Domain: Work factors

Introduction[1]

According to conceptual considerations, work factors have a central role among the factors that influence labour market participation in higher working age [1]. They are associated with socio-economic position, lifestyle and health and especially with the motivation and the ability to work and thus plausibly influence retirement decisions. This report investigates the evidence available for work-related factors to predict early exit from work in older workers.

Work factors can be physical, chemical and climatic exposures at the workplace, ergonomic demands or psychosocial exposures and demands at work. Physical work environment factors include noise, vibrations and ambient air quality; ergonomic demands can be poor work postures, handling of heavy loads or repetitive work. Mental demands include computer use, complex tasks and learning new things at work [2]. Psychosocial exposures include control at work, violence and social support. All these factors can be associated with labour market participation in higher working age and – if adverse – constitute "push factors" [3] inducing people to leave working life early. If positive, work factors such as challenging work (work content), sense of community (the social work environment) or work organizational factors such as flexible work or technical assistance may make it possible and desirable for older workers to keep working ("pull factors").

The World Health Organization defines workers aged 55 and above as older workers [4]; in this report, we consider older workers to be aged 50 and above. Concerning premature retirement we in this report distinguish between either disability retirement (independent of age) or non-disability retirement before the age of 65 or resp. statutory retirement age [5].

Methods

A systematic search using PUBMED was conducted followed by a hand search for relevant research findings. A first PUBMED search was conducted in order to find reviews only; a second search identified relevant primary studies as well. The search string combined keywords for the outcome of labour market participation or early retirement with keywords for study type and date of publication (2005 - 2014). Only European and Canadian studies in English were selected. The focus was on quantitative prospective, longitudinal studies, qualitative studies were not included. In the search, the target population was not specified to cover the full range of the work force, neither were work factors specified in order to gain an insight into the scope of current research on determinants of early retirement. Return to work following disability and unemployment were not included in the search. Finally, studies examining work-related physical exposures and ergonomic demands as well as psychosocial factors as risk factors for disability and non-disability retirement were identified and included, whereas studies examining factors that were not work-related were excluded. Studies on

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[1] The authors of this report are Anne Pohrt and Hans Martin Hasselhorn of the Federal Institute for Occupational Safety and Health (BAuA) in Germany. They were national representatives in the working group „Understanding employment participation of older workers" appointed by the Joint Programming Initiative „More Years, Better Lives – The Potential and Challenges of Demographic Change".
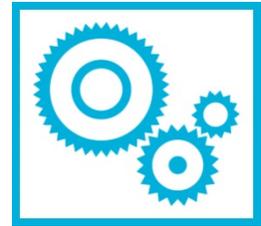
the intention to retire e.g. [7-9] were excluded, as well as the numerous studies on specific occupational groups (e.g. nurses [10, 11]).

Findings

In the first search, two reviews on the association of early retirement and work factors were identified, one focussing on disability retirement [12], the other on non-disability early retirement [5]. The search for primary studies returned 681 results from PUBMED. Out of these and by additional hand search, 29 primary studies on work factors and retirement were identified and selected for this report.

Investigation of work factors predicting disability retirement

26 out of 29 studies and one review focussed on disability retirement. The concept and implementation of disability retirement and benefits differ substantially between countries as does the research on their relation to work factors. There are, however, factors that are common to many studies and were researched in several countries. Nine of the studies on work disability risk come from Finland, another 6 from Denmark, 5 from Norway and 4 from Sweden. Germany and the Netherlands contributed one study each.

The German review [12] focussing on psychosocial exposures and disability retirement found 17 studies considering job control or decision latitude as independent factor, 13 studies considering mental demands, 7 studies considering social support as well as 7 studies considering job satisfaction. Concentration demands, time pressure, monotony, job strain and conflicts were considered in fewer studies. The review finds evidence that psychosocial work factors influence the short- and long-term risk of disability pensioning.

Among the psychosocial factors assessed in the primary studies, job control is the one most often assessed; in 18 of the identified studies it was included in the analyses. Items and scales were taken either from the Job Content Questionnaire (JCQ), based on Karasek's job strain model [13] that includes psychological job demands and job control (or decision latitude/decision authority) or - in the case of data analyses of the Danish DWECS study – from the COPSOQ, a questionnaire on psychosocial stress. For job control the risks for disability retirement were consistently significantly increased with hazard ratios ranging from 1.1 in [14] to 2.61 in [15]. [15] identified job control as the most important work factor for disability risk, as it consistently entailed high disability retirement risks across all diagnose groups, thus accounting for a proportion in disability retirement of almost 40% for men and 20% for women. In those studies that considered the causal pathways from socio-economic status (SES) to disability risk, job control was found to be an important mediator [16-21].

High job demands were found to be associated with an increased disability risk in four studies [22-25], but were found not to be in three others [14, 26, 27].

In some studies, the scales of job control and job demands were combined to assess job strain [14, 22-24, 28], which – when increased – was also associated with higher risk of disability pension, except in [23], where it was associated with a lower risk. In [24], iso-strain (combination of high job strain and poor social support) was found to be a significant predictor for disability retirement.

Social support, as part of the Karasek model [22, 27], as part of the COPSOQ [26] or with specific questions [25, 29, 30] was often examined separately, in one case with a Job-Exposure-Matrix (JEM) [24]. Except in [27], low social support proved to be significantly associated with risk of disability pension.
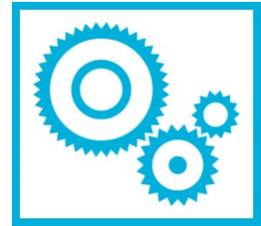
Domain: Work factors

Physical workload was assessed in 16 studies and is thus a well-researched work factor with respect to the risk of disability retirement. The way of its assessment varied between studies, though. Questions concerning the level of physical exertion at work or a set of items on uncomfortable positions, repetitive movements and lifting serve as indicators of heavy physical work in survey studies. Combinations of heavy work, forced positions, vibrations and other features of physical work are used in studies employing a job-exposure-matrix [15, 18, 31]. Physical workload contributes considerably to disability risk: [32] found that about 8% of the disability pension cases in their study were attributable to physically demanding work. Most of the studies found the risk of disability pension to be significantly increased for people with heavy physical work [15, 20, 27, 31-33]. The hazard ratios reported comprise relative risks up to 6.56 [8]. It is important to note that physical workload is a factor inherent in many occupations, mostly those of lower social class. So it could also be regarded as an indicator of social status. To find out its impact beyond that of SES (socio-economic status), SES was often adjusted for in analyses; in a few studies analyses were stratified. Other studies considered physical workload to be a mediator between SES (education or occupational social class) and risk of disability pension. Among the work factors identified as mediators between SES and risk of disability pension, physical workload was one of the most prominent.

Further well established ergonomic risk factors for musculoskeletal diseases are working in awkward positions, standing/kneeling over long periods of time as well as vibrations; they were frequently assessed by the studies found. While these demands were sometimes incorporated into general measure of physical demands or workload, they were also considered separately, including questions for working in kneeling or squatting positions, with hands above the shoulders, bent neck or questions for repetitive movements or standing work. Standing work was associated with higher risk of disability in [25, 29, 33] with hazard ratios up to 1.56, working with lifted arms was not associated with an increased risk in [29, 32, 34] and squatting or kneeling was associated with a higher risk in [25, 34], as well as in [32] (significant only for women). Whole body vibration was assessed in [27], and found to be a risk factor for disability, likewise in [25, 30]. Standing work was found to be associated with risk of early retirement in [25, 29], but not in [33].

Monotony at work can be straining both physically and mentally. Six studies included monotony vs. variation at work in their analysis [25, 29, 30, 32, 33, 35]. It proved to be a significant predictor with hazard ratios ranging from 1.09 to 1.95, except in [29] where it was not significant.

Other factors that appeared less often include contact with cleaning agents [36], noise [15, 30], computer work [27], heat or cold [15], conflicts at work [29], outdoor work [33] and effort-reward-imbalance [37, 38].

Several Swedish and Finnish studies [16-21, 39] considered work factors to be mediating factors between Socio-economic status (education, occupational SES) and risk of disability pension. The most important factors examined were found to be physical workload and job control as well as contact with hazardous substances.

Investigation of work factors predicting non-disability early retirement
Four of the primary studies and one review considered early retirement without disability, i.e. early old-age retirement.

The review [5] from the Netherlands remarked on the paucity of studies on the impact of work-related factors on non-disability early retirement. Factors identified in the review were heavy
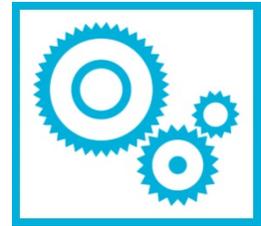
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physical work, lack of job satisfaction, high work pressure. Health at baseline was almost always considered, as were gender, education or socioeconomic status.

The assessment of work factors in our overview was not as broad as for disability, the four studies found focussed on job control and physical workload. Two of them originated from the Netherlands, one from Denmark and one from Norway.

Job control showed to be associated with risk of early old-age retirement in [31, 40] but not in [26], where job strain, too, remained insignificant. Physical demands were associated with risk of non-disability early retirement in [31, 41], but not in [26, 40]. [41] found conflicts at work to be associated with risk of early retirement, also extreme bending/twisting of the neck/back, and working mainly standing or squatting. [26] found social support to be a significant predictor of early retirement risk, "job stress" was found to be significant [31], time pressure was insignificant in [40].

In Finland, where a lot of research was done on disability risk (9 studies on disability risk came from Finland), the pension reform in 2005 has restricted early non-disability retirement routes considerably [42]. It is interesting we did not identify any Finnish study published thereafter on work factors and early non-disability retirement.

Work factors predicting general labour market participation

One Norwegian study [31] investigating determinants of both disability and non-disability early retirement found disability retirement to be related to physical job strains (by JEM). Among men, both disability and non-disability retirement were found to be related to low autonomy in job tasks.

A Dutch study [40] used data from SHARE to examine three pathways out of the labour market: disability pension, unemployment, and early retirement. Of all work characteristics studied, lack of job control was found to show the highest increased risk for all three pathways, followed by low rewards (HR 1.10–1.76). Having physical job demands was not found to be related with exit from work after adjustment for demographics.

In Germany, micro census data were used to assess the relation of labour market participation of older workers (age 50 and beyond) with type of occupation [43]. Manual occupations as well as qualified service occupations were identified as the groups with the highest risk of early exit from the labour market.

Analysis of research

Outcome: Current research focus on disability retirement

Our review indicates that current quantitative prospective research on work-related determinants of early retirement largely focusses on disability retirement and rarely on non-disability early old-age retirement. Of 29 identified studies, 26 concerned disability retirement, whereas only 4 considered non-disability early old-age retirement and three studies combined the outcomes. This is not surprising, considering the availability of disability pension data from social welfare registers in Scandinavia and the most often clear cut definition of the outcome, which is usually defined by the receiving benefits due to recognised disability-related work incapacity. Early old-age retirement or non-disability retirement in contrast are not easy to define in times when the concept of retirement is broadening in many countries [44].Leaving the labour market may happen gradually, with part-time or bridge employment or phases of unemployment or sick-leave. In the research, this difficulty is reflected by the different potential definitions of the outcome of non-disability early old-age
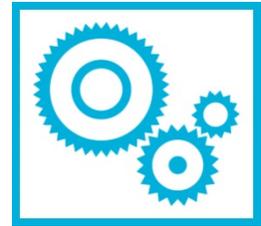
retirement[45]. For example, it may be defined as self-reported retirement before the statutory retirement age as in [26, 40], as a drop in work-related income not below US$ 9000 as in [31] and as receiving registered early retirement pension as in [41].

However, considering that the majority of early departures from the labour market does not occur via disability retirement, but via early old-age retirement [46], it is of great importance to investigate and understand better the influence of work factors on labour market participation beyond disability retirement.

Exposure: Choice of factors

Population-based research on work-related determinants of older workers' labour market participation focusses mainly on the exposures physical workload, job control, job strain and ergonomic demands, to a lesser extent on vibrations, monotony or variation at work, effort-reward imbalance and on social support. Several studies focus on either physical [32, 36, 38] or psychosocial [14, 35, 39, 47, 48] work factors; others consider both aspects.

However, there are more risk factors than the established ones. Surprisingly, no research was found that examined the influence of newly emerging psychosocial demands such as permanent availability or geographical and temporal work flexibility. The discussion and research on these factors and their impact on labour market participation seems yet to be in its infancy.

Exposure: Measurement

There are established scales for measuring job control or job strain, which make results from different studies comparable. Such scales are not used in the assessment of monotony or even physical workload; instead each study has different questions or ways of assessment. When there are established risk factors, comparable measures could be beneficial.

Context

Variables that reflect the context in which labour market participation decisions are made, such as SES, family status or health risk behaviour were frequently included as covariates in the models for effect estimation e.g. [23, 26, 33].

While in many cases, results were differentiated by gender, only a few studies stratified by education or other indicators of SES in order to identify risk groups and subsets of the working population that may have higher vulnerability to certain factors [19, 28, 48].

A number of studies [16-21, 39] considered work factors as mediators between education resp. occupational class and disability, taking a view towards causal pathways from SES to disability risk. In contrast, [49] views self-reported poor work environment as mediator between health and disability, thus considering work factors a step on the causal pathway from health to disability risk.

Life-Course approach

There are three studies that considered variables from the earlier biography of the participants, thus taking a life-course oriented approach. [20] included paternal education, ambition to study, and intellectual performance at age 13 when assessing the contribution of work factors to risk of disability retirement to explain associations between low education and disability pensions. In [18], a large part of the association between level of education and risk of disability pension was explained by factors measured in late adolescence, IQ in particular, and somewhat less by work characteristics measured in adulthood. [15] tried to take into account the whole working life by applying a JEM to the complete occupational biography of subjects.
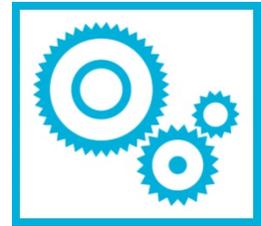
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Most other studies used exposure assessments from a fixed survey date, and followed up the outcome with register data or follow-up surveys. Thus timing of exposure assessment and follow-up was often determined by data availability rather than by theoretical time sequential causal considerations. Not only the periods and durations considered but also the age at which exposure is assessed may be relevant in analyses and the interpretation of findings. For example, a reduced physical work load in advanced working age may indicate a selection effect, for example reflecting reduced exposures in old age bridge jobs that were chosen specifically to avoid certain demands.

More complexity behind life course influences on early exit from work could be expected from qualitative studies, which this report did not focus on.

Age and calendar time

The studies from 2005 and later considered here assessed work exposures between 1988 and 2006 and follow-up times until 1999-2009. When analysing exposures long dating back, research, of course, has to consider the rapid changes of work in certain sectors when drawing conclusions of relevance for today.

In our review, we aimed at workers' age 50 years and above. The age range in the studies selected was often arbitrary. There were studies considering ages 60-66 years, <=60 years, 42-60 years and 57-62 years, but most studies did not make restrictions.

Attributable vs. relative risks

Mostly, studies reported hazard ratios from register follow-up showing relative risks given the exposure vs. the risks in its absence. However, to capture and understand the population impact of risk factors as a whole, the prevalence of the exposure to these factors in the population as well as the general population risk need to be considered. On a population level, an exposure doubling a risk can mean a huge difference in retirement if many workers are affected by it, but can also mean very little if the exposure occurs very rarely. A few studies reported such 'attributable risks', that is the proportion of cases that could be avoided, if certain exposures were absent [15, 25, 26, 32, 34, 36]. One study even went on to estimate the cost of disability retirement due to work factors [15]. This type of study may be of more interest for policymakers, as it also reflects the impact that interventions might have.
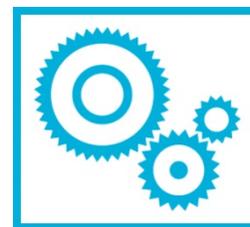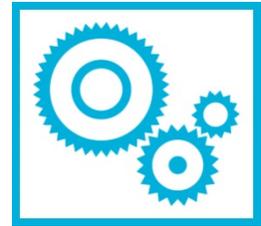
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Cross-national diversity

Prospective research on work factors predicting early retirement is unevenly distributed in Europe (table 1). In our review, the research reports mainly come from Scandinavian countries, foremost Finland and Denmark, but also Norway and Sweden. Of all analysed studies, only 4 originate in other countries (two from the Netherlands, two from Germany). In Scandinavia the combination of the availability of large cohorts on work and health and the possibility of social register (employment) data linking for research purposes fosters this research. It is also in these countries that working longer is very much in the focus of policy and economy. For example, quite a few of the primary studies on work factors and disability retirement were based on the Danish Work Environment

country	no. of studies	Studies	datasets
Finland	9	Lahelma, Laaksonen [27], Kärkkäinen, Pitkaniemi [33], Juvani, Oksanen [38] Laine, Gimeno [14] Leinonen, Pietilainen [39] Pietilainen, Laaksonen [21], Mäntyniemi, Oksanen [28] Polvinen, Gould [19], Ropponen, Samuelsson [23]	Finnish Public Sector study, Finnish Twin Cohort Study, Helsinki Health Study, Health2000 Study
Denmark	7	Albertsen, Lund [29], Labriola, Feveile [32], Tüchsen, Feveile [34], Feveile, Christensen [36], Lund and Villadsen [41], Christensen, Feveile [47], Clausen, Burr [48] ENREF_7	DWECS, DREAM register
Norway	5	Blekesaune [31] Hagen, Tambs [16] Haukenes, Mykletun [17] Sterud and Tyres [25] Stover, Pape [30]	Survey data from Statistics Norway, Nord-Trondelag Health Study, Hordaland Health Study, Study of Living Conditions, Nordland Health Study
Sweden	4	Johansson, Leijon [18], Falkstedt, Backhans [20], Canivet, Choi [22], Samuelsson, Ropponen [24]	Swedish Twin register, Malmö Shoulder and Neck Study, social insurance data. Conscription Cohort, Swedish Twin Study of Disability Pension and Sickness Absence
Netherlands	2	de Wind, Geuskens [26], Robroek, Schuring [40]	SHARE study, STREAM study
Germany	2	Bödeker, Friedel [15], Brussig [43]	Occupational history data, Micro census data

Table 1: Overview of studies selected for this review by country and exposure data source used

Domain: Work factors

Cohort Study [50] and Danish register data. Studies from Norway and Sweden also made extensive use of social welfare register data. They can provide up-to-date and complete information on retirement. If combined with studies that have good indicators of work factors, there is a wealth of data, which continuously provides a basis for research. As can be seen in the Scandinavian countries this wealth is used well. Also Dutch studies are increasingly linking self-report with register data [e.g. 26]. German studies use register data but have no individual information on work factors.

The conceptual framework underlying this JPI UEP Fast Track Activity implies complexity of (early) retirement. Many of the determinants indicated there may be expected to differ between countries, not least those related to legislation and regulation. The domain 'work factors' is embedded in the complex network of these determinants for work participation. Thus, its role may be expected to differ between countries. For example, in countries where options for non-disability retirement are low, adverse work factors may be associated with disability retirement pathways out of work to higher degree than in other countries. Thus, the association of work factors with early retirement pathways may well be expected to differ between countries. Cross national research exploring communalities and differences between countries may give valuable insights into underlying mechanisms. In our review, only one study [40] was analysing European cross national data (SHARE). However, the effects of work factors were not hypothesized to be dependent on country, hence no stratification was made and thus no insights into national (or welfare state type) mechanisms could be gained.

Research Conclusions

The research content
- Current research on work factors on a population level is dominated by a few work factors only: the job demand/control model, physical workload and ergonomic demands. The impact of further, for example new emerging psychosocial demands (e.g. permanent availability) need yet to be researched.
- The positive impact of work factors for retaining workers at work needs to be considered in studies assessing work and retirement.
- The complexity of the retirement decision is not adequately considered in the prospective studies. Qualitative studies and the application of a life course perspective in longitudinal studies will contribute to a more differentiated understanding, also acknowledging cumulative exposures and work changes and transitions. Quantitative studies should learn from qualitative research and for example include domestic factors. To that end, a life course approach is required, which is seldom seen in current research. A few studies consider variables from earlier life phases, the majority however does not.
- Indicators are necessary and good for comparability. They should reflect the broad work content as well as new emerging working conditions.

The research outcomes
- The influence of work factors on the risk of disability retirement is much better researched than their influence on non-disability or early old-age retirement. This may reflect the availability of data as well as the relative clarity of the concept of disability retirement. In comparison, non-disability retirement is both more difficult to grasp and more difficult to assess. However, in magnitude it is a much bigger issue and may be approachable by intervention. Therefore, more research activity should focus on this outcome.

Research methodology
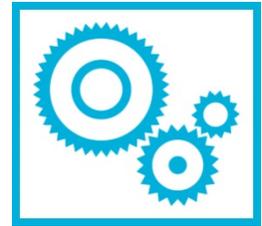
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- Register data are a valuable source of information on retirement and labour market participation. They provide complete follow-up and, if coupled with survey studies can yield strong evidence about work factors' influence. Also outside Scandinavia and the Netherlands data protection should allow researchers to take advantage of this valuable source.
- A more differentiated view should not only consider gender but also SES and – not least – age.
- The timing of exposure measurements in relation to the subjects' age and age at retirement should be considered more already in study planning.
- Studies that compute attributable risks and costs may have an additional benefit in comparison to studies reporting relative risks; they may highlight the areas where intervention may be most worthwhile.

Cross national approach
- There is need for extension of the research to other countries. Almost all studies found in this report come from Scandinavian countries, a few from Germany and the Netherlands.
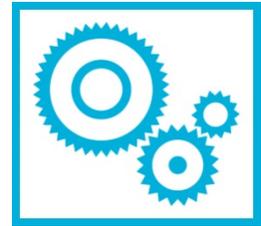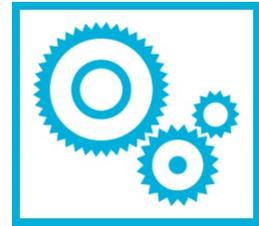
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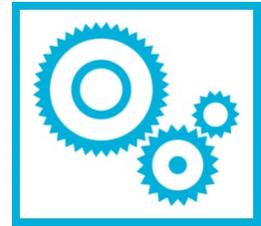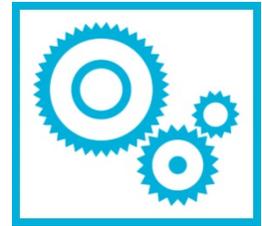
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