

Workplace Accommodation Among Persons with Disabilities: A Systematic Review of Its Effectiveness and Barriers or Facilitators

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Abstract *Purpose* A systematic review was conducted to review the effectiveness of workplace accommodation (WA) regarding employment, work ability, and cost-benefit among disabled people. It also describes the evidence gained on the barriers and facilitators of WA process to sustain employment. *Methods* We reviewed systematically current scientific evidence about effectiveness of WA among disabled persons. The outcomes were employment, work ability, and cost-benefit. Qualitative studies of employment facilitators and barriers were also included. The population comprised people with physical disability, visual impairment, hearing impairment, cognitive disability, or mental disability, aged 18–68 years. CINAHL, the Cochrane Library, Embase, Medic, OTseeker, PEDro, PsycInfo, PubMed, Scopus, and Web of Science were searched for peer-reviewed articles published in English from January 1990 to November 2012. *Results* Three

quantitative (one randomized controlled, one concurrently controlled, and one cohort) and eight qualitative studies met the inclusion criteria. There was moderate evidence that specific types of WA (vocational counselling and guidance, education and self-advocacy, help of others, changes in work schedules, work organization, and special transportation) promote employment among physically disabled persons and reduce costs. There was low evidence that WA (liaison, education, work aids, and work techniques) coordinated by case managers increases return to work and is cost-effective when compared with the usual care of persons with physical and cognitive disabilities. The key facilitators and barriers of employment were self-advocacy, support of the employer and community, amount of training and counselling, and flexibility of work schedules and work organization. *Conclusions* More high-quality studies using validated measures of the work ability and functioning of disabled persons are needed. The identified barriers and facilitators found in the qualitative studies should be used to develop quantitative study designs.

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Background

Workplace accommodation (WA) is an important means of ensuring equal opportunity for employment among persons with disabilities [1–3]. WA includes changes in work schedules and work organization, development of the work environment, acquirement of assistive technology (AT), assistance of other persons, and changes in commuting to and from work, and it can focus on a single person or whole organization [2, 4–11]. On a personal level, the aim

of WA is to promote equal employment opportunities, enhance work performance and self-efficacy, delete obstacles, and increase job satisfaction [6, 12–14]. On a workplace level, the employer can get or retain a qualified employee, increase a worker's productivity, and eliminate the costs of training a new employee (e.g. sick leaves, training a new employee) [1, 11, 15]. In addition, on a society level, legislation provides the rules and opportunities for implementing WA and thus increases equality for persons with disabilities to participate in work life, as well as society as a whole, and supports cost-effective actions [3, 16, 17]. However, national statistics show low employment rates for people with disabilities in different countries.

Previous studies have provided some evidence that WA can be effective in promoting and maintaining employment. The culture and organizational capacity concerning WA [3, 18], a participative work approach, and employee involvement in the WA process [1, 3, 12, 19–22], compatibility between the WA and the needs of the user [19, 21], positive attitudes and support of employers and co-workers [1, 6, 23], good communication between the employer and the worker [1], liaison between the workplace and rehabilitation professionals [21, 24, 25], and low costs [11, 16] enhance the possibility of a successful WA outcome. In any case, the employer plays an important role in the provision of the WAs or in the use the public services [6, 11]. Typical barriers to the use of WAs are a lack of knowledge and information about WA and special technologies, a lack of timeliness in receiving WA, inadequate evaluation procedures, and the absence of collaboration between different actors [21].

There are currently no systematic reviews that specifically concern WA and employment. There are, however, reviews that have evaluated WA as one factor in the process of rehabilitation [2, 26–28] or have focused on AT [29] in rehabilitation (including WA), and one review focusing on systematic reviews [30] of ATs for persons with disabilities. Within these reviews, some positive outcomes of WA with respect to job performance have been found among persons with cognitive disabilities [28]. According to Crowther et al. [31] supported employment was more effective than prevocational training in helping people with severe mental illness obtain competitive employment. However, the review of Khan et al. [27] showed insufficient evidence for vocational rehabilitation including WA regarding competitive employment or work ability among persons with multiple sclerosis. Systematic reviews [26, 29] concerning the effects of mobility devices showed that the use of ATs improved the users' activity and participation and increased mobility. The review of systematic reviews [30] included 44 reviews on various ATs among persons with disabilities.

While the previous reviews have focused primarily on one particular disability group, our review concerns the effectiveness of WA among different disability groups. The aim was to evaluate the effectiveness of WA with respect to employment, work ability, and cost-benefit among persons with physical, visual, hearing, cognitive, and mental disabilities. The second aim is to describe the barriers and facilitators of using and implementing WA to sustain the employment of disabled people. The theoretical orientation guiding this study is the ICF (International Classification of Functioning, Disability and Health) framework [32] (Fig. 2). The ICF identifies and classifies the domain of environmental factors, including WA, as one of its health-related domains [33, 34]. It provides a detailed framework or problem list for describing disease experience at each level and “core sets” comprising lists of ICF categories [27]. According to the ICF, these environmental factors can be either barriers or facilitators for the individual [34].

Methods

We reviewed systematically current scientific evidence about effectiveness of WA, as well as barriers and facilitators of the process of WA among disabled persons. Both quantitative and qualitative studies were included, because they gave different kind of knowledge about this phenomenon. Quantitative studies showed the effectiveness of WA, and qualitative studies showed the effectiveness of the process. The reviewed studies were randomized controlled trials (RCTs) and such non-randomized studies as concurrently controlled trials (CCTs), case-control studies, cohort studies, follow-up studies, and case studies that investigated the effectiveness of WA among disabled persons. The outcomes were employment (getting employment, maintaining employment, return to work), work ability (functioning, sick leaves), and cost-benefit. The population comprised people with permanent disability (physical disability, visual impairment, hearing impairment, cognitive disability, mental disability), in the age group of 18–68 years.

The searches were conducted covering articles published in English from January 1990 to November 2012. Databases searched in November 2012 included: CINAHL, the Cochrane Library, Embase, Medline, OTseeker, PEDro, PsycInfo, PubMed, Scopus, and Web of Science. The search terms used were workplace accommodation(s), occupational rehabilitation, vocational rehabilitation, and AT interventions. These terms were combined with the “and” operator with the following terms: disability, impairment, physical disability, visual impairment, hearing impairment, mental disability, mental health or stroke (can cause physical or cognitive disabilities). Full details of the search strategy are available (Supplementary material). In

addition, reference lists of identified reviews were manually scanned for additional relevant articles and automatic searches were conducted until May 2013. One article was included based on this search.

The review team was comprised of five researchers (NN, IP, IK, JR, & HA). Their expertise areas were disability, ergonomics, rehabilitation, social sciences, interventions, systematic reviews, and quantitative and qualitative methodology. The modified selection instrument (PIOS: participants, intervention, outcome, and study design) [35] was used in the selection of the titles, abstracts, and full papers according to the selection criteria. First, titles and abstracts were independently reviewed by pairs of researchers who made a unanimous decision. If consensus was not reached, the third researcher (JR) was consulted. Full text was obtained of all of the eligible articles and those whose eligibility could not be discerned from reading the abstract.

The methodological quality of the included RCT study and two non-randomized studies (cohort, longitudinal follow-up) were independently assessed by two reviewers (NN & IP). The RCT and CCT studies were assessed with the methodological quality checklist of van Tulder et al. [36], which has also been used in reviews addressing rehabilitation [28, 37, 38]. The checklist consists of 11 criteria [36]. Each item is scored 2 points for “Yes”, 1 point for “Don’t know”, and 0 points for “No”. The item scores were summed to a single total score (range 0–22). Studies were considered to be of high methodological quality if the score was at least 11 out of 22. Studies were rated as having low methodological quality if they achieved fewer than 11 points [37]. One non-randomized study was assessed with the Newcastle-Ottawa Scale (NOS) [39]. This assessment scale consists of eight criteria within the following three categories: selection of cohorts, comparability of cohorts, and assessment of outcome. The highest value for quality assessment was 9 “stars”. One star can be allocated for each item within the selection and outcome categories and two stars for the comparability category. The method includes separate scales for cohort and case–control studies [39]. In previous studies study quality has been graded as follows: 1–3 stars (low quality), 4–6 stars (intermediate quality), and 7–9 stars (high quality) [40–42].

The methodological quality of the included qualitative studies in this review were independently assessed by two reviewers (IK & HA) using a modified version of the Critical Appraisal Skills Program (CASP) [43, 44]. Any difference in the item scoring was resolved through discussion with a third author (JR) until a consensus was achieved. This assessment tool consists of evaluation criteria that are commonly acknowledged as central with regard to qualitative research in the social sciences. The assessment tool involved 10 questions based on the

following 4 main principles: (1) research should provide a defensible research strategy that can answer the questions posed, (2) it should demonstrate rigor through systematic and transparent data collection, analysis and interpretation, (3) it should contribute to advancing wider knowledge and understanding, and (4) it should demonstrate credibility with plausible arguments about the significance of the findings. Each item was scored with “yes” or “no”, depending on whether the topic was described sufficiently. An additional score of “partially” was added, as the original checklist was not able to adequately differentiate between the quality of the studies. This addition resulted in the three options: “yes” (2 points), “partially” (1 point), and “no” (0 points). The higher the total score, the better the methodological quality, with a maximum score of 20. The studies were rated as having high methodological quality if they achieved more than 10 points.

All of the reviewers (NN, IP, IK, JR & HA) participated in the data extraction, which was carried out separately for the quantitative and qualitative studies, including details of the participants, descriptions of the WA, and outcomes. The meaningful concepts of each outcome were linked to the ICF categories using the linking rules of Cieza et al. [45]. The data were synthesized descriptively using tables to describe the characteristics and quality of the included studies. Findings and themes from the qualitative studies were synthesized to common theses using an aggregative method [46]. The overall quality was categorized as high, moderate, low or very low for the quantitative studies and their outcomes using the principles from “Grading of Recommendations, Assessment, Development, and Evaluation” (GRADE) [47].

Results

The search strategy identified 1,232 references (Fig. 1). Altogether, the search identified 79 references in CINAHL, 7 references in Cochrane, 118 references in Embase, 20 references in Medic, 4 references in OTseeker, 4 references in PEDro, 224 references in PsycInfo, 84 references in PubMed, 604 references in Scopus, and 88 references in Web of Science. After removing duplicates, 819 references remained. The titles and abstracts were scrutinized and assessed by two reviewer authors according to the inclusion criteria, and, when the information necessary for inclusion was lacking, the full-text of the articles was read. Further, 11 abstracts and 3 full papers had to go to the third researcher to meet the consensus. The full text of 74 articles was obtained from the search. In addition, manual searching the reference lists of the included studies produced two additional references whose full-text was then scrutinized; both of them were included. Hence the total number of included full-text articles was 76. The search

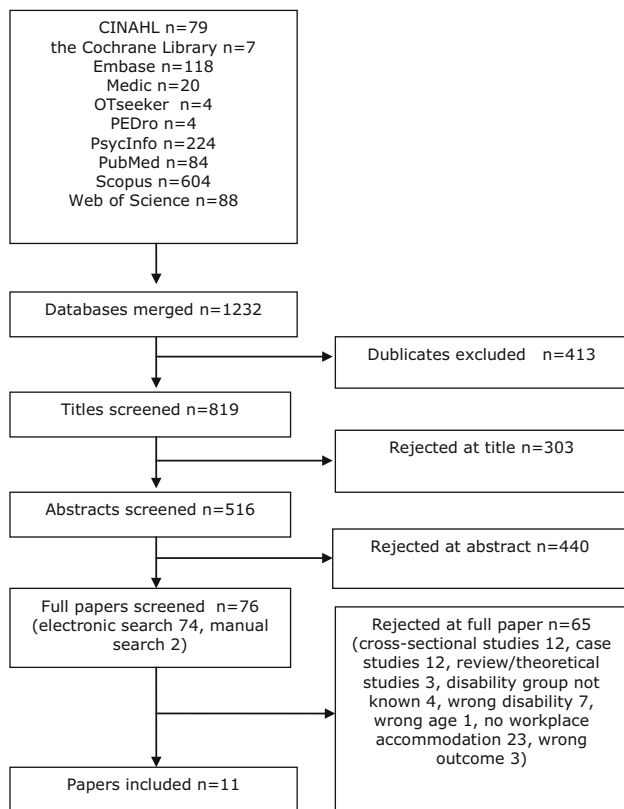


Fig. 1 Flow chart of the review identification and selection process

also included 12 case studies that fulfilled the inclusion criteria. However, these studies were excluded because (1) the articles were clinical case reports lacking appropriate research methodology or (2) they reported only one or two person cases and no workplace cases. Finally, three quantitative (one RCT, one CCT, and one cohort) studies and eight qualitative studies met the inclusion criteria.

Characteristics of Included Studies

Design and Methods

Three papers of the included 11 studies were quantitative studies (Table 1), and eight were qualitative (Table 2). The quantitative studies included one RCT [48], one CCT [49], and one cohort study [50]. The qualitative studies included three interview studies [51–53], three mixed method studies [54–56], and two focus-group studies [57, 58].

Participants

The total number of participants in the 11 studies was 1,060; the quantitative studies included from 94 to 502 participants ($n = 838$) and the qualitative studies from 6 to

58 participants ($n = 222$). The age of the participants varied between 16 and 68 years. However, two articles [53, 57] did not report the age of the studied persons and one study [53] did not report the gender of the participants. The disabilities in two quantitative [48, 50] and five qualitative [51–53, 55, 56] studies concerned mainly persons with physical disabilities. Employees with traumatic brain injury were the participants in the study of Radford et al. [49]. Persons with cognitive disabilities participated in two qualitative studies [53, 58]. Furthermore, Gold et al. [57] focused on visible disabilities, which were not specified. Two [55, 56] of the eleven studies reported the exact occupation as a background factor or as a context of intervention and one study [48] classified the occupation according to the demands.

Interventions

All of the studies contained various mixes of intervention components, with WA as one part of the intervention. In general, the content of the intervention was better described than the process of the WA. In the quantitative studies, the duration of the interventions varied from two appointments [48, 49] to several times a year [49]. In the longitudinal survey of [50], the WA duration or process was not reported.

The WA during the interventions consisted of redesign of work schedules, work organization, the environment, AT, assistance of others, special transportation, and legislation. The accommodation of work schedules was reported in six studies in the form of flexible work hours [51–54], modified hours [51, 58], a shorter workday [50, 51], more breaks and rest periods at work [50], freedom to take days off [54], and part-time work [54]. Changes in the work organization were reported in eight studies, meaning modified tasks, duties, routines or requirements [49–52, 54], sharing of work [51], reduced work-pace [49], teleworking [51, 52], general flexibility at work [54] and in work assignments [53], self-advocacy or adaptation to roles [48, 58], training of skills [49, 50], and liaison with employer [49].

Accommodations concerning both the physical and social environment were reported in five studies. Changes in the physical environment and accessibility concerned work space, furniture and floor mats [51], a place to rest [54], accessible parking facilities, accessible path, railings, ramps, handles of the door, open and locking door systems, accessible bathrooms, separate office [52], and adapted or special equipment and tools [50, 52, 58]. AT was reported to be used in four studies [49, 51, 52, 55], meaning dictation-based word processing programs, ergonomic keyboards, use of computer, and different types of memory aids [49, 51], voice recognition

Table 1 Characteristics of the included quantitative studies

Authors (year)	Study design, methods	Population	Intervention	Outcome measures	Findings
Allaire et al. [48]	A randomized controlled trial (RCT) Telephone interview and mailed questionnaire	N = 242 (45 M/197 F), experimental group N = 122, control group N = 120 Age: 18–65 (mean 49.5) years Employed Dg: rheumatic diseases Occupation: nr	Experimental group: two 1.5 h session of vocational rehabilitation (job accommodation, vocational counselling and guidance, education and self-advocacy); control group: print materials about disability employment issues and resources by mail	The time to first job loss (permanent or temporary)	Vocational rehabilitation both delayed and reduced job loss. Participation in the experimental group was found to be protective against job loss (OR 0.58, 95 % CI 0.34–0.99, $p = 0.05$ for time to either permanent or temporary job loss) Intervention reduced the high indirect costs, as well as the personal impact of rheumatic diseases
Radford et al. [49]	A concurrently controlled study with 3, 6, and 12 months of follow-up Postal questionnaire with telephone assistance	N = 94 (80 % M/20 % F), N = 40 vocational rehabilitation, N = 54 traditional care Age: 16–68 (mean 34) years Dg: traumatic brain injury (TBI) (minor, moderate or severe) Occupation: nr, paid or voluntary work or education at the time of injury, a cohort comparison with follow-up at 3, 6 and 12 months	Case managers coordinated the care, support, education and advice at home, at work or in the community. Development of liaison with the employers, tutors or employment advisors Education about the impact of TBI on work, strategies to lessen the impact, e.g. memory aids, pacing techniques, training in use of transport, structured routines with gradually increased activity, practice skills for work e.g. use of computers	Return to paid or voluntary work (>1 h/week) or full-time education (≥ 5 h/week) at 3, 6 and 12 months of follow-up Cost-effectiveness analyses	At 1 year of follow-up, 15 % more (OR 2, 95 % CI 0.77–5.23) participants in traumatic brain injury-vocational rehabilitation (TBI-VR) group were working compared with traditional care participants. The corresponding difference was 18.2 % (OR 2.28, 95 % CI 8.87–5.97) at 6 months and 17 % (OR 2, 95 % CI 0.83–4.83) at 3 months of follow-up. When the broader perspective for cost was used, it cost less (12,418 pounds) to return a person to work with TBI-VR than traditional care
Yelin et al. [50]	A cohort study Interviews in 1992 and 1994	N = 502 (55 % M/45 % F) Age: 51–61 years Dg: musculoskeletal conditions (arthritis, rheumatism, back or feet problems), limitation in work Occupation: nr, employed	Receipt of accommodations in 1992: providing someone to help the respondent, a shorter work day, more breaks and rest periods, special transportation, special equipment, changing the time that work started and stopped, changing the job to something the respondent could do, training of new skills, work task changes	Employment rate 2 years after the baseline	Receiving any form of workplace accommodation in 1992 had no impact on the employment rate in 1994 Getting someone to help with work was associated with an increase in employment after 2 years (OR 5.61, 95 % CI 2.23–14.09, $p < 0.05$)

N number, M males, F females, Dg diagnosis, nr not reported

software, dual-monitor system, special mouse, computerized phone, and alarm systems [52]. de Jonge and Rodger [55] reported the use of a wide range of AT including, for example a hands-free phone, mouthstick, headpointer, headmaster mouse, joystick mouse, trackball, access software, onscreen keyboard, word prediction software,

enlarged screen, screen reader, text enlargement software, braille and scanner. The assistance of others at work was reported in four studies concerning the help of colleagues [50, 53], and case managers, tutors or employment advisors [49], and the help of a workplace personal assistant or job coach [52]. In addition, accessible

Table 2 Characteristics of the included qualitative studies

Authors (year)	Methods, study design	Population	Workplace accommodations	Findings
Crooks [51]	In-depth, semi-structured interviews, thematic analysis	N = 18 F Age: 26–69 (mean 44) years Dg: fibromyalgia syndrome, lupus, osteoarthritis or rheumatoid arthritis Functioning: nr Occupation: nr Work status: 10 employed full or part-time, 8 not working	Modified duties (3), modified hours (2), physical accommodations (3) including dictation-based word processing program, floor mat, and ergonomically placed computer keyboard 3 unsuccessful WA attempts	<i>Barriers and facilitators of employment</i> – Co-workers and employers' attitudes, disbelief, and lack of understanding – Lack of accurate knowledge about musculoskeletal diseases – Built environment and physical workspace + Flexible work hours + Job-sharing and telecommunicating initiatives + Part-time work by people receiving disability income assistance + Wage support programs that were awarded to the employee (instead of employer) <i>Barriers and facilitators of WA process</i> – Employers unwillingness to accept modifications – Lack of consultation with the employee about the appropriateness of the WA – WA requests lost in the administrative system <i>Barriers and facilitators of using AT</i> – Personal discomfort and pain when carrying out the work tasks – Limited knowledge about AT's functioning – Complexity of the AT – Cost of support (many paid for the modifications themselves) – Difficulty to meet training needs – Reliance on trial and error and informal support systems – Time required to become familiar with AT + Addressing positioning and ergonomics of the workstation (sometimes with the help of occupational therapist) + Purchase of alternative equipment + Use of labor-saving techniques + Being aware what is possible (AT) + Having access to the right people (those who know how to help) + Training and learning support (informal, suppliers, experimental learning) + Opportunity to explore and practice AT (at home for instance)
de Jonge and Rodger [55]	In-depth, semi-structured interviews, observations of AT users, field notes from the workplace, collection of demographic information, thematic analysis	N = 26, (22 M/4 F) Age: 18–55 years Dg: spinal cord injury, congenital spinal condition, spinal atrophy, multiple sclerosis, cerebral palsy, vision impairment, rheumatoid arthritis, amputation, overuse syndrome Functioning: endured fatigue, discomfort and pain Occupation: administration = 8, managers/coordinators = 5, own business = 4, education/research = 4, computer programming = 2, other professionals = 2	Wide range of AT for various work tasks including: hands-free phone, mouthstick, headpointer, headmaster mouse, joystick mouse, trackball, access software, onscreen keyboard, word prediction software, enlarged screen, screen reader, text enlargement software, braille and scanner	

Table 2 continued

Authors (year)	Methods, study design	Population	Workplace accommodations	Findings
Dyck and Jongbloed [54]	A mixed method study In-depth, semi-structured interviews and a postal survey, qualitative (constant comparative method) and quantitative methods	N = 31 F Age: 25–49 years Dg: multiple sclerosis Functioning: nr Occupation: nr Work status: 19 employed full-time, 12 employed part-time	Job flexibility, flexible hours of arrival and departure, a place to rest, freedom to take days off, part-time work, altered work requirements	Barriers and facilitators of employment – Severity of symptoms (e.g. fatigue) – Limitations of function + WA including job flexibility, flexibility hours of arrival and departure, a place to rest, freedom to take days off, part time work, altered work requirements + Supportive employers + Support at home
Gold et al. [57]	Semi-structured interviews with separate focus groups (2 groups of employers, 3 groups of employees, 2 groups of service providers), screening interviews, co-moderators notes A grounded theory, constant comparative method	N = 17 (8 M/9 F) Age: nr Dg: nr Functioning: most (N = 14) had a visibly apparent disability Occupation: nr Work status: 14 employed N = 11 employers N = 11 service providers	–	<i>Barriers and facilitators of WA process</i> ◦ The employees bear the burden of proof in persuading employers of their need for WA and in demonstrating its benefits for the business operation ◦ The stakeholders wrestle with trust and respect on each other as they negotiate WA request ◦ Stakeholders' sharp divergence between each other's expectations on legal, fiscal and moral obligations in approving or denying accommodation requests

Table 2 continued

Authors (year)	Methods, study design	Population	Workplace accommodations	Findings
Lock et al. [58]	Five focus group discussions, an adapted framework method	<p>N = 37 (24 M/13 F) Age: 20–over 65 years Dg: stroke Functioning: ranging from minimal residual impairments to severe communication or physical difficulties Occupation: nr Work status: 8 full-time employed, 3 part-time employed, 6 voluntary work, 16 not working N = 12 stroke survivors partners</p>	<p>Adaptations to role, work hours, equipment, transportation to work</p>	<p><i>Barriers and facilitators of employment</i></p> <ul style="list-style-type: none"> – Misdiagnosis of the condition – Negative attitudes of medical and rehabilitation staff in return to work – Insufficient or too short rehabilitation (rehabilitation stops when minimal function is regained) – Employer's negative attitudes – Inflexibility and failure to implement adaptations – Employer's tendency to put profitability and productivity before the employee's needs – Employer's ignorance of legislation – Paucity concerning searching for work – Unfair benefits system – Competition in the job market – Fear of losing benefits if employed but not able to cope in work – Lack of awareness of stroke – Poor service provision – General ignorance – Lack of funding for appropriate transport – Impairments and difficulties in functioning + Early identification of condition + Proactive professional who takes leading role in rehabilitation for work + Liaison between employer and rehabilitation + Participation and membership in disability association + Flexible sick leave arrangements + Adaptations to role, to work hours, to equipment + Positive attitudes of the employer + Legislation + Job creation schemes suitable for the particular impairment + Ease of accessibility to information at all stages + Transportation to work + Personal factors (such as determination to return to work) + Family support + Financial situation

Table 2 continued

Authors (year)	Methods, study design	Population	Workplace accommodations	Findings
Medin et al. [53]	An open-ended interview supported by a sociogram, empirical phenomenology	N = 6 (M/F: nr) Age: nr Dg: stroke Functioning: 2 with mild aphasia, all suffered to various degrees from lack of concentration, depression and fatigue Occupation: nr Work status: all employed	Flexible work assignments, work hours, support and assistance of colleagues	<i>Barriers and facilitators of employment</i> + Self-efficacy + Flexible work assignments + Flexible work hours + Support (attitudes, understanding and help) by co-workers + Positive attitudes of employers and co-workers + Support of family + Support of rehabilitation professionals <i>Barriers and facilitators of employment</i> + Use of WA: work schedule, such as flexible hours and/or reduced work schedule; transportation, such as accessible public or substitute transportation; physical alteration of the building and/or equipment, such as handicapped parking, accessible path, railings, ramp, handle of the door, open and locking doors system, accessible bathroom, separate office, and adjustable desk; AT and devices, such as voice recognition software, dual-monitor system, special mouse, computerized phone, and alarm; workplace personal assistance services and job coaching; changes in job description or telecommunicating; personal aids
Solstad Vedeler and Schreier [52]	Qualitative, semi-structured interviews, policy documents, story-based or narrative research, a thematic content analysis	N = 29 (13 M/16 F) Age: 22–43 years Dg: Cerebral palsy, osteogenesis imperfecta, spina bifida, acquired impairments Occupation: nr Work status: 15 full-time employed, 14 part-time employed	Work schedule, such as flexible hours; and reduced work schedule; transportation, such as accessible public or substitute transportation; physical alteration of the building and equipment, such as accessible parking and paths, railings, ramps, handles of the doors, door systems, accessible bathrooms, separate office, and adjustable desks; AT and devices, such as voice recognition software, dual-monitor system, special mouse, computerized phone, and alarm systems; workplace personal assistance services and job coaching; changes in job description or telecommunicating; personal aids	° The employer's role and engagement in the WA process Steps in WA process: a. 'employee's identification of his/her needs for WA b. disclosing the needs to the employer c. cooperation with the employer and with public services d. provision or non-provision of WA <i>Barriers and facilitators of WA process</i> – Redistributive social policy system (e.g. in Norway, Sweden, Finland) is fragmented and hinders the WA process + Employer's and employee's mutual understanding about responsibilities in the process and mutual trust about motivations for WA

Table 2 continued

Authors (year)	Methods, study design	Population	Workplace accommodations	Findings
Westmorland et al. [56]	Focus group and individual interviews, Organizational Policies and Practices Questionnaire; grounded theory	N = 58 (19 M/36 F) Age: 27–68 years Dg: occupational fractures, joint injuries, muscle tears, sciatica, arthritis, stroke, cancer, dental problems, scabies 81 % of the respondents had sustained an occupational injury Functioning: nr Occupation/place of employment: hotel or motel, health care, factory, railway, post office Work status: 55 employed, 3 unemployed	Support/assistance by colleagues	<i>Barriers and facilitators of employment</i> – Lack of communication between injured workers, supervisors and co-workers – Ambiguity about the roles of individuals involved in return to work – Employers' tendency to put productivity before the employees + Getting assistance with work tasks and lifting loads + Contacting the injured workers and keeping in touch with them during their absence from work + Supportive and communicative supervisors + Team meetings with all players in the process + Job retraining + Provision of ergonomic modifications + Development of meaningful written policies and procedures for injured employees + General education about health and safety ◦ Attitudes of the supervisors and co-workers Barriers and facilitators of WA process – Employers not listening to employees' requests or not following through on potential WA + Employer and employees working together in the WA process + Employers' respect of employees' opinion in the WA process

N number, M males, F females, Dg diagnosis, nr not reported, – barrier, + facilitator; ◦ dimension, WA workplace accommodation, AT assistive technology

Table 3 Quality of the included qualitative studies assessed with the method of CASP [43] using the scale: yes (2), partially (1), and no (0)

Item	Crooks [51]	deJonge and de Jonge and Rodger [55]	Dyck and Jongbloed [54]	Gold et al. [57]	Lock et al. [58]	Medin et al. [53]	Solstad Vedeler and Schreuer [52]	Westmorland et al. [56]
Was there a clear statement of the aims of the research?	2	1	2	2	2	2	2	2
Was a qualitative methodology appropriate?	2	1	2	2	2	2	2	2
Was the research design appropriate to address the aims of the research?	2	1	2	2	2	2	2	1
Was the recruitment strategy appropriate to the aims of the research?	1	1	2	1	2	2	2	2
Were the data collected in a way that addressed the research issue?	2	2	2	2	2	2	2	2
Has the possible researcher effect on the results been adequately considered?	0	2	0	2	1	2	0	0
Have ethical issues been taken into consideration?	1	1	0	1	1	1	2	2
Was the data analysis sufficiently rigorous?	2	1	2	2	1	2	2	1
Is there a clear statement of findings?	2	2	2	2	2	2	2	2
How valuable is the research?	1	1	1	2	1	2	1	1
Total score (out of 20)	15	13	15	18	16	19	17	15

transportation and training to use it was reported in four articles [49, 50, 52, 58]. Legislation and the general system was reported as facilitators for employment in two studies [51, 58] concerning disability income assistance and wage support, which support part-time work, health care funding, societal attitudes, training programs, and general information.

Outcomes

The outcomes in all three of the quantitative studies were based on employment after permanent or temporary job loss [48], return to work at 3, 6, or 12 months of follow-up [49], or employment rate 2 years after the baseline [50]. Cost-effectiveness was an outcome in one study [49].

Study quality

The RCT study [48] was considered to be of high methodological quality with scores of 14 out of 22, and the CCT study of Radford et al. [49] was of low methodological quality with scores of 10 out of 22 according to van Tulder et al. [36]. The methodological quality of the cohort study [50] was high with 7 “stars” out of 9 according to Wells et al. [39]. All eight qualitative studies [51–58] were

considered to be of high quality with scores ranging from 13 to 19 out of 20 according to the modified CASP method [43] (Table 3).

Effectiveness of workplace accommodations

There was moderate evidence that specific types of WA (vocational counselling and guidance, education and self-advocacy, help of others, changes of work schedules, work organization, and special transportation) maintains employment (permanent or temporary job loss, return to work, employment rate) among physically disabled persons (rheumatoid arthritis). This moderate evidence was based on two high-quality (RCT, cohort) studies among physically disabled persons ($n = 744$), especially rheumatoid arthritis (Table 1). Furthermore, moderate evidence was found, that vocational rehabilitation reduced costs. This result was based on two quantitative studies. Allaire et al. [48] showed that WA reduced high indirect costs, and Radford et al. [49] reported that vocational rehabilitation cost less than traditional care (Table 1). There was low evidence that WA coordinated by case managers increased return to work when compared with the traditional care of persons with physical and cognitive disabilities (traumatic brain injury). This evidence was based on one non-randomized study [49] (Table 1).

Barriers of facilitators of workplace accommodations

The qualitative studies concerned both the barriers and facilitators of the process and the use of WA (Table 2). Four qualitative studies focused on employees' perceptions of the barriers and facilitators of employment after the onset of disability [51, 52, 54, 58], whereas two studies concentrated on employees' perceptions of barriers and facilitators regarding return to work after the onset of their disability [53, 56]. One qualitative study addressed the barriers to customizing and learning to use AT [55]. One qualitative study [57] focused on factors that help or hinder the implementation and evaluation of WA.

Five qualitative studies found co-workers' and employers' attitudes, understanding, and knowledge about the disability or disease to be a barrier or a facilitator of employment [51–53, 56, 58] (Table 2). For instance, co-workers' and employers' disbelief, negative attitudes, and lack of understanding were regarded as barriers [51], whereas co-workers' and employers' appropriate knowledge and first-hand experience of the disability or disease was regarded as a facilitator [58]. In addition, employers' or colleagues' support of WA or return-to-work process was mentioned as a facilitator of employment in four studies [52–54, 56]. Five studies [51–54, 58] mentioned flexibility in designing the work schedule and organizing work as facilitating factors for retaining employment. Flexible work schedules included part-time work, freedom to take days off, reduced hours, or telecommuting work. Furthermore, a flexible work organization included job-sharing, adaptations to work roles, and altered work requirements.

Four qualitative studies found key factors that facilitate the WA process [51, 52, 56, 57] (Table 2). The first was employees' communicating and justifying their needs and benefits to the employer [52, 57]. Second, a supportive role of the employer in the WA process and a willingness to offer WA was found to enhance the process [51, 52, 57]. The third facilitator was employee and employer cooperation in the WA provision process [51, 56] and the creation of a liaison with other professionals (e.g. service providers, occupational health care [52, 57]. Finally, the willingness of employees, the employer, and other professionals to build mutual trust and understand their responsibilities in the provision process, as well as mutual understanding of the motivations for WA, enhanced the process [52, 57].

Synthesis of the barriers or facilitators for employment

The findings of the qualitative studies unravel the scope and the complexity of maintaining employment and return-to-work processes of disabled people. The results were synthesized to the themes of the ICF-model (Fig. 2). The

themes show the key aspects, the actors and the dimensions of the WA process that were not covered in any of the studies alone. First, the key aspects of the WA process were knowledge, attitudes, functioning, rehabilitation, support of others, built environment, training, and assistance of other persons. Secondly, the key actors during the WA process were the employee, employer, colleagues, family, and professionals. Thirdly, the dimensions of the process were (1) personal, (2) interpersonal or social (family, colleagues, employers), (3) organizational (e.g. workplace, rehabilitation), and (4) societal (legislation, rehabilitation system, policies). Maintaining employment of disabled workers extends well beyond local concerns of supporting individual worker's functioning and work ability to broader concerns of managing complex configuration of different aspects of the process and a network of key players of the process and the environment.

Discussion

This systematic review was conducted on 11 studies (1 RCT, 1 CCT, and 1 cohort study, and eight qualitative studies) that investigated the effectiveness and barriers or facilitators of WA among disabled persons. There was moderate evidence that specific WA (vocational counselling and guidance, education in self-advocacy, help of others, changes of work schedules, work organization, and special transportation) moderately promotes employment among physically disabled persons (rheumatoid arthritis). This result is in line with the results of an earlier review [28] concerning the effectiveness of WA with respect to job performance among persons with cognitive disabilities, but it differs from the results of Khan et al. [27] concerning the effectiveness of vocational rehabilitation among persons with multiple sclerosis. Through education and vocational counselling, disabled persons can improve their knowledge of WA and gain enough confidence in it to request WA and actively participate in the implementation process.

Moderate evidence was found that WA that includes vocational counselling and guidance, education and self-advocacy reduces costs. Furthermore, low evidence showed that WA coordinated by case managers was cost-effective when compared with the traditional care of persons with traumatic brain injury. These results concerning cost-effectiveness are in line with those of earlier studies [16, 59], which have shown that WA is low cost, beneficial, and effective. There was also low evidence that WA coordinated by case managers increased return to work and was cost-effective when compared with the traditional care of persons with physical and cognitive disabilities after traumatic brain injuries. This evidence was based on one CCT study, whose quality was assessed as being low (10 scores out of 22)

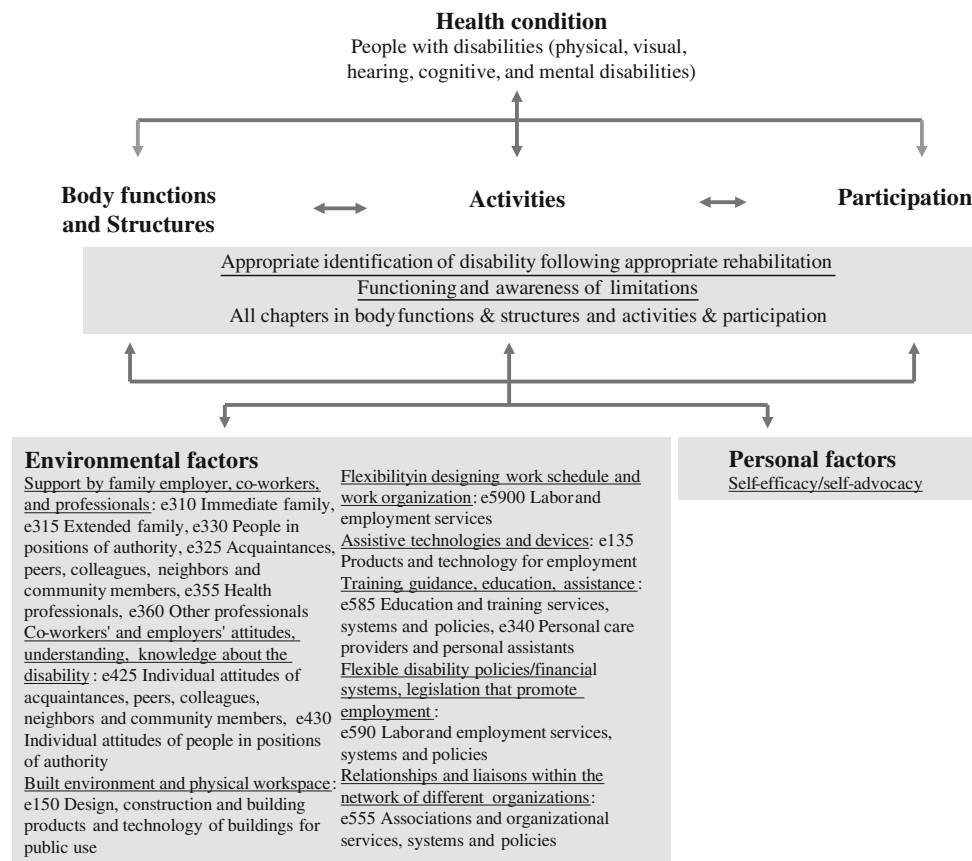


Fig. 2 Barriers and facilitators of employment among persons with disabilities linked to the ICF-model (International Classification of Functioning, Disability and Health) [32]

according to van Tulder et al. [36]. The low quality was mainly based on the deficiency of randomization. No studies were identified concerning WA among persons with other disabilities and outcomes.

Few randomized controlled interventions have been carried out on the enhancement of employment among disabled persons, possibly because of the lower employment rate of disabled persons than that of persons without a disability, the low number of disabled people in different disability groups, the low number of implemented WAs, the ethical aspects of the study designs, and the deficiency of financing instruments for such studies. However, the cost-effectiveness of WA is important at the community level. One high-quality RCT study [48] and one low-quality CCT study [49] showed that WA reduces high indirect costs and that vocational rehabilitation is less expensive than traditional care. The result is in accordance with those of earlier studies [16, 17].

The key facilitators and barriers of employment were found to be self-advocacy on the part of disabled persons, support of the employer and community, the amount of training and counselling disabled persons receive, and flexibility with respect to work schedules and work

organization. This result is in accordance with the findings of earlier studies. Varekamp et al. [14] reported that an increase in self-advocacy and a better understanding of ways to deal with work-related problems is needed to develop more efficient support for employees with chronic diseases. Of the six studies that focused on the barriers and facilitators of employment, five found co-workers' and employers' attitudes, understanding, and knowledge of the disability or disease to be a key factors in either preventing or promoting employment. This result is in accordance with those of earlier studies concerning the positive attitudes and support of others [1, 6, 14, 23], as well as those concerning understanding and knowledge [14].

Methodological discussion of the included studies

Overall, better reporting is required regarding some basic methodological quality issues. A better description of the participants, such as gender, age, education, occupation, and work experience, is needed also for persons with disabilities. It can be concluded that disabled persons are not seen as professionals since, although their diagnosis or disability has been described well, their competence and

strengths, such as their educational background or work experience, have not been mentioned.

There were some elements of the interventions and WA processes that were not clearly reported in the articles. In most studies, the WA was one part of an occupational rehabilitation process, which should have been better reported. Furthermore, more information about the methods used to evaluate the need for WA, the initiator of WA, the planning of solutions, the implementation schedule, and the direct and indirect costs should be given. Only a few studies reported the occupational background of the persons who implemented the WA. In addition, the participation rate was seldom described. The intervention steps, the effectiveness of the intervention, and the potential confounding activities at work should also be better reported. Both the quantitative and qualitative studies showed the importance of training and guiding employees during the WA process, for instance, if AT were provided. However, the theoretical background and specific program of the counselling and education did not receive enough attention. It would also be important to describe the concrete WA actions taken. In many situations, people have different diseases and disabilities and these diseases cause different kinds of deficiencies in personal capacity, the persons have different occupations and work tasks, and several possibilities for WA are available. It should be considered, that disabled persons need specific accommodations, not simple accommodations in general, as also Balser [3] and Butterfield and Ramseur [2] have reported.

The outcomes in this review were employment, work ability, and cost-effectiveness. With the ICF -model as a framework, our outcome employment (getting work, maintaining work, return to work) belongs to “participation”. According to the ICF -model, WA belongs to the “environmental factors” that affect “activity” (e.g. work ability) as well as most of the synthesized themes from the analysis of the qualitative studies. Obviously, the primary aim of WA on a personal level is to enhance the work ability of people with disabilities and make it possible for them to work in the open labor market. Only two of the reviewed studies [48, 49] used cost-effectiveness as an outcome. On the society level, it is important to develop and implement solutions that enhance employment and are cost-effective at the same time [1, 3, 11, 17, 59]. We reviewed both quantitative and qualitative studies because they show different aspects of WA implementation, for example effectiveness and barriers or facilitators. According to the framework (ICF) we used, both aspects are important when WAs are developed as environmental factors.

Strengths and limitations of this review

The strengths include the multi-scientific review group, the comprehensiveness of the searches, use of the ICF -model

as the theoretical framework, and the inclusion of a wide range of WA studies. The reviewers have expertise in different scientific areas, including both quantitative and qualitative methodology. Every effort was made to insure a comprehensive search. It is possible, however, that not all of the relevant studies were found. Another limitation is that the included studies concerned mainly the employee’s perspective, except for cost-effectiveness. By omitting the employers’ perspective, we gained greater comparability of the results. We included both quantitative and qualitative studies which showed different kind of knowledge about the process and the effectiveness of WA. By including studies with different designs, research gaps in WA could be identified.

Quality assessment

The quality of the RCT and CCT studies were assessed with the use of the validated method of van Tulder et al. [36], which has also been used in other reviews. The quality of the CCT study was low mainly due to the study design, which did not include randomization, treatment allocation, blinding, or intention to treat the analysis. The quality of the cohort study was assessed with the Newcastle-Ottawa Scale [39]. The validity and reliability of this method was only partly evaluated in that the content validity and inter-rater reliability have been established, whereas the criterion validity and intra-rater reliability are still in progress [39]. However, the Newcastle-Ottawa Scale has also been criticized by Stang [60].

The original qualitative assessment tool CASP was perceived as not being very powerful in differentiating between high- and low-quality studies. It only measures whether certain basic items that are essential identifiers of high-quality research are mentioned in the report or not. This type of measurement is crude and makes the scale difficult to use when some of the criteria are implicit in the study. Furthermore, a “yes or no” scale does not capture the fact that certain items in the CASP criteria may be more crucial to the quality of the study than others are. With the addition of a third level of assessment, “partially”, to the method, the first problem can be solved. However, the second problem remains: Of the three problematic points of the qualitative studies evaluated, researcher effect is a self-evident fact connected with any study of social life, and thus it is less informative than reporting the contribution of a particular study to existing knowledge. Although CASP offers a good basis for evaluating qualitative research reports, it can be further developed by giving different weights to different criteria.

In the comparison of the results of the assessment of the quantitative and qualitative studies, a bias was found in that the quality assessment of qualitative studies resulted in

various high-quality studies, while the quantitative assessment yielded only a few of them. This is, of course, partly due to the different evaluation methods, but it may also be an indication of the different nature of these two types of research. Qualitative studies report interesting new observations about the ways in which the participants observe, understand, or experience the phenomenon studied, while quantitative studies aim at making generalizations about possible causes and effects, as well as revealing other connections between the variables describing the phenomenon being studied. As the knowledge gained by qualitative research is descriptive, not numeric by nature, ranking between studies is also challenging. A further observation is that, despite the greater number of high-quality qualitative studies, these studies did not score very well with respect to the value of the research criterion. Few of the qualitative studies were assessed as being able to introduce new areas of study on the basis of the results or as clearly explaining the contribution that the study makes to existing knowledge, practice, or policy. They listed facilitators and barriers reported by the participants concerning a particular item, but they rarely made an effort to interpret their findings any further, for instance, by theorizing or at least contemplating possible explanations for their findings.

Methodological discussion

Not full support for WAs was found primarily because of low number of methodologically sound quantitative studies currently available in the literature. More randomized controlled interventions with long follow-up times are needed before the effectiveness of WA can be shown. Only with RCT studies systematic bias can be prevented, and therefore they are preferable also in this research area. According to Sibbald and Roland [61], RCT studies are the most rigorous means of assessing whether a cause-effect relation exists between the “treatment” and outcome and of assessing the cost effectiveness of a “treatment”. The non-randomized cohort studies included bias because in many cases, the WA was introduced for persons with more severe disabilities, who then, more apparently, are not employed in the follow-up situation.

Validated methods were seldom used to quantify the outcomes of the WA process. Employment rates and measurements of work ability or functioning with valid methods were seldom used. It is evident that more validated methods are needed for WA and vocational rehabilitation before the personal needs and the effectiveness of WA implementation can be evaluated in different occupations and disability groups. One example is the new WORQ method (Work Rehabilitation Questionnaire) [62] with which it is possible to collect multifaceted functional information.

The qualitative studies concentrated on the participants’ experiences of barriers and facilitators. Therefore, there is a

need to broaden the scope of research designs. For example, it would be worthwhile to examine the implementation of intervention studies and use observational methods. Such studies could yield information about the actual process—the activities through which the intervention is carried out, not just about the facilitators and barriers as remembered by the participants in interviews after the intervention.

Conclusions

There is moderate evidence showing that specific forms of WA promote employment and reduce costs among persons with physical disabilities and low evidence that WA coordinated by case-managers increases return to work and is cost-effective among persons with physical or cognitive disabilities. More high-quality studies using validated measures of the work ability and functioning of disabled persons are needed. The identified barriers and facilitators found in the qualitative studies should be utilized in the development of quantitative study designs.

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Conflict of interest Nina Nevala, Irmeli Pehkonen, Inka Koskela, Johanna Ruusuvuori and Heidi Anttila declare that they have no conflict of interest.

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