measures of prognostic factor are presented (odds ratio/risk ratio), including 95% confidence interval, analysis is controlled for confounding.

<sup>b</sup> Ischemic heart disease related surgery.

<sup>c</sup> No ischemic heart disease surgery.

<sup>d</sup> Included both operated and non-operated ischemic heart disease patients.

quality” when meeting  $\geq 7$  criteria, “medium quality” when meeting 5–6 criteria, and “low quality” when meeting  $< 5$  criteria. Low quality studies were excluded from the review.

**Data extraction**

We extracted data from the selected studies regarding study population, outcome measures, and prognostic factors. To facilitate the interpretation and comparison of the results, we categorized the studies by a specific prognostic factor. We distinguished five groups of prognostic factors for work disability based on the core concepts used in the International Classification of Functioning, Disability and Health (15): (i) disease-related factors (eg, severity of the disease, duration of the disease); (ii) body function or structural impairment factors (eg, breathlessness, pain, and body mass index); (iii) activity limitation and participation restriction factors (eg, walking, self-care, communication, and participation at work); (iv) environmental factors (eg, all factors related to work content, work environment, work conditions, care received [including medication], and situation at home); and (v) personal factors (eg, age, gender, education, coping style, and co-morbidity).

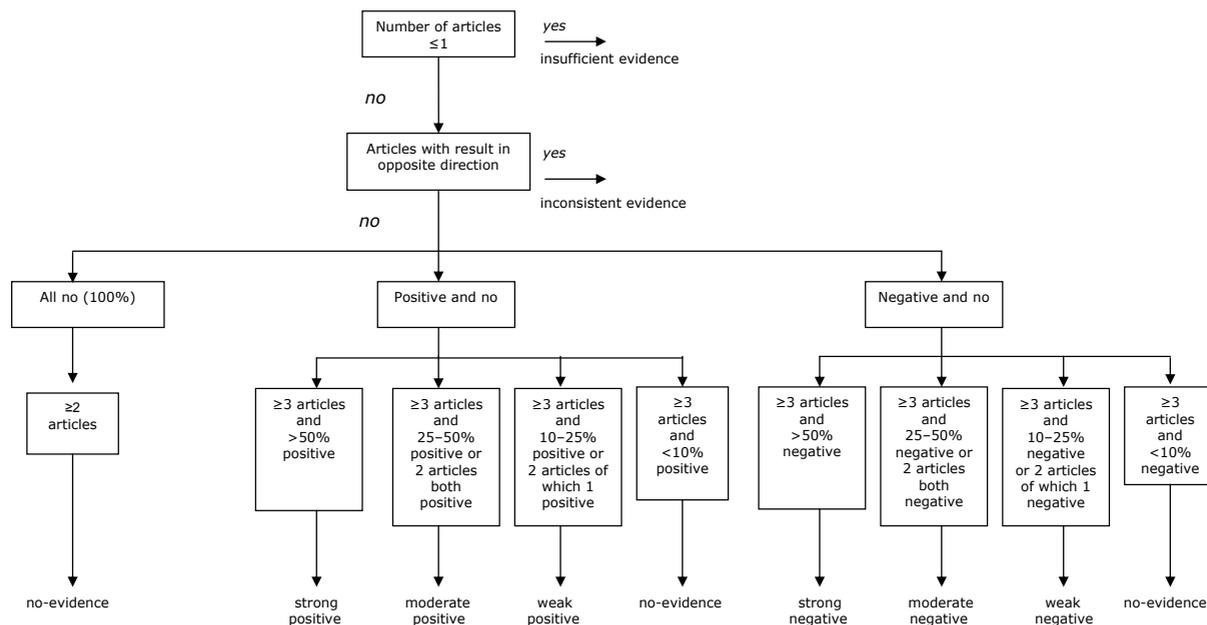
**Best evidence synthesis**

We synthesized the data using the “best-evidence synthesis” procedure (16). The levels of evidence were determined using a rating system similar to those used by de Croon et al (17) and Steenstra et al (18). The

information was synthesized into different evidence levels as shown in figure 1. For the purpose of synthesizing the results, we clustered similar work-related outcomes – such as work disability, work disability pension, continuing to work, and return to work (not returning to work) – as the same outcome of “work disability” as there is no single or “gold standard” to define work disability. We did not cluster the outcome “sickness absence” with work disability as we believe that different prognostic factors may play a role in sickness absence (ie, “temporal” inability to work) than in work disability (ie, “permanent” inability to work). The prognostic factors predicting sickness absence were not used in the final results; the direction of the evidence level (ie, positive or negative) was based on the outcome “work disability”.

Univariate or, if available, multivariate data are presented in tables. Univariate data were only shown in tables 2, 3, and 4 if there were only univariate results for the factor or if a factor was not significant in univariate analysis and, therefore, not included in the multivariate analysis.

Most articles found with the MeSH term “myocardial ischemia” dealt with a variety of coronary artery diseases including acute coronary syndrome, coronary disease, myocardial infarction, and angina pectoris. Some articles focused on return to work after a coronary artery bypass graft or a percutaneous transluminal coronary angioplasty (PTCA). In the best evidence synthesis, we considered using the categories “IHD with operation” and “IHD without operation”, but we found that the diagnosis of the patients included at the



**Figure 1.** Best evidence synthesis

**Table 2.** Results of the best evidence synthesis for employees with *rheumatoid arthritis*. [Positive *or* (+) = a significant positive relation between the prognostic factor and the outcome; Negative *or* (-) = a significant negative relation between the prognostic factor and the outcome]

Factor	Result	Evidence	Outcome <sup>a</sup>
<b>Disease-related factors</b>			
Duration of illness		<b>Inconsistent</b>	
Mau et al (35)	No effect		Work disability
Straaton et al (37)	No effect		Work disability
Reisine et al (7/22)	No effect		Return to work
<b>&gt;24 months</b>			
Chung et al (25)	Positive (Nashville) <sup>b</sup>		Work disability
Chung et al (25)	Negative (Jyväskylä) <sup>b</sup>		Work disability
Disease stage		Insufficient	
Reisine et al (7)	No effect		Work disability
Non-fracture diagnosis		Insufficient	
Straaton et al (37)	Negative		Return to work
<b>Impairments in body function or body structure</b>			
Erythrocyte sedimentation rate (30 mm/h)		<b>Weak (+)</b>	
Wolfe & Hawley (36)	No effect		Work disability
Young et al (26)	Positive		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Puolakka et al (24)	No effect <sup>b</sup>		Work disability
Borg et al (43)	No effect <sup>b</sup>		Work disability
Presence rheumatoid factor (RF+)		<b>Moderate (+)</b>	
Mau et al (35)	Positive		Work disability
Barrett et al (39)	No effect		Work disability
Wolfe et & Hawley (36)	Positive		Work disability
Chung et al (25)	No effect (Nashville/Jyväskylä) <sup>b</sup>		Work disability
Sokka et al (40)	No effect		Work disability
Puolakka et al (24)	No effect		Work disability
Straaton et al (37)	Negative		Return to work
Albers et al (38)	Negative		Return to work
Amount of damaged joints		<b>Moderate (+)</b>	
Amount of deformed joints			
Reisine et al (41)	Positive		Work disability
Amount of erosive joints			
Puolakka et al (24)	No effect <sup>b</sup>		Work disability
Young et al (26)	No effect		Work disability
Joint damage score			
Fex et al (42)	No effect		Work disability
Erosive joints			
Mau et al (35)	Positive		Work disability
Reisine et al (22)	Positive		Work disability
Reisine et al (7)	No effect		Work disability
Amount of inflamed, swollen or flared joints		<b>Moderate (+)</b>	
Reisine et al (41)	Positive		Work disability
Reisine et al (22)	Positive		Work disability
Mau et al (35)	Positive		Work disability
Sokka et al (40)	Positive		Work disability
Barrett et al (39)	No effect		Work disability
Borg et al (43)	No effect		Work disability
Puolakka et al (24)	No effect <sup>b</sup>		Work disability
Wolfe & Hawley (36)	No effect		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Fex et al (42)	No effect		Work disability

(continued)

**Table 2.** Continued.

Factor	Result	Evidence	Outcome <sup>a</sup>
Amount of tender joints		Insufficient	
Puolakka et al (24)	No effect <sup>b</sup>		Work disability
Pain		<b>Moderate (+)</b>	
Visual Analog pain scale (0–3)			
Wolfe & Hawley (36)	Positive		Work disability
Pain (high versus low score)			
Eberhardt & Fex (44)	No effect		Work disability
Reisine et al (7/22)	No effect		Work disability
Borg et al (43)	No effect <sup>b</sup>		Work disability
Joint pain (yes versus no)			
Puolakka et al (24)	No effect		Work disability
Fex et al (42)	No effect		Work disability
Pain interfering with work (yes versus no)			
Mancuso et al (8)	Positive		Work disability
Pain at first assessment (high versus low score)			
Chung et al (25)	Positive (Nashville/Jyväskylä) <sup>b</sup>		Work disability
Pain at last observation			
Chung et al (25)	No effect (Nashville)		Work disability
Chung et al (25)	Positive (Jyväskylä) <sup>b</sup>		Work disability
SF-36 (pain) (high versus low score)			
Odegaard et al (54)	No effect		Work disability
Pain >5			
Straaton et al (37)	Negative		Return to work
Keitel functional test		Insufficient	
Borg et al (43)	Positive <sup>b</sup>		Work disability
Physician global assessment (somatic)		Insufficient	
Puolakka et al (24)	No effect		Work disability
Rheumatology Attitudes Index <sup>c</sup>		Insufficient	
Odegaard et al (18)	Positive		Work disability
Psychological variables		No evidence	
90 item symptom checklist			
Eberhardt et al (34)	No effect		Work disability
Psychological distress			
Fex et al (42)	No effect		Work disability
Beck depression score			
Borg et al (43)	No effect		Work disability
Arthritis Impact Measurement Scales affect		Insufficient	
Odegaard et al (54)	No effect		Work disability
Larsen score <sup>d</sup>		Insufficient	
Jääntti et al (55)	No effect		Work disability
Grip strength		No evidence	
Wolfe & Hawley (36)	No effect		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Body mass index		Insufficient	
Wolfe & Hawley (36)	Positive		Work disability
Fatigue at last observation		<b>Weak (+)</b>	
Chung et al (25)	No effect (Nashville) <sup>b</sup>		Work disability
Chung et al (25)	Positive (Jyväskylä) <sup>b</sup>		Work disability

(continued)

Table 2. Continued.

Factor	Result	Evidence	Outcome <sup>a</sup>
<b>Activity limitations and participation restrictions</b>			
Health Assessment Questionnaire (HAQ)		<b>Strong (+)</b>	
HAQ >1.50			
Barrett et al (39)	Positive		Work disability
Eberhardt & Fex (44)	Positive		Work disability
Young et al (26)	Positive		Work disability
Fex et al (42)	Positive		Work disability
HAQ ≥1.0			
Puolakka et al (23)	Positive		Work disability
Puolakka et al (24)	Positive		Work disability
Modified HAQ per unit			
Odergaard et al (54)	Positive		Work disability
Chung et al (25)	No effect	(Nashville/Jyväskylä) <sup>b</sup>	Work disability
HAQ (high versus low score)			
Wolfe & Hawley (36)	No effect		Work disability
Borg et al (43)	Positive		Work disability
Jääntti et al (55)	Positive		Work disability
American Rheumatism Association functional class		Insufficient	
Mau et al (35)	Positive		Work disability
Sickness absence		<b>Weak (+)</b>	
Straaton et al (37)	No effect		Work disability
Reisine et al (7)	Positive		Return to work
<b>Environmental factors</b>			
Occupation type		<b>Strong (+)</b>	
Manual work/heavy physical demands versus sedentary work/professional/mental work			
Eberhardt & Fex (44)	Positive		Work disability
Puolakka et al (24)	No effect <sup>b</sup>		Work disability
Sokka et al (40)	No effect		Work disability
Reisine et al (41)	No effect		Work disability
Reisine et al (7)	Positive		Work disability
Manual work/heavy physical demands versus sedentary work/professional/mental work			
Young et al (26)	Positive		Work disability
Sokka et al (40)	Positive		Work disability
Wolfe & Hawley (36)	Positive		Work disability
Fex et al (42)	No effect		Work disability
Manual versus non-manual work			
Holte et al (57)	Positive		Work disability
Reisine et al (7)	Positive		Work disability
Precision versus non-precision work		<b>Moderate (+)</b>	
Borg et al (43)	Positive		Work disability
Mau et al (35)	Positive		Work disability
Non-sedentary work versus sedentary work		<b>Weak (+)</b>	
Chung et al (25)	No effect	(Nashville) <sup>b</sup>	Work disability
Chung et al (25)	Positive	(Jyväskylä) <sup>b</sup>	Work disability
Routine non-manual versus professional		Insufficient	
Holte et al (57)	Positive		Work disability
Autonomy at work (high versus low)		No evidence	
Eberhardt & Fex (44)	No effect		Work disability
Fex et al (42)	No effect		Work disability
Income (high versus low)		Insufficient	
Holte et al (57)	No effect		Work disability

(continued)

Table 2. Continued.

Factor	Result	Evidence	Outcome <sup>a</sup>
Working hours		<b>Weak (+)</b>	
Part- versus full-time work			
Holte et al (57)	Positive		Work disability
>30 hours			
Reisine et al (7/22)	No effect		Work disability
Data complexity (high versus low)		<b>Weak (+)</b>	
Wolfe & Hawley (36)	No effect		Work disability
Reisine et al (22)	Positive		Work disability
Self-employed versus not self-employed		No evidence	
Sokka et al (40)	No effect		Work disability
Reisine et al (7)	No effect		Work disability
Manager role		No evidence	
Supervise others			
Reisine et al (7)	No effect		Work disability
Manage people (per 1 unit)			
Wolfe & Hawley (36)	No effect		Work disability
Occupational prestige (high versus low)		Insufficient	
Reisine et al (22)	No effect		Work disability
Work factors		Insufficient	
Straaton et al (37)	No effect		Return to work
Duration of employment (years)		Insufficient	
Straaton et al (37)	No effect		Return to work
Demands at work previous job (high versus low)		Insufficient	
Straaton et al (37)	No effect		Return to work
Prestige of previous job (high versus low)		Insufficient	
Straaton et al (37)	No effect		Return to work
Paid sick days <sup>a</sup>		Insufficient	
Reisine et al (41)	Positive <sup>b</sup>		Work disability
Annual income (high versus low)		Insufficient	
Straaton et al (37)	No effect		Return to work
Social security insurance (yes versus no)		Insufficient	
Straaton et al (37)	Negative		Return to work
Type of drug therapy		No evidence	
Combination treatment			
Puolakka et al (24)	No effect <sup>a</sup>		Work disability
Treatment group (disease-modifying anti-rheumatic drug)			
Borg et al (43)	No effect		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Ever/never biological use		Insufficient	
Chung et al (25)	No effect	(Nashville/Jyväskylä) <sup>b</sup>	Work disability
Ever/never methotrexate		<b>Weak (+)</b>	
Chung et al (25)	Positive	(Jyväskylä) <sup>b</sup>	Work disability
Chung et al (25)	No effect	(Nashville) <sup>b</sup>	Work disability
Ever/never used prednisone		<b>Weak (+)</b>	
Chung et al (25)	Positive	(Jyväskylä) <sup>b</sup>	Work disability
Chung et al (25)	No effect	(Nashville) <sup>b</sup>	Work disability

(continued)

**Table 2.** Continued.

Factor	Result	Evidence	Outcome <sup>a</sup>
Time before start of drug therapy		<b>Weak (-)</b>	
Delay to treatment (>4 months)			
Puolakka et al (24)	No effect <sup>a</sup>		Work disability
Time to first disease-modifying anti-rheumatic drug			
Chung et al (25)	Negative (Nashville) <sup>b</sup>		Work disability
Chung et al (25)	No effect (Jyväskylä) <sup>b</sup>		Work disability
<b>Personal factors</b>			
Age		<b>Strong (+)</b>	
High versus low			
Odergaard et al (54)	No effect		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Puolakka et al (23/24)	Positive		<b>Work disability</b>
Reisine et al (7/22)	Positive		Work disability
Borg et al (43)	Positive		Work disability
Mau et al (35)	Positive		Work disability
Higher age			
Albers et al (38)	Positive		Work disability
Per 5 years extra of age			
Sokka et al (40)	Positive		Work disability
40–49 versus 30–39/50–56 versus 39 years			
Holte et al (57)	Positive		<b>Work disability</b>
≤55 versus >55 years			
Puolakka et al (23/24)	Positive		<b>Work disability</b>
46–55 versus ≥35/>55 versus <35 years			
Fex et al (42)	Positive		<b>Work disability</b>
46–55 versus ≤35/>55 versus <35 years)			
Chung et al (25)	Positive (Jyväskylä) <sup>b</sup>		Work disability
Chung et al (25)	No effect (Nashville) <sup>b</sup>		Work disability
>43 versus ≤43 years			
Straaton et al (37)	Negative		<b>Return to work</b>
Age at onset		<b>Weak (+)</b>	
Young et al (26)	Positive		<b>Work disability</b>
<50 years versus >50 years			
Barrett et al (24)	No effect		Work disability
Gender (female versus male)		<b>Moderate (+)</b>	
Reisine et al (7/22)	No effect		Work disability
Odergaard et al (54)	Positive		Work disability
Holte et al (57)	Positive		Work disability
Barrett et al (24)	No effect		Work disability
Albers et al (38)	Positive		Work disability
Fex et al (42)	No effect		Work disability
Wolfe & Hawley (36)	Positive		Work disability
Young (26)	Positive		Work disability
Borg et al (43)	No effect <sup>b</sup>		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Puolakka et al (24)	No effect <sup>b</sup>		Work disability
Sokka et al (40)	No effect		Work disability
Chung et al (25)	No effect <sup>b</sup>		Work disability
Straaton et al (37)	No effect		Return to work
Marital status		No evidence	
Married versus single/divorced/ widowed			
Reisine et al (7/22)	No effect		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Albers et al (38)	No effect		Work disability
Borg et al (43)	No effect		Work disability
Fex et al (42)	No effect		Work disability
Sokka et al (40)	No effect		Work disability
Holte et al (57)	No effect		Work disability
Married (only in women)			
Straaton et al (37)	No effect		Return to work
Reisine et al (41)	Positive		Work disability

(continued)

**Table 2.** Continued.

Factor	Result	Evidence	Outcome <sup>a</sup>
Previously married versus never married		<b>Insufficient</b>	
Holte et al (57)	Positive		<b>Work disability</b>
Desire to be or remain employed (higher versus low)		<b>Weak (-)</b>	
Reisine et al (7)	No effect		Work disability
Reisine et al (22)	Negative		<b>Work disability</b>
Satisfaction with working conditions (high versus low)		<b>Weak (-)</b>	
Eberhardt & Fex (44)	No effect		Work disability
Fex et al (42)	No effect		Work disability
Reisine et al (41)	Negative		<b>Work disability</b>
Education		<b>Moderate (-)</b>	
High versus low			
Reisine et al (7/22)	No effect		<b>Work disability</b>
Sokka et al (40)	No effect		<b>Work disability</b>
Odegard (54)	Negative		<b>Work disability</b>
Borg et al (43)	No effect <sup>b</sup>		Work disability
Fex et al (42)	Positive		Work disability
Straaton et al (37)	Positive		Return to work
Higher			
Wolfe & Hawley (36)	Negative		Work disability
Eberhardt & Fex (44)	No effect		Work disability
Puolakka et al (24)	No effect		Work disability
Number of years			
Barrett et al (39)	No effect		<b>Work disability</b>
0–9 years			
Holte et al (57)	Negative		<b>Work disability</b>
>12 years			
Chung et al (25)	Negative (Nashville/Jyväskylä) <sup>b</sup>		Work disability
Social class		<b>Insufficient</b>	
Barrett et al (39)	No effect		<b>Work disability</b>
Ethnic origin (white versus non-white)		<b>Moderate (-)</b>	
Wolfe & Hawley (36)	No effect		<b>Work disability</b>
Chung et al (25)	Negative (Nashville) <sup>b</sup>		Work disability
Reisine et al (41)	No effect		<b>Work disability</b>
Co-morbidity (yes versus no)		<b>No evidence</b>	
Odergaard et al (54)	No effect		<b>Work disability</b>
Straaton et al (37)	No effect		Return to work
General health		<b>Insufficient</b>	
Borg et al (43)	No effect <sup>b</sup>		Work disability
Patient Global Severity Score		<b>Moderate (+)</b>	
High versus low			
Wolfe & Hawley (36)	No effect		Work disability
Chung et al (25)	Positive (Nashville/Jyväskylä) <sup>b</sup>		Work disability
Puolakka et al (24)	Positive		Work disability
At first assessment (high versus low)			
Chung et al (25)	No effect (Nashville) <sup>b</sup>		Work disability
At last assessment (high versus low)			
Chung et al (25)	Positive (Jyväskylä) <sup>b</sup>		Work disability

<sup>a</sup> Based on the best evidence synthesis level

<sup>b</sup> Results based on univariate analysis.

<sup>c</sup> Helplessness subscale (RAI-score </=median).

<sup>d</sup> Rating scale mainly for hip impairments.

<sup>e</sup> <1 week versus ≥1 week.

**Table 3.** Results of the best evidence synthesis for employees with *asthma*. [Positive or (+) = a significant positive relation between the prognostic factor and the outcome; Negative or (-) = a significant negative relation between the prognostic factor and the outcome; Cont. employ = continuous employment]

Factor	Result	Evidence	Outcome <sup>a</sup>
<b>Disease-related factors</b>			
Asthma severity score		<b>Weak (+)</b>	
Blanc et al (10)	Positive		Work disability
Yelin et al (11)	No effect		Cont. employ
<b>Impairments in body function or body structure</b>			
Forced Expiratory Volume (%)		Insufficient	
Blanc et al (10)	Positive		Work disability
<b>Activity limitations and participation restrictions</b>			
SF-36 (physical)		Insufficient	
Yelin et al (11)	No effect		Cont. employ
<b>Environmental factors</b>			
Occupation type		<b>Moderate (-)</b>	
Physically demanding work/ blue-collar occupations			
Yelin et al (11)	Negative		Cont. employ/ return to work
Metal versus office workers			
Alexopoulos & Burdorf (21)	Negative		Cont. employ/ return to work
Office workers versus welders		Insufficient	
Alexopoulos & Burdorf (21)	Positive		Return to work
Working full-time at first interview		Insufficient	
Yelin et al (11)	Positive		Cont. employ
Set own job space / autonomy		Insufficient	
Yelin et al (11)	Positive <sup>b</sup>		Cont. employ
Hospitalizations in prior year		Insufficient	
Yelin et al (11)	No effect		Cont. employ
<b>Personal factors</b>			
Gender (female versus male)		<b>Weak (-)</b>	
Yelin et al (11)	Negative		Cont. employ
Blanc et al (10)	No effect		Work disability
Marital status		Insufficient	
Yelin et al (11)	Positive <sup>b</sup>		Cont. employ
Age		No evidence	
Yelin et al (11)	No effect		Cont. employ
Alexopoulos & Burdorf (21)	No effect		Return to work
Blanc et al (10)	No effect		Work disability
Education		Insufficient	
Yelin et al (11)	No effect		Cont. employ
Ethnic origin		Insufficient	
Yelin et al (11)	No effect		Cont. employ
Smoking status		No evidence	
Yelin et al (11)	No effect		Cont. employ
Blanc et al (10)	No effect		Work disability
Perceived severity score		Insufficient	
Yelin et al (11)	No effect		Cont. employ

<sup>a</sup> Based on the best evidence synthesis level

<sup>b</sup> Results based on univariate analysis.

**Table 4.** Results of the best evidence synthesis for employees with *ischemic heart disease*. [Positive or (+) = a significant positive relation between the prognostic factor and the outcome; Negative or (-) = a significant negative relation between the prognostic factor and the outcome; CBS = coronary bypass surgery]

Factor	Result	Evidence	Outcome <sup>a</sup>
<b>Disease-related factors</b>			
History of myocardial infarction (yes versus no)		<b>No evidence</b>	
Lundbom et al (27)	No effect <sup>b</sup>		Return to work
Sellier et al (33)	No effect		Return to work
Presence of congestive heart failure		<b>Weak (-)</b>	
Hlatky et al (31)	No effect		Return to work
Mark et al (32)	Negative		Return to work
Extent of coronary artery disease		Insufficient	
Hlatky et al (31)	No effect		Return to work
Recurrent cardiac events		Insufficient	
Bhattacharyya et al (30)	Negative		Return to work
Diagnosed with myocardial infarction (versus angina)		Insufficient	
Earle et al (58)	Positive		Return to work
Chronic heart failure (≤class I)		Insufficient	
Mark et al (32)	No effect		Return to work
Evidence of extracardiac vascular disease (yes versus no)		Insufficient	
Mark et al (32)	Negative		Return to work
Presence of angina pectoris (yes versus no)		<b>Weak (-)</b>	
Sellier et al (33)	Negative		Return to work
Mark et al (32)	No effect		Return to work
Presence of angina before acute myocardial infarction		Insufficient	
Froom et al (51)	Negative		Return to work
Angina course (stable or none versus progressive angina versus unstable angina)		Insufficient	
Mark et al (32)	No effect		Return to work
Duration of angina		Insufficient	
Lundbom et al (27)	No effect <sup>b</sup>		Working full-time after CBS
History of Percutaneous Trans-luminal Coronary Angioplasty		<b>Weak (+)</b>	
Sellier et al (33)	No effect		Return to work
Drory et al (34)	Positive		Return to work
History of coronary artery bypass graft		Insufficient	
Sellier et al (33)	No effect		Return to work
Acute versus elective operation		Insufficient	
Lundbom et al (27)	Positive <sup>b</sup>		Return to work
Complete revascularization <sup>c</sup>		<b>Weak (+)</b>	
Sellier et al (33)	No effect		Return to work
Boudrez & De Backer <sup>d</sup> (19)	Positive		Return to work
Number of coronary vessels involved		No evidence	
Sellier et al (33)	No effect		Return to work
Mark et al (32)	No effect		Return to work

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
New York Heart Association classification at admission (yes versus no)		<b>Insufficient</b>	
Froom et al (51)	Negative		Return to work
<b>Impairments in body function or body structure</b>			
Holter monitor		<b>Insufficient</b>	
Sellier et al (33)	No effect		Return to work
Echocardiogram: wall motion index (N=528) <sup>c</sup>		<b>Insufficient</b>	
Sellier et al (33)	No effect		Return to work
Percentage of ejection fraction		<b>No evidence</b>	
Boudrez & De Backer <sup>d</sup> (19)	No effect		Return to work
Mark et al (32)	No effect		Return to work
Left ventricular function (normal versus abnormal)		<b>Moderate (+)</b>	
Hlatky et al (31)	Positive		Return to work
Boudrez & De Backer <sup>d</sup> (19)	Positive		Return to work
Q wave in cases of acute myocardial infarction (yes versus no)		<b>Moderate (-)</b>	
Drory et al (34)	Negative		Return to work
Froom et al (51)	Negative		Return to work
Peak creatinine kinase		<b>Insufficient</b>	
Soejima et al (45)	No effect		Return to work
Global Registry of Acute Coronary Events score <sup>b</sup>		<b>Insufficient</b>	
Bhattacharyya et al (30)	No effect		Return to work
Somatic complaints		<b>Strong (-)</b>	
High versus low			
Boudrez et al (50)	Negative		Return to work
Boudrez & De Backer <sup>d</sup> (19)	<b>No effect</b>		Return to work
Boudrez & De Backer <sup>e</sup> (19)	<b>Negative</b>		Return to work
Agren et al (28)	Negative		Return to work
Perceived health complaints			
Abbott & Berry (46)	<b>No effect <sup>b</sup></b>		Return to work
Arrhythmia		<b>Insufficient</b>	
Bhattacharyya et al (30)	Negative		Return to work
Percentage of hypertension		<b>Insufficient</b>	
Mark et al (32)	No effect		Return to work
Presence of dyspnea (no versus yes); breathlessness (no versus yes)		<b>Moderate (+)</b>	
Sellier et al (33)	Positive		Return to work
Caine et al (53)	Positive		Return to work
Chest pain; chest tightness		<b>Moderate (-)</b>	
Speziale et al (52)	Negative		Return to work
Mark et al (32)	No effect		Return to work
Caine et al (53)	No effect		Return to work
New York Heart Association classification Angina class III or IV		<b>No evidence</b>	
Engblom et al (49)	No effect		Return to work
Mark et al (32)	No effect		Return to work
Exercise test <sup>f</sup>		<b>Insufficient</b>	
Sellier et al (33)	<b>No effect</b>		Return to work

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
Peak workflow (watts); final workflow		<b>Weak (+)</b>	
Sellier et al (33)	Positive		Return to work
Engblom et al (49)	No effect		Return to work
Exercise duration <420 seconds		<b>Insufficient</b>	
Sellier et al (33)	Negative		Return to work
Exercise tolerance		<b>No evidence</b>	
Boudrez et al (50)	No effect		Return to work
Boudrez & De Backer <sup>e</sup> (19)	<b>No effect</b>		Return to work
Söderman et al (48)	No effect		Return to work
Anxiety (clinical/borderline versus normal)		<b>No evidence</b>	
Samkange et al (47)	No effect		Return to work
Boudrez & De Backer <sup>e</sup> (19)	<b>No effect</b>		Return to work
Abbott & Berry (46)	No effect		Return to work
Depression & anxiety		<b>Strong (-)</b>	
Beck depression score			
Bhattacharyya et al (30)	Negative		Return to work
Söderman et al (48)	Negative		Return to work
Beck depression score (preoperative)			
Engblom et al (49)	No effect		Return to work
Depressive symptoms in hospital			
Soejima et al (45)	Negative		Return to work
Depression (clinical/ borderline versus normal)			
Abbott & Berry (46)	<b>Negative <sup>b</sup></b>		Return to work
Hospital anxiety and depression scale adjusted for Germany			
Samkange et al (47)	Negative		Return to work
Mental health inventory score		<b>Insufficient</b>	
Hlatky et al (31)	<b>No effect</b>		Return to work
Summary psychological scales		<b>Weak (+)</b>	
Boudrez & De Backer <sup>e</sup> (19)	<b>No effect</b>		Return to work
Mark et al (32)	Positive		Return to work
Cognitive insufficiency		<b>No evidence</b>	
Boudrez & De Backer <sup>e</sup> (19)	<b>No effect</b>		Return to work
Boudrez & De Backer <sup>d</sup> (19)	<b>No effect</b>		Return to work
Psycho neuroticism		<b>Insufficient</b>	
Boudrez & De Backer <sup>d</sup> (19)	<b>No effect</b>		Return to work
Extraversion		<b>Insufficient</b>	
Soejima et al (45)	Positive		Return to work
<b>Activity limitations and participation restrictions</b>			
Duke activity status index		<b>Weak (-)</b>	
Functional activity patients view			
Hlatky et al (31)	No effect		Return to work
Duke activity (0–12)			
Mark et al (32)	Negative		Return to work

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
Subjective working capacity		<b>Strong (-)</b>	
Vocational disability to cardiac status (patient's view) (strong versus light) Mittag et al (56)	Negative		Working full-time after CBS
Patients' perception of their working capacity 6 months after CBS Engblom et al (49)	No effect		Return to work
Work incapacitation (strong versus moderate versus light) Samkange et al (47)	Negative		Return to work
Vocational disability due to overall health (physician's view) <sup>g</sup> Mittag et al (56)	Positive	<b>Insufficient</b>	Return to work
Sick listed before operation Lundbom et al (27)	Negative <sup>b</sup>	<b>Strong (-)</b>	Working full-time after CBS
Munro (29)	Negative		Return to work
Agren et al (28)	Negative		Return to work
Engblom et al (49)	No effect		Return to work
Caine et al (53)	Negative		Return to work
Boudrez & De Backer <sup>d</sup> (19)	Negative		Return to work
Work status before surgery Speziale et al (52)	No effect	<b>Insufficient</b>	Return to work
Sick-leave versus laid-off Hlatky et al (31)	Positive	<b>Insufficient</b>	Return to work
Effect of health on activities Mark et al (32)	No effect	<b>Insufficient</b>	Return to work
Nottingham health profile (physical mobility, lower than twice normal population) Caine et al (53)	Negative	<b>Insufficient</b>	Return to work
<b>Environmental factors</b>			
Occupation type		<b>Moderate (-)</b>	
<b>Blue- versus white-collar</b>			
Boudrez et al (50)	No effect		Working full-time after CBS
Hlatky et al (31)	No effect		Return to work after CBS
Caine et al (53)	No effect		Return to work after CBS
Drory et al (34)	Negative		Return to work
Samkange et al (47)	Negative		Return to work
<b>Goods-producing industry</b>			
Engblom et al (49)	No effect		Working full-time after CBS
Manual/white-collar work Lundbom et al (27)	No effect <sup>b</sup>		Working full-time after CBS
Boudrez & De Backer <sup>e</sup> (19)	Negative		Working full-time after CBS
Physically demanding work Soejima et al (45)	No effect		Return to work after CBS
Sellier et al (33)	Negative		Return to work after CBS

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
Self-employed tradesmen versus public service employees Lundbom et al (27)	No effect <sup>b</sup>	<b>Insufficient</b>	Working full-time after CBS
Full- versus part-time Hlatky et al (31)	Positive	<b>Insufficient</b>	Return to work
Hours worked per week Mark et al (32)	No effect	<b>Insufficient</b>	Return to work
Length of time with an employer Caine et al (53)	No effect <sup>b</sup>	<b>Insufficient</b>	Return to work
Mental stress of job Hlatky et al (31)	No effect	<b>No evidence</b>	Return to work
Mark et al (32)	No effect		Return to work
Flexible work schedule Earle et al (58)	No effect	<b>Insufficient</b>	Return to work
Able to work fewer hours Earle et al (58)	No effect	<b>Insufficient</b>	Return to work
Allowed to change work tasks Earle et al (58)	No effect	<b>Insufficient</b>	Return to work
Job held open after operation Caine et al (53)	No effect	<b>Insufficient</b>	Return to work
Decision latitude/authority Boudrez & De Backer <sup>d</sup> (19)	No effect	<b>Insufficient</b>	Return to work
Psychological job demands Boudrez & De Backer <sup>d</sup> (19)	No effect	<b>Insufficient</b>	Return to work
Method of pay Hlatky et al (31)	No effect	<b>Insufficient</b>	Return to work
Income		<b>No evidence</b>	
Annual income job; Hlatky et al (31)	No effect		Return to work
Percentage of income Mark et al (32)	No effect		Return to work
Job insecurity (high versus low) Boudrez & De Backer <sup>d</sup> (19)	Positive	<b>Insufficient</b>	Return to work
Paid leave available at work Earle et al (58)	Positive	<b>Insufficient</b>	Return to work
Co-workers/supervisor support Earle et al (58)	No effect	<b>Insufficient</b>	Return to work
Social support from friends Boudrez et al (50)	Positive	<b>Weak (+)</b>	Return to work
Soejima et al (45)	No effect		Return to work
Boudrez & De Backer <sup>d</sup> (19)	No effect		Return to work
Health insurance Hlatky et al (31)	Positive	<b>Weak (+)</b>	Return to work
Earle et al (58)	No effect		Return to work
Other household members with job Hlatky et al (31)	No effect	<b>Insufficient</b>	Return to work

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
Employment status partner		Insufficient	
Mark et al (32)	No effect		Return to work
Husband has higher education		Insufficient	
Earle et al (58)	No effect		Return to work
Number of dependents		Insufficient	
Mark et al (32)	No effect		Return to work
Residence		<b>Moderate (-)</b>	
Rural versus urban area			
Lundbom et al (27)	No effect <sup>b</sup>		Working full-time after CBS
South East region France			
Sellier et al (33)	Negative		Return to work
Region of residence (south Italy)			
Speziale et al (52)	No effect		Return to work
Length of time waiting for grafting (<6 months)		Insufficient	
Caine et al (53)	Positive		Return to work
Attended cardiac rehabilitation		<b>Moderate (+)</b>	
Earle et al (58)	Positive		Return to work
Boudrez et al (50)	Positive		Return to work
Anti-depressant use		Insufficient	
Bhattacharyya et al (30)	No effect		Return to work
Time interval between acute myocardial infarction & visit to occupational medicine clinic		Insufficient	
Froom et al (51)	Negative		Return to work
<b>Personal factors</b>			
Age		<b>Strong (-)</b>	
High versus low			
Agren et al (28)	Negative		Working full-time after CBS
Söderman et al (48)	Negative		Return to work
Lundbom et al (27)	Negative <sup>b</sup>		Return to work
Caine et al (53)	No effect		Return to work
Boudrez et al (50)	No effect		Return to work
Soejima et al (45)	No effect		Return to work
Abbott & Berry (46)	Negative <sup>b</sup>		Return to work
>51 years			
Sellier et al (33)	Negative		Return to work
Speziale et al (52)	Negative		Return to work
>55 years			
Drory et al (34)	Negative		Return to work
>54 years			
Froom et al (51)	Negative		Return to work
Mark et al (32)	Negative		Return to work
52–56/57–61 versus <52 years			
Samkange et al (47)	Negative		Return to work
<55 versus >55 years			
Söderman et al (48)	Negative		Return to work
46–55/56–53 versus <45 years			
Munro (29)	Negative		Return to work
Per extra year			
Mittag et al (56)	Negative		Return to work
<55 years versus 55–59 years			
Hlatky et al (31)	Negative		Return to work
In years			
Bhattacharyya et al (30)	Negative		Return to work

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
Gender (male versus female)		<b>Weak (+)</b>	
Sellier (28)	No effect		Return to work
Hlatky et al (31)	Positive		Return to work
Bhattacharyya et al (30)	No effect		Return to work
Drory et al (34)	No effect		Return to work
Samkange et al (47)	No effect		Return to work
Mark et al (32)	No effect		Return to work
Education		<b>Strong (+)</b>	
High versus low			
Earle et al (58)	Positive		Return to work
Soejima et al (45)	No effect		Return to work
Söderman et al (48)	Positive		Return to work
≥15 versus 9–11 versus ≤8 years			
Mark et al (32)	Positive		Return to work
Professional education		Insufficient	
Engblom et al (49)	No effect		Return to work
Socioeconomic status		<b>Weak (-)</b>	
Engblom et al (49)	No effect		Return to work
Social class (high versus low)			
Abbott & Berry (46)	Negative		Return to work
Marital status		No evidence	
Earle et al (58)	No effect		Return to work
Mark et al (32)	No effect		Return to work
Origin (Israel/ Europe/ America versus other)		Insufficient	
Drory et al (34)	Positive		Return to work
Ethnic origin		<b>Weak (+)</b>	
White versus non-white			
Earle et al (32)	No effect		Return to work
White versus black			
Mark et al (32)	Positive		Return to work
Smoking		No evidence	
Smoker versus non-smoker			
Earle et al (58)	No effect		Return to work
Smoking history (percentage)			
Mark et al (32)	No effect		Return to work
Active versus passive coping		Insufficient	
Agren et al (28)	Positive		Working full-time after CBS
Health locus of control (internal versus external)		<b>Moderate (+)</b>	
Soejima et al (45)	No effect		Return to work
Earle et al (58)	No effect		Return to work
Abbott & Berry (46)	Positive <sup>a</sup>		Return to work
<b>Boudrez &amp; De Backer<sup>d</sup> (19)</b>	<b>No effect</b>		Return to work
Distrust (low degree versus high degree)		Insufficient	
<b>Boudrez &amp; De Backer<sup>d</sup> (19)</b>	<b>Positive</b>		Return to work
Perception job stress caused heart attack		Insufficient	
<b>Boudrez &amp; De Backer<sup>d</sup> (19)</b>	<b>Negative</b>		Return to work

(continued)

**Table 4.** Continued.

Factor	Result	Evidence	Outcome
Importance of work		<b>Moderate (+)</b>	
Perceived importance of work Boudrez et al (50)	Positive		Return to work
Wanting to go back to work Samkange et al (47)	Positive		Return to work
Meaning of work versus other aspects of life Boudrez et al (50)	No effect	Insufficient	Return to work
Preoperative expectations regarding work after surgery (yes versus no)		<b>Strong (+)</b>	
Engblom et al (49)	No effect		Return to work
Hlatky et al (31)	Positive		Return to work
<b>Boudrez &amp; De Backer<sup>d</sup></b> (19)	<b>Positive</b>		Return to work
Satisfaction with sexuality Boudrez et al (50)	No effect <sup>b</sup>	Insufficient	Return to work
Co-morbidity		No evidence	
Lundbom et al (27)	No effect <sup>b</sup>		Working full-time after CBS
Hlatky et al (31)	No effect		Working full-time after CBS
Caine et al (53)	No effect <sup>b</sup>		Working full-time after CBS
Presence of diabetes (yes versus no)		<b>Moderate (-)</b>	
Hlatky et al (31)	No effect		Return to work
Drory et al (34)	Negative		Return to work
Froom et al (51)	Negative		Return to work
Mark et al (32)	No effect		Return to work
Previous health perception <b>Boudrez &amp; De Backer<sup>e</sup></b> (19)	<b>No effect</b>	Insufficient	Return to work
Attitude versus illness <b>Boudrez &amp; De Backer<sup>d</sup></b> (19)	<b>No effect</b>	Insufficient	Return to work
Health concern Soejima et al (45)	No effect	Insufficient	Return to work
Lack of perception of stress-illness link Soejima et al (45)	No effect	Insufficient	Return to work

<sup>a</sup> Based on the best evidence synthesis level

<sup>b</sup> Results based on univariate analysis.

<sup>c</sup> Indicated as numbers and percentages.

<sup>d</sup> With ischemic heart disease related surgery.

<sup>e</sup> Without ischemic heart disease related surgery.

<sup>f</sup> ST segment depression >1 mm and abnormal SBP increase during exercise, indicated as numbers and percentages.

<sup>g</sup> 1-6 = light versus 6 = bad.

start of the study (inception cohort) are not always well defined and may change in the course of the follow-up study. On the basis of this finding, we decided to use one category (ie, IHD). The only exception was the article of Boudrez (2007) (19), in which a difference was made in the analyses between patients with and without an operation. These two groups are described as two different cohorts.

## Results

### Selection and methodological quality assessment

The literature search resulted in 620 hits, of which 89 articles were marked “probable inclusion” or “indecisive result”. The third reviewer decided on 11 articles, on which no consensus had been reached. Of the 89 articles, 48 were excluded. Reference checking yielded ten additional articles, three of which were included in this review, bringing the total to 44 studies: 20 for rheumatoid arthritis, two for asthma, one for asthma and COPD, 21 for IHD. All 44 articles were screened for quality; one low quality study on IHD was found (20) and excluded. In the final results, 43 studies were included, 32 of which were of high quality and 11 were of medium quality.

No cohort studies were found for diabetes mellitus. COPD was excluded from the results as a minimum of two articles is needed for inclusion and only one (21) was found. In this article, asthma and COPD were studied; consequently, only the results of the asthma patients were included in this review. Background information and the quality criteria for the selected cohort studies are presented in table 1. Data from the same cohort studies mentioned in more than one article have only been presented once in the final results. This applies to the articles of Reisine (7, 22) and Puolakka (23, 24). Chung et al (25) described two cohort studies (Nashville/Jyväskylä) in one article, but we presented the results as two studies. Also the results of the two cohorts of Boudrez et al (19) are described separately (IHD with and without surgery).

### Study characteristics

The studies concerned different populations and countries, and did not use the same data sources nor define work disability or return to work in the same way. Puolakka defined work disability in two different ways. In one article (24), work disability is defined in terms of work disability days; in another (23), it is defined in terms of becoming a disability pensioner. Other authors have defined work disability in terms of losing of a full-time job or early retirement because of a chronic

**Table 5.** Prognostic factors with sufficient evidence [weak (x), moderate (xx) or strong (xxx)] for work disability in rheumatoid arthritis (RA), asthma, and ischemic heart disease (IHD). Factors which increase (+) or decrease (-) the risk of work disability are indicated. The direction of the prognostic factors is presented as, for example, pain (high/low) which means a high pain condition versus a low one. (PTCA = percutaneous transluminal coronary angioplasty, AMI = acute myocardial infarction).

	RA		Asthma		IHD	
	+	-	+	-	+	-
<b>Disease-related factors</b>						
Asthma severity score			x			
Presence of congestive heart failure					x	
Presence of angina pectoris					x	
History of PTCA						x
Complete revascularization (%)						x
<b>Impairments in body functions/ body structure</b>						
Presence of rheumatoid factor	xx					
Erythrocyte sedimentation rate (ESR)	x					
Amount of damaged joints	xx					
Amount of swollen joints	xx					
Pain (high / low)	xx					
Fatigue (high / low)	x					
Presence of dyspnoea (no / yes)						xx
Chest pain (yes / no)					xx	
Left ventricular function (normal / abnormal)						xx
Peak workflow (watts)						x
Presence of depression					xxx	
Somatic complaints (high / low)					xxx	
Q wave AMI (yes / no)					xx	
Summary psychological scales						x
<b>Activity limitations and participation restrictions</b>						
Health Assessment Questionnaire (>1.5)	xxx					
Sickness absence	x					
Duke activity scale					x	
Subjective vocational disability (strong / light)					xxx	
Sick leave before operation (yes / no)					xxx	
<b>Environmental factors</b>						
Occupation type (blue- versus white-collar)	xxx		xx		xx	
Precision work (high / low)	xx					
Non-sedentary work / sedentary work	x					
Working hours (full-time / part-time)	x					
Data complexity at work (high / low)	x					
Residence (rural / urban)					xx	
Attended cardiac rehabilitation (yes / no)						xx
Ever/ never used methotrexate	x					
Delay to treatment (early / late)		x				
Ever/never used prednisone	x					
Support from friends (yes / no)						x
Health insurance						x
<b>Personal factors</b>						
Age (high / low)	xxx				xxx	
Age at onset (>50 years / <50 years)	x					
Gender (female / male)	xx		x		x	
Education (high / low)		xx				xxx
Socioeconomic status (high / low)						x
Ethnic origin (white / non-white)		xx			x	
Patient global severity score	xx					
Desire to remain employed (yes / no)		x				
Preoperative expectations regarding work after surgery (yes / no)						xxx
Perceived importance of work / wanting to go back to work (yes / no)		x				xx
Satisfaction with working conditions (yes / no)		x				
Presence of diabetes (yes / no)					xx	
Health locus of control (internal / external)						xx

disease (26). There were also variations in the definition of return-to-work employees with IHD. Some authors (27, 28) used the definition of return to work as working (full-time) after coronary bypass surgery, while others (29, 30) defined it as the resumption of a former job or starting a new job, on a full- or part-time basis.

### Prognostic factors for work disability

The prognostic factors found in the literature for rheumatoid arthritis, asthma, and IHD are presented in tables 2–4 including the original outcomes mentioned in the articles (ie, work disability, return to work, etc). To facilitate the interpretation and comparison of the results, in table 5 and the following sections, we have synthesized the results for the outcome *work disability only*. Table 5 presents all the prognostic factors supported by weak, moderate, or strong evidence for each disease for the outcome work disability.

**Disease-related factors.** For employees with *rheumatoid arthritis*, there is currently not enough evidence on disease-related factors for any conclusion to be drawn. Among employees with *asthma*, the asthma severity score has been found to have a weak positive relation with work disability. One study found a positive relation between the asthma severity score and work disability (10) while another study found no such relation at all (11).

In the case of employees with *IHD*, a weak negative relation has been found between the presence of congestive heart failure and return to work: one article found no relation (31); one article found a negative relation (32). The presence of angina pectoris has been found to be a weak positive factor of work disability: one article found a positive relation (33); another article found no relation (32). Two factors, a history of PTCA and a complete revascularization, have been found to have a weak negative relation for work disability. For PTCA, one article found a negative relation (34); one found no effect (33). For a complete revascularization, one study found a positive relation (19); one study found no effect (33).

**Impairments in body function or body structure.** In employees with *rheumatoid arthritis*, various factors related to impaired body function or body structures have been found to be predictive of work disability. A moderate positive relation has been found between the presence of a rheumatoid factor (RF+) and work disability: four studies found a positive relation (35–38) and four studies found no relation (24, 25, 39–40). The amount of deformed and swollen joints has been found to be a moderate positive prognostic factor for work disability: three studies found a positive relation between the amount of deformed joints and work disability (22, 35, 41), and four studies found no effect (7, 24, 26, 42).

Four studies found a positive relation between the amount of swollen joints and work disability (22, 35, 40, 41), and six studies found no relation (24, 36, 39, 42–44). A moderate positive effect has been found for pain: four studies were positive (8, 18, 36, 37) and six showed no effect (7/22, 18, 24, 42–44). Weak evidence has been found for the erythrocyte sedimentation rate and fatigue as prognostic factors of work disability in rheumatoid arthritis.

For employees with *asthma*, there is currently not enough evidence on factors which are predictive of work disability in this category.

The presence of depression and the level of somatic complaints (high versus low) have been found to be strong positive prognostic factors of work disability for employees with *IHD*. Six studies found a positive relation (30, 45–49) and one article found no relation (49) between depression and work disability. The level of somatic complaints was found to have a positive relation with work disability in three articles (19, 28, 50), while two articles found no effect (19, 46). For employees with *IHD*, Q wave in cases with acute myocardial infarction (yes versus no) (34, 51) and chest pain (yes versus no) (32, 52, 53) were found to be moderate positive prognostic factors for work disability. The presence of dyspnea (no versus yes) (33, 53) and left ventricular function (normal versus abnormal) (19, 31) have been shown to be moderate negative prognostic factors for work disability. Weak negative factors that have been found include peak/final workflow (33,49) and a sum score of psychological problems (19, 32).

To conclude, we did not find any studies which identified common prognostic factors valid for more than one disease in this category.

**Activity limitations and participation restrictions.** For employees with *rheumatoid arthritis*, two factors have been found to be predictive of work disability: a high score on the health assessment questionnaire (HAQ) (strong positive) and previous sickness absence (weak positive). Eight studies found a positive relation between a high score on the HAQ and work disability (23/24, 26, 39, 42–44, 54, 55). Two studies found no relation (25, 36).

In employees with *asthma*, there was not enough evidence on any factors in this category for any conclusion to be drawn.

For employees with *IHD*, sickness absence before operation has been found to be a strong positive prognostic factor of work disability: five articles found a positive relation with work disability (19, 27–29, 53) and one article found no relation (49). The patient's view on the limitations caused by the disease at work (strong versus light) has been found to be another strong positive prognostic factor for work disability in

employees with *IHD*: two articles found a positive relation with work disability (47, 56), and one article found no relation (49). Functional activity (the patient's view) has been found to be a weak positive factor of work disability: one article found a positive relation (32) and the other no relation at all (31).

Based on the evidence, we can conclude that the limitation in daily activities caused by the disease (HAQ and Duke activity scale) and sickness absence (for *IHD* before operation) are common prognostic factors for rheumatoid arthritis and *IHD*.

**Environmental factors.** The type of employment (heavy manual work/blue-collar work) has been shown to be a strong positive prognostic factor for work disability in *rheumatoid arthritis*. Six studies reported a positive relation with work disability (7, 26, 36, 40, 44, 57) and four studies found no effect (24, 40–42). Another moderate positive prognostic factor found in the literature was precision versus non-precision work (35, 43). Studies have shown weak positive factors to include the following: non-sedentary versus sedentary work (25), complex work (high versus low) (22, 36), working hours (part-time versus full-time) (7, 22, 57), and the use of methotrexate and prednisone (25). Another weak negative prognostic factor found in the literature was the commencement of medication use (<4 months versus >4 months) (24, 25).

For employees with *asthma*, heavy manual work/blue-collar work was reported to be a moderate positive factor of work disability (11, 21).

Studies have also shown heavy manual work/blue-collar work to be a moderate positive prognostic factor of work disability for employees with *IHD*. Four articles have shown a positive relation between work disability and heavy manual work/blue-collar work (19, 33, 34, 47), while six articles found no relation between the type of occupation and work disability (27, 31, 45, 49, 50, 53). Living in a rural versus urban area was identified in the literature as another moderate positive factor for work disability (27, 33, 52); the attendance of a cardiac rehabilitation program was found to be a moderate negative factor (50, 58). Support from friends (yes versus no) and health insurance were shown to be weak negative prognostic factors for work disability (19, 45, 50, and 31, 58, respectively).

In the category "environmental factors", we can conclude that the type of employment (manual/blue-collar work versus non-manual/white-collar work) is a prognostic factor that results in a higher risk of work disability in all diseases.

**Personal factors.** Studies have shown that age (high versus low) has been found to be a strong positive prognostic factor of work disability for employees with

*rheumatoid arthritis*. Ten studies reported a positive relation (7, 22–25, 35, 37, 40, 43, 57), while four studies found no relation (25, 38, 44, 54). A moderate positive relation has been shown between gender (female versus male) and work disability. Five studies found a positive relation (26, 36, 38, 54, 57) and ten studies found no relation at all (7, 22, 25, 37, 39, 40, 42–44). The literature has also shown the patient global severity score (high versus low) to be a moderate positive factor (24, 25, 36). **Education (high versus low)** has been shown to be a moderate negative prognostic factor of work disability in rheumatoid arthritis. Six studies reported a negative relation (25, 36, 37, 42, 54, 57) and seven studies found no relation (7, 22, 24, 39, 40, 43, 44). Ethnic origin (white versus non-white) has also been identified as a moderate negative factor for work disability (25, 36, 41). The literature has identified age at the onset of the disease to be a weak positive prognostic factor (26, 39); weak negative prognostic factors include the desire to remain employed (yes versus no) and satisfaction with working conditions (7, 22, and 41, 42, 44 respectively).

For employees with *asthma*, gender (female versus male) was found to have a weak negative relation with continuous employment and thus a weak positive relation with work disability. One study reported a negative relation (11) while another found no effect (10).

Age (high versus low) was shown to be a strong positive factor of work disability for employees with *IHD*. A positive relation between an older age and work disability was reported in 14 studies (27–29, 31–34, 46–48, 50–52, 56), while three studies found no relation (30, 45, 53). The literature has identified education (high versus low) as being a strong negative factor of work disability. Three studies report a negative relation (32, 48, 58); one study found no relation (45). The patient's expectation (yes versus no) regarding return to work after a coronary bypass operation was reported to be a strong negative prognostic factor of work disability. Two articles showed a negative relation (19, 31) while a third found no relation (49). An internal locus of health control in patients with *IHD* has also been found to have a moderate negative relation with work disability. One study reported a positive relation with return to work (46), while three studies found no relation (19, 45, 58). The perceived importance of work (high versus low) was identified as a moderate negative factor (47, 50) and the presence of diabetes (yes versus no) a moderate positive factor for work disability (31, 32, 34, 51). A weak positive relation has been shown between gender (female versus male) and work disability (30–34, 47), while a weak negative relation was found between ethnic origin (white versus non-white), socioeconomic status (high versus low) and work disability (32, 58 and 46, 49, respectively).

To summarize, in the category “personal factors”, gender (female) has been found to be a common positive determinant of work disability for asthma, rheumatoid arthritis and *IHD*. Being of older age has been identified as a strong positive prognostic factor of work disability in rheumatoid arthritis and *IHD*. Furthermore, education (high versus low) and ethnic origin (white versus non-white) have been shown to be negative prognostic factors for work disability in employees with rheumatoid arthritis and *IHD*.

## Discussion

### Relevant factors

Using prospective and retrospective disease cohort studies, the aim of this study was to identify common prognostic or risk factors for work disability in employees with rheumatoid arthritis, asthma, COPD, *IHD*, and diabetes mellitus. We found only one cohort study for COPD and none for diabetes mellitus. We did, however, identify a number of studies which point to common prognostic factors for rheumatoid arthritis, asthma and *IHD*.

In the category “impaired body function or body structure”, studies have identified many prognostic factors. For rheumatoid arthritis and *IHD*, the perceived health complaints were mostly related to somatic complaints. In *IHD*, depression was also found to be a positive prognostic factor of work disability. In the category “activity limitations”, studies examining rheumatoid arthritis and *IHD* have found that disease-related restrictions in daily physical activities (high versus low) is a positive prognostic factor for work disability. Studies have also identified sickness absence as a common prognostic factor between rheumatoid arthritis and *IHD*. In the category “environmental factors”, studies have pointed to the type of employment (ie, manual work/blue-collar work versus non-manual work/white-collar work) as a prognostic factor that results in a higher risk of work disability in all diseases. While studies have found social support at work to be a prognostic factor of work disability in *IHD*, no evidence has been found for rheumatoid arthritis or asthma.

In the category “personal factors”, studies have identified several common factors: being of an older age is a strong prognostic factor for work disability in all three diseases. Female gender is a strong positive prognostic factor in employees with rheumatoid arthritis and asthma. High education is a negative prognostic factor for work disability in employees with rheumatoid arthritis and *IHD*. In the latter, an internal health locus of control and perceived importance of wanting to

work have been found to be a negative factor for work disability. For **employees with rheumatoid arthritis and asthma, we did not find any cohort studies identifying the prognostic factors of health locus of control or coping with the illness.** In rheumatoid arthritis, studies have found the desire to remain employed to be a negative prognostic factor of work disability. Factors such as coping with disease symptoms and health locus of control are possibly important for continuing to work or return-to-work intervention programs but they have not yet been analyzed in observational cohort studies for all the diseases. This review confirms the prognostic factors found in rheumatoid arthritis for work disability in other reviews (17, 59). We did not find any other reviews pointing to prognostic factors for work disability in asthma, IHD, and diabetes mellitus.

Most risk factors with weak, moderate or strong evidence found in this systematic review were disease/impairment-related, socio-demographic-related, or work-related. Common prognostic factors that we found in the literature were: (i) various severity of disease/impairment factors, (ii) gender (female versus male), (iii) age (high versus low), (iv) education (low versus high), (v) heavy manual work (blue- versus white-collar work), (vi) sick leave, and (vii) perceived health complaints (high versus low). Factors such as low functional status, age, gender, education and blue-collar work are already known to be risk factors for work disability for employees without a chronic disease (60, 61).

A serious weakness of most of the cohort studies reviewed was that they had not analyzed the role of psychosocial personal factors (eg, health locus of control or coping). Cross-sectional studies have suggested that there is a causal relationship between low psychological well-being and high health-related distress, and an increase in work limitations among employees with various chronic diseases (62–64). A cross-sectional study (65) has also identified an association between psychological distress, an external health locus of control, and reported disabilities in patients with lower back pain. Working women, non-whites, and low-educated employees suffer more psychological distress because of a chronic medical condition (66, 67). This finding may partly explain the excessive risk of work disability in women and low-educated, blue-collar workers.

A well-known pathway is the relationship between coping style and the health locus of control on one side, and gender, education, age, and blue-collar work on the other. A meta-analysis of Tamres et al (68) showed that, compared to men, women are more likely to use an external rather than internal health locus of control (ie, have a passive versus active coping style). A study of van der Linden et al (69) showed that there is an association between low education, a higher age, blue-collar work and an external health locus of control.

More research is needed on the influence of work-related and psychosocial personal factors on work disability as such factors can be influenced by work-oriented behavioral and environmental interventions. Supporting employees at work to cope with the limitations of the disease (in terms of self management behavior at work) has been found to be associated with lower psychological distress and a greater control over the disease. These employees are also more likely to be proactive in seeking support at work (70–71). Active coping has also been shown to reduce the chance of work disability (72). One article on IHD (28) found a positive relation between return to work and coping with or accepting the illness (ie, active versus passive sick role).

### Methodological problems

We encountered five methodological problems in this systematic review. Firstly, there were methodological differences between the studies: work-related outcomes and definitions of work disability were different, measurements were taken at different times, and definitions of prognostic variables (eg, various age categories and cut-off points) were not standardized. Of paramount importance is the fact that national differences in the organization of the social security system and unemployment rates are major determinants of work disability risks. These overarching differences can also have an impact on the influence of prognostic factors, which has to be taken into account in the interpretation of findings and the implementation of measures.

Secondly, it was difficult to find cohort studies on asthma, COPD, and diabetes mellitus. For diabetes mellitus, we found only cross-sectional studies providing “determinants” of the relation between the disease and work disability. The determinants found were similar to the prognostic factors identified in the cohort studies in the present study, for example, age (high versus low) and gender (female versus male), both of which were positively associated with work disability, and education (high versus low) which was found to be negatively associated with work disability (73–75).

Thirdly, the results of the review were based on the evidence provided in the cohort studies. This may imply that some variables, which in occupational practice are supposed to have an effect on work disability, may not have been analyzed in the studies. An example of this is the lack of data regarding the prognostic factors for work disability in asthma. More research is needed on the effects of environmental and occupational exposure as these factors are known to be related to work disability in employees with asthma.

Fourthly, we decided in this review to give priority to data from multivariate analysis over data from univariate analysis as the former controls for confounding

variables like gender and age (76) – particularly as controlling for confounding is included in international guidelines as an important criterion to screen the quality of an observational study (77, 78). Nevertheless, a disadvantage of multivariate analysis is the difficulty faced by or the subjectivity of the researchers when constructing adequate models. In articles, information is not always presented on the intercorrelations between the independent factors involved and whether one factor overrides the other in the final model. An example is the forced expiratory volume (FEV%) and the asthma severity score in employees with asthma – two prognostic variables that highly correlate with each other (10). Multivariate analysis can select one variable to the exclusion of another when there may be only minor differences in the strength of their prediction. In the final model, the researcher may decide to exclude or to keep one of the variables. In univariate analysis, more factors are visible as having a relation with work disability but an important disadvantage is that confounding and effect modifying is invisible.

Finally, due to the inclusion of a variety of chronic diseases and the wide range of prognostic variables found, it was not possible to effectuate a meta-analysis (79). In order to overcome the limitations of the methods of a traditional narrative review and a meta-analysis, we used the method of “best-evidence synthesis” (16). This method combines the strengths of the methods of both traditional narrative review and meta-analysis, incorporating the statistical rigor of the latter to synthesize quantitative findings as well as the flexibility of the former. Subjectivity in this method is, to a certain extent, excluded by the use of well-justified and well-described inclusion criteria for the studies (16).

### Recommendations for further research

From the findings in this study, we derived some recommendations for further research.

Firstly, more observational cohort studies with objective data on the effect of coping style and health locus of control on work disability are needed, as these variables can be influenced by work-oriented behavioral interventions. Secondly, more observational cohort studies are needed on the effect of work factors on work disability, as these factors can also be influenced by interventions at the workplace. Thirdly, more observational cohort studies in general are needed for COPD, asthma, and diabetes mellitus. Fourthly, more research and discussion is needed on the advantages and disadvantages of different prognostic models as data may be lost by using a final multivariate model of analysis. A combination of strategies may provide more transparency, better insights of data, and more efficient control of confounding.

### Concluding remarks

This review shows that several prognostic factors for work disability have been found to be common amongst employees with a chronic physical disease. This implies that these prognostic or risk factors have a more generic character beside the more specific problems for working life that may be related to every chronic disease. The common factors are presumably related to the impact of a long-lasting or recurrent health problem on working life as such. As many prognostic factors for work disability are common, we are now better equipped to distinguish groups of employees at high risk of becoming work disabled, regardless of the employee’s specific disease. In short, we have to pay special attention to (i) employees with a more severe chronic disease, including a high level of perceived health complaints, (ii) employees with disease-specific impaired body functions, such as pain and swollen/deformed joints in rheumatoid arthritis and depression in IHD, and (iii) employees with more daily physical limitations caused by the disease. Special consideration of older workers, women, blue-collar workers and low-educated employees is also needed. We may be able to use this information in the development and implementation of general disability management interventions for employees with a chronic disease to overcome health-related limitations at work.

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