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WORK ABILITY SCORE AND FUTURE WORK ABILITY AS PREDICTORS OF REGISTER-BASED DISABILITY PENSION AND LONG-TERM SICKNESS ABSENCE: A THREE-YEAR FOLLOW-UP STUDY

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Abstract

Aims: We investigated two single items of the work ability index – work ability score, WAS, and, future work ability, WFA – as predictors of register-based disability pension (DP) and long-term sickness absence over 3-year follow-up.

Methods: Survey responses of 11,131 Finnish employees were linked to pension and long-term (more than 10 days) sickness absence register data by Statistics Finland. WAS was divided into poor (0-5), moderate (6-7) and good/excellent (8-10) and FWA into poor (1-2) and good (3) work ability at baseline. Cox proportional hazard regressions were used in the analysis of DP and a negative binomial model in the analysis of long-term sickness absence. The results were adjusted for several background, work- and health-related covariates.

Results: Compared to those with good/excellent WAS, the hazard ratios (HR) of DP after adjusting for all covariates were 9.84 (95% CI 6.68–14.49) for poor and 2.25 (CI 95% 1.51–3.35) for moderate work ability score. For FWA, the HR was 8.19 (95% CI 4.71–14.23) among those with poor future work ability. The incidence rate ratios (IRR) of accumulated long-term sickness absence days were 3.08 (95% CI 2.19–4.32) and 1.59 (95% CI 1.32–1.92) for poor and moderate WAS, and 1.51 (95% CI 0.97–2.36) for poor FWA.

Conclusions: The single-items of WAS and FWA predicted register-based DP equally well, but WAS was a better predictor of register-based long-term sickness absence days than FWA in 3-year follow-up. Both items seem to be of use especially when examining the risk of poor work ability for disability but also for long sick leaves.

Key words: health, psychosocial job characteristics, register data, work ability index

Introduction

It is has been shown that the work ability index (WAI) questionnaire developed in the Finnish Institute of Occupational Health [1–2] predicts both register-based disability pension and long-term sickness absence [3–7]. However, as WAI is a multi-item measure, it has disadvantages in terms of its implementation: due to its length the entire index cannot be easily included in surveys. WAI has also been criticized for its theoretical grounds, as it consists of a combination of self-reported work ability, diagnoses, symptoms and sick leave, which do not seem to form a single dimension of work ability as intended [8–9]. Therefore simpler measures to monitor work ability have been called for [e.g. 10–11].

Single items of WAI have also been examined as predictors of disability pension and long-term sickness absence. The single item examined most often is known as the work ability score (WAS), which is a self-assessment of present overall level of work ability compared to lifetime best. In recent studies WAS predicted register-based disability pension among ageing Finnish municipal workers [3] and register-based long-term sickness absence among a national Swedish sample [5]. It also predicted self-reported long-term sick leaves among female Swedish human service workers [10]. In the study by Roelen et al. [12] both WAI and WAS predicted self-reported disability pension among male Dutch construction workers.

In addition to WAS, the single item eliciting an individual's own prognosis of his or her future work ability (FWA) two years hence has been used to predict register-based disability pension and long-term sickness absence [4]. The study showed that FWA predicted both disability pension and long-term (> 14 days) sickness absence among Swedish workers in seven-year follow-up. Also, Lindberg et al. [13] found that among Swedish municipal workers FWA predicted register-based long-term (≥ 28 days) sickness absence across four years approximately as well as WAI. Furthermore, Alavinia et al. [14] suggested that all separate WAI items had predictive power for future self-reported disability pension among Dutch construction workers aged 40 and over.

Detailed results concerning the items, however, were not reported in the study. In the context of register-based long-term sickness absence, Lundin and co-workers [4] showed that three items may be suitable proxies of the full WAI. These, in addition to WAS, were estimated work impairment due to diseases and number of current diseases diagnosed by a physician.

The aim of the present study was to examine WAS and FWA as predictors of register-based disability pension and long-term sick leave among a representative sample of Finnish employees covering all sectors and occupations. Although earlier studies have studied both of these single items of WAI, they have not been compared with regard to both disability pension and long-term sick leave. This comparison of the two single items, however, is meaningful, as simple measures of impaired work ability have been called for. With an ageing workforce valid simple measures are needed even more urgently than before to monitor disability and long sick leaves.

Earlier studies also have certain limitations related to the samples used. The Finnish sample [3] included only municipal workers aged 44–58 years. The Swedish samples consisted of municipal employees [13], individuals living in only one city (Stockholm) [4], and in one study [5] the sample was nationally representative. The Dutch studies only concerned workers in certain fields [6-7]. Thus our representative sample captures the working aged population better as a whole in Finland. Earlier other relevant studies have all used self-reported outcomes [10, 12, 14], which may be biased. We expected that both work ability items would have predictive power for register-based disability pension and long-term sick leave in three-year follow-up. However, the predictive power might be stronger for disability pension than for sick leave as disability pension awards are specifically based on diagnosed work ability [see 4].

Methods

Sample and procedure

The data include the Finnish Quality of Work Life Survey (FQWLS) of 1997, 2003 and 2008 linked to a register follow-up on disability pension and long-term sickness absence over three years. The

linkages were performed and approved by Statistics Finland following their ethical standards using each person's unique identification code, which was not included in the data. In each year the representative survey sample consisted of about 3,000 to 4,500 employees. The response rates were 79% in 1997, 78% in 2003, and 68% in 2008. According to Statistics Finland, which conducted the survey in face-to-face interviews using a standardized interview format, non-response does not seriously undermine the representativeness of FQWLS data. The pooled data (N = 11,131) included 15- to 60-year-old employees with a normal weekly working time of at least 5 hours.

Outcomes: Disability pension (DP) and long-term sickness absence

DP information was drawn from the Finnish Centre for Pensions, which provides complete information on all cases of retirement. DP is illness-based, and may be granted to anyone aged between 16 and 64 years if that person's work ability is more or less permanently impaired. The impairment is 3/5 in full DP and 2/5 in part-time DP. The sample was scrutinized for disability pensions granted for three years following the survey (i.e. 1998–2000, 2004–2006, 2009–2011). DP is a categorical variable (0 = no, 1 = yes) indicating whether the person received any DP during those three years. The most common causes for DP in Finland are mental disorders (the largest proportion since 2000), musculoskeletal diseases and circulatory system diseases [15].

Long-term sickness absence information was obtained from the Finnish Social Insurance Institution, which keeps records of sickness allowances paid for medically certified sickness absences of more than ten days. A sickness allowance is payable for a maximum of 300 working days, after which one can apply for DP. Maternity leave and absence from work to care for a sick child are not included in these sickness absences. The accumulated number of days on long-term sickness leave for the follow-up time of three years was used as an outcome measure. Thus the measure corresponded to the length of absence, i.e. the total number of days an individual was absent from work over a specific period. The total number of days may result from one or several

sickness absence episodes exceeding ten days. In addition, we used long-term sickness absence in previous year (1996, 2002 and 2007) as baseline absenteeism in the analyses. In Finland in the 2000's the most common causes of long-term sickness absence were musculoskeletal diseases, mental disorders, injuries and toxic illnesses.

Predictor: Self-rated work ability

In this study work ability was measured with two single items (WAS and FWA) from the WAI questionnaire [1–2]. First, the WAS item "current work ability compared with lifetime best" was rated on a scale from 0 (completely unable to work) to 10 (work ability as its best). WAS has been shown to have the highest discriminating power over the entire index [9]. It was classified into three categories which best correspond to that of WAI [16]: poor (0–5 points), moderate (6–7), good (8–9), excellent (10). The two last categories were combined in the analyses [see 3]. WAS has been included in the FQWLS data since 1997.

Second, the FWA item "Do you believe that, from your health perspective, you will be able to do your current job two years from now?" was rated with three response alternatives: unlikely (1), not certain (2) and relatively certain (3). These alternatives were dichotomized as poor work ability (1–2) versus good work ability (3) [see 4]. The discriminating power of FWA has been shown to be intermediate [9]. FWA has been included in the FQWLS data since 2008.

Covariates

Other information appropriate from the viewpoint of DP and sickness absence was obtained from the survey. This information covered the major background, work- and health-related factors shown to be relevant in earlier studies [e.g. 3–4, 12, 14, 17–18] and therefore controlled for in the analyses. The five *background factors* were gender (0 = male, 1 = female), age (aged 15–34, 35–49 and 50–60 years), having a partner (0 = no, 1 = yes), having children under age of 18 living at home (0 =

no, 1 = yes) and socioeconomic status (1 = blue-collar worker, 2 = lower white-collar worker, 3 = upper white-collar worker) and survey year (1997, 2003, 2008).

Work-related factors included four variables, of which high work demands and low job control have most often been related to both poor work ability and the outcomes studied here [e.g. 4, 17, 19]. Weekly working hours were ascertained by asking participants how many hours they usually worked in their main job. The hours were divided into three categories (1 = 5–34, 2 = 35–40, 3 = 41–98). Participants estimated how demanding their job was physically and mentally (0 = very or fairly light, 1 = very or rather heavy). Time pressure was measured with five items addressing the occurrence of tight time schedules and the mismatch between time and task demands. Participants were asked to what extent time pressure and tight time schedules were perceived as a negative factor in a work environment (1 = not at all, 5 = very much), whether the pace of their work had changed over the past few years (1 = decreased considerably, 5 = increased considerably), whether in their work they could generally take breaks or rest periods (1 = often enough, 2 = not quite often enough, 3 = far too seldom), and to what extent they agreed (1 = untrue, 4 = true) with the statements "My work involves tight time schedules", and "I do not have time to do my work as well and conscientiously as I would like to". All individual variables were rescaled to range from 0 to 1 before constructing the index by summing up the response scores to the rescaled questions (Cronbach's α 0.70–0.71). On the basis of the sum-score participants were classified into quartiles to indicate lower and higher levels of time pressure. Job control was measured with five items by asking how much the participants could influence the order they performed their tasks, working methods, job content, working pace and division of labour. The items were rated on a four-point scale (1 = not at all, 4 = much). On the basis of the sum score (Cronbach's α 0.78–0.81) participants were classified into quartiles to indicate lower and higher levels of job control.

Health-related factors included long-standing illness, psychosomatic symptoms and sickness absence days of the previous year. Long-standing illness was measured by asking participants whether they suffered (0 = no, 1 = yes) from any permanent injury or medically diagnosed chronic illness, such as cardiovascular, pulmonary, or muscular-skeletal disease, disease of the digestive system, or some other long-term illness. Psychosomatic symptoms were studied by asking how often on a six-point scale (1 = never, 6 = daily) the participants had recently suffered from various symptoms: headache; fatigue, apathy or lack of energy; difficulties in falling asleep or recurrent awakenings at night; palpitations or irregular heartbeat; feeling of dizziness; depression; heartburn, acidity, stomach pains or diarrhea; over-exhaustion; tenseness, nervousness or irritability; feeling that it is "all just too much". A 10-item sum variable was constructed by summing the response scores of the various symptoms (Cronbach's α 0.82 each year). The participants were classified into three groups to indicate low, medium and high levels of psychosomatic symptoms. Long-term sickness absence days of the previous year (1996, 2002, 2007) were treated as baseline absenteeism.

Statistical analyses

We calculated hazard ratios (HR) of DP and their 95% confidence intervals (95% CI) using Cox proportional hazard regressions. Four models were constructed. In the first model we analyzed HR of DP connected with WAS and FWA at baseline. In the second model we adjusted HRs and their 95% confidence intervals for background factors. In the third model HRs were adjusted for both background and work-related factors, and the last model was a full model in which health-related factors were also added as adjusted variables.

The effects of WAS and FWA on the number of accumulated long-term sickness absence days were analyzed using a negative binomial model (BM) which is suitable for this kind of count data. As long-term sickness absence days were clearly overdispersed (e.g., the variance was higher

than the mean, and there was an excess of zeros), a simple Poisson model was unsuitable [20]. The results were presented as incidence rate ratios (IRR), their 95% confidence intervals and predicted number of days. IRR indicates the rate between the predicted number of days in exposure groups. We used the same procedure (models 1-4) as for analyzing DP. The Wald Chi-Square test was used in both predictions to test statistically the effect of WAS and FWA.

For descriptive purposes the relationships between background, work- and health-related factors and self-reported work ability (WAS, FWA) were examined using t-tests or univariate analysis of variance. In addition, the relationships of work ability, background, work- and health-related factors with registered DP granted and long-term sickness absence days were examined using cross-tabulation with χ^2 test, t-test or univariate analysis of variance. All analyses were conducted with SPSS 23.0 for Windows (IBM Software, Chicago).

Results

Baseline characteristics and their associations with WAS and FWA are presented in Table 1. The majority of the participants were women (54%), living with a partner (66%), had no children living at home (58%), and working 35–40 hours per week (77%). The largest share of the participants were 35–49 years old (42%) and working in lower white-collar occupations (40%). On average the participants rated their work ability as good (Mean = 8.6 on a scale 1–10 and Mean = 2.8 on a scale 1–3). Altogether there were 87% reporting good WAS-based work ability and 96% reporting good FWA-based work ability. Both WAS- and FWA-based work ability declined with age. On the basis of WAS and FWA, those with children (under age 18) living at home and those employed in upper white-collar occupations reported better work ability than others.

Insert Table 1 about here

All the psychosocial work factors and health-related factors we examined were associated with both WAS- and FWA-based work ability. Of the psychosocial work factors, high mental demands had the strongest association with poor WAS-based and high physical demands with poor

FWA-based work ability. Health-related factors, however, were more strongly associated with work ability than these work factors.

Over the 3-year follow-up, 187 employees were granted DP, which amounts to 1.7% of the participants. Of the sample, 72.3% had no medically certified long-term absences during follow-up. For those who had at least one long-term sickness leave, the average was 51.7 days of absence during follow-up.

Table 2 shows that both WAS- and FWA-based work ability were strongly related to register-based DP and long-term sickness absence across three years. Of those who were granted DP, 36% had poor work ability according to WAS and 57% had poor work ability according to FWA. Of the background factors, old age, no children living at home and lower socioeconomic status were associated with having been granted DP. Also, weekly working hours played a role: the DP rate was higher (33.7% vs. 14.3%) among those with under 35 working hours per week. Of the psychosocial work factors, high physical demands and low job control were associated with being granted DP. In addition, DP was more common among participants with some long-standing illness, psychosomatic symptoms and previous sickness absences.

Insert Table 2 about here

Long-term sickness absence days (Table 2) decreased with better self-rated work ability: those with poor WAS-based work ability had on average 63 long-term absence days, whereas the corresponding figure was 11 days among those with good/excellent work ability. Among those with poor FWA-based work ability, the corresponding figures were 41 and 14 days. The same covariates related to DP also played a role in increasing long-term sickness days. In addition to these, those employees in the highest quartile of time pressure had more sickness days than the others.

Table 3 presents the HRs for DP related to baseline WAS- and FWA-based work ability. Both poor and moderate WAS-based work ability were associated with DP. Overall, adding covariates (in three separate models) had a considerable effect on the HR estimates. The HR related

to poor WAS-based work ability at baseline was 31.36 (95% CI 24.48−43.76) and when adjusted for all covariates it was 9.84 (95% CI 6.68−14.49). Of the covariates, in a fully adjusted model age, working hours and long-standing disease were significant ($p < 0.001$). Subjects aged 50−64 years had a 15.92 fold risk (95% CI 6.39−39.66) of DP compared to those aged 15−34. Those working 35 −40 hours per week had a 0.36 fold lower risk (95% CI 0.26−0.49) of DP than those working under 35 hours. Long-standing disease increased the fold risk of DP to 3.38 (95% CI 2.29−5.00) compared to those without such a disease. Similarly, the HR for DP related to poor FWA-based work ability decreased from 31.23 (95% CI 19.30−50.52) to 8.19 (95% CI 4.71−14.23) in a fully adjusted model. The same three covariates were significant: Subjects aged 50-64 years had an 11.84 fold risk (95% CI 2.79−50.28), working 35−40 hours per week had a 0.34 fold lower risk (95% CI 0.20−0.59) and those having long-standing disease had a 3.65 fold risk (95% CI 1.83−7.31) of DP.

Insert Table 3 about here

Both poor and moderate WAS-based and poor FWA-based work ability predicted long-term sickness absence days (Table 4). In the fully adjusted model IRR related to poor WAS-based work ability was 3.08 (95% CI 2.19−4.32) and IRR related to poor FWA-based work ability was 1.51 (95% CI 0.97−2.36). The IRR became non-significant in the fully adjusted model when health-related covariates (including sickness absence during the previous year) were added into the model (Model 4). Regarding WAS-based work ability among the covariates, gender (female), age (50−64), having no partner, lower socioeconomic status, low weekly working hours, high physical and mental demands, high time pressure and all health-related factors significantly ($p < 0.001$) predicted more long-term sickness days. Of these, female gender, old age, lower socioeconomic status, long-standing disease and sickness absence in previous year were also significant ($p < 0.001$) predictors of FWA-based work ability in a fully adjusted model.

Insert Table 4 about here

Discussion

Using register data on DP and long-term (> 10 days) sick leave, we found that both WAS and FWA predicted DP and long-term sick leave among Finnish employees over a three-year period. At baseline poor WAS-based work ability had an HR of 9.84 (6.68−14.49) and poor FWA-based work ability had an HR of 8.19 (4.71−14.23) during three years of follow-up. The same background (age 50−64), work-related (working hours under 35 hours per week) and health-related factors (long-standing illness) increased being granted DP in both predictions. These findings are in line with those of earlier studies, in which WAS or FWA predicted either register-based DP [3−4, 12] or self-reported DP [5, 10, 12, 14]. However, earlier studies have not studied simultaneously the predictive power of WAS and FWA in relation to DP, which turned out to be quite equal. It is worth noting that in our study the prediction of FWA was based on a smaller sample, which may indicate that increased power in the analysis may further increase the significance of FWA. FWA asks one‘s evaluation of work ability from health perspective and also DP is illness-based. This may explain why FWA was a good predictor of DP. In all, both WAS and FWA are useful items for use in general health surveys to monitor risk of DP.

It seems that in our study the HRs are higher than in those two earlier studies examining register-based DP and single items of WAI. In the study by Jääskeläinen et al. [3] WAS-based work ability had an HR of 2.66 (2.27−3.12) among Finnish municipal workers aged 44−58 years followed up 1981−2009. In the study by Lundin et al. [4] FWA-based work ability had an HR of 2.46 (1.81−3.35) over 7-year follow-up among Swedish employees aged 18−59. Both HRs reported were adjusted for background, work- and health-related factors. One reason for the higher HRs in our study may relate to the shorter follow-up time. It is quite natural that predictions are better at a short-term than a long-term perspective (see [5]).

When predicting long-term sick leave days, poor WAS had an IRR of 3.08 (2.19−4.32) and poor FWA an IRR of 1.51 (0.97−2.36) over a three-year period. When the predicted absence days

were on average 30 for poor WAS-based work ability, they were 17 days for poor FWA-based work ability. That is, they were at approximately the same level (15 days) as for moderate WAS-based work ability. In this case, WAS predicted long-term sick leave better than FWA. Thus our results suggest that a decrease in work ability compared to lifetime best is more significant for long-term sick leave than for predicting one's work ability in a two-year (health) perspective. Our results are in line with those of the study by Lundin et al. [5] in which WAS (but not FWA) was among those three single items having acceptable predictive validity in relation to long-term sickness absence. However, our finding gives a somewhat different picture compared to the study by Lindberg et al. [13], who found that FWA predicted long-term sickness absence four years later with reasonable accuracy to the whole WAI questionnaire. One reason for the observed difference may be that in the study by Lindberg et al. [13] long-term sick leave was defined as leave for 28 days or longer. In that case the evaluation of one's work ability based on one's health, as elicited in FWA, may function better than in the case of shorter sick leaves of over 10 days. Our finding makes also sense as a resource loss, as decreased WAS-based work ability, is based on the perception of former resources, and may therefore be anchored in reality better than evaluations concerning the future.

In both predictions partially same background (female gender, old age, lower socioeconomic status) and health-related factors (long-standing disease, sickness absence in previous year) predicted long-term sick leave in line with earlier studies [4, 13, 17, 21]. However, work-related factors did not play a significant role in predicting sick leave by FWA-based work ability, whereas the majority of these factors (short working hours, high physical and mental demands and high time pressure) were significant in predicting sick leave by WAS-based work ability. Thus work-related factors reduced the association between WAS and sick leave more than that between FWA and sick leave. This finding confirms that the evaluation of WAS is more dependent on working conditions than is FWA in line with the way FWA is asked.

A main strength of the present study is that it is based on a representative Finnish sample covering all sectors and occupations. Therefore the generalizability of our findings can be considered good. In addition, the WAS data covered different time periods from the late 1990's to the 2000's adding to the generalizability of these findings across time. Furthermore, we used register-based DP and long-term sick leave as outcomes, which are considered reliable measures. Finally, we were able to use several covariates for the most important background, work- and health-related confounders, thus excluding many so-called third factor explanations in the associations studied.

Despite these strengths, the study has certain limitations. First, we lack information on how long the participants had suffered from poor work ability. Thus follow-up measures of work ability would have improved the study design. Adding follow-up measures of exposure time is meaningful as accumulated long-term exposure to adverse working conditions has health effects. In addition, when examining the link between work and health from a longer life course perspective, multiple exposure and follow-up measures are necessary [22].

Second, we lack information on the reasons for which employees had been granted DP or sick leave. Therefore, we could only examine the association between work ability and all-cause DP and sick leave. Earlier studies, however, have shown that poor psychosocial work environment may increase the likelihood of DP due to depression [23–24]. As psychosocial factors at work play a crucial role in the development of work ability [14, 19, 25–27], in future studies the role of self-reported work ability in predicting DP due to depression or other mental disorders, which are the main reasons for granting DP, would be worth examining in more detail. According to Lundin et al. [5], the information on the diagnosis causing the sick leave could also contribute to the long-term predictive ability of self-rated work ability. Although in their study [5] the WAI and WAS had an acceptable ability to predict long-term (≥ 90 consecutive days) sick leave, on the basis of the study by Schouten et al. [28], the WAI (and likely its single items) may over-predict long-term sickness

absence over 90 days. Thus a certain cautiousness is needed when interpreting our sick leave results.

Third, we did not have information about the participants' health behaviour (e.g. alcohol consumption, smoking, low physical activity) which has been found to increase the risk of DP [29] and sick leave [4]. In addition, it should be borne in mind that the results for FWA are based on a smaller sample, as FWA was not included in the FQWLS until 2008. Therefore, lower statistical power in the analyses may play a role in the results for FWA-based work ability. Finally, national differences in retirement and sick leave policies may limit the generalization of the findings.

In conclusion, individuals' own evaluation of their work ability compared to lifetime best (WAS) and two years from now (FWA) predicted both DP and long-term (> 10 days) sick leave over a subsequent three-year period. Therefore both these items can be recommended singly for use in general health studies to examine the risk for labour market exclusion of two kinds.

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Table 1. Relationships of background, work- and health-related factors with WAS- and FWA-based work ability

	WAS (1–10)			FWA (1–3)		
	n (%)	M (SD)	t/F-test p	n (%)	M (SD)	t/F-test p
WAS-based work ability			-			<0.001
poor (0-5)	305 (2.7)	3.42 (1.91)		126 (3.0)	2.33 (0.73)	
moderate (6-7)	1163 (10.5)	6.80 (0.40)		442 (10.5)	2.85 (0.39)	
good/excellent (8-10)	9656 (86.8)	8.95 (0.79)		3629 (86.4)	2.98 (0.15)	
FWA-based work ability			<0.001		-	-
poor (1-2)	185 (4.4)	5.97 (2.63)			1.84 (0.36)	
good (3)	3974 (95.6)	8.64 (1.13)			3.00 (0.00)	
Gender			0.443			<0.001
male	5177 (46.5)	8.56 (1.32)		1921 (45.7)	2.96 (0.21)	
female	5954 (53.5)	8.58 (1.38)		2280 (54.3)	2.94 (0.28)	
Age (years)			<0.001			<0.001
15-34	3479 (31.3)	8.98 (1.11)		1269 (30.2)	2.98 (0.16)	
35-49	4708 (42.3)	8.56 (1.33)		1659 (39.5)	2.96 (0.22)	
50-64	2944 (26.4)	8.11 (1.50)		1273 (30.3)	2.90 (0.34)	
Living with a partner			<0.001			0.505
no	3742 (33.6)	8.64 (1.40)		1121 (26.7)	2.95 (0.24)	
yes	7389 (66.4)	8.54 (1.33)		3080 (73.3)	2.95 (0.26)	
Children living at home			<0.001			<0.001
no	6441 (57.9)	8.52 (1.40)		2478 (59.0)	2.94 (0.28)	
yes	4690 (42.1)	8.65 (1.29)		1723 (41.0)	2.97 (0.20)	
Socioeconomic status			<0.001			<0.001
blue-collar	3783 (34.0)	8.44 (1.51)		1291 (30.7)	2.92 (0.31)	
lower white-collar	4417 (39.7)	8.63 (1.32)		1681 (29.3)	2.95 (0.25)	
upper white-collar	2931 (26.3)	8.67 (1.17)		1229 (29.3)	2.98 (0.16)	
Weekly working hours			0.042			0.093
< 35	1620 (14.6)	8.64 (1.39)		573 (13.7)	2.93 (0.28)	
35-40	8516 (76.5)	8.56 (1.36)		3216 (76.8)	2.95 (0.24)	
>40	969 (8.7)	8.60 (1.22)		396 (9.5)	2.94 (0.28)	
Physical demands			<0.001			<0.001
low	7193 (64.6)	8.69 (1.23)		2746 (65.4)	2.97 (0.18)	
high	3933 (35.3)	8.36 (1.53)		1453 (34.6)	2.90 (0.34)	
Mental demands			<0.001			0.006
low	5392 (48.4)	8.75 (1.27)		2006 (47.8)	2.96 (0.22)	
high	5735 (51.5)	8.41 (1.41)		2193 (52.2)	2.94 (0.27)	
Time pressure			<0.001			<0.001
1 low	2645 (23.8)	8.81 (1.23)		918 (21.9)	2.97 (0.19)	
2	2689 (24.2)	8.66 (1.30)		1030 (24.5)	2.96 (0.24)	
3	2853 (25.6)	8.60 (1.21)		1146 (27.3)	2.96 (0.22)	
4 high	2944 (26.4)	8.25 (1.56)		1107 (26.4)	2.91 (0.33)	
Job control			<0.001			0.013
1 low	2648 (23.8)	8.42 (1.53)		936 (22.3)	2.93 (0.30)	

2	2953 (26.5)	8.51 (1.39)		1172 (27.9)	2.95 (0.24)	
3	2781 (25.0)	8.62 (1.22)		1067 (25.4)	2.95 (0.24)	
4 high	2748 (24.7)	8.75 (1.24)		1026 (24.4)	2.96 (0.22)	
Long-standing illness			<0.001			<0.001
no	7840 (70.4)	8.81 (1.08)		2858 (68.0)	2.98 (0.15)	
yes	3285 (29.6)	8.00 (1.72)		1341 (31.9)	2.88 (0.38)	
Psychosomatic symptoms			<0.001			<0.001
low	4055 (36.5)	8.97 (1.06)		1412 (33.6)	2.99 (0.12)	
medium	3483 (31.4)	8.67 (1.17)		1345 (32.0)	2.97 (0.18)	
high	3569 (32.1)	8.03 (1.62)		1442 (34.3)	2.89 (0.37)	
Sickness absence in previous year			<0.001			<0.001
no	9923 (89.1)	8.66 (1.23)		3701 (88.1)	2.97 (0.19)	
yes	1208 (10.9)	7.84 (1.97)		500 (11.9)	2.81 (0.47)	
Year at baseline			0.001			
1997	2932 (26.3)	8.63 (1.37)				
2003	3998 (35.9)	8.59 (1.33)				
2008	4201 (37.7)	8.51 (1.37)		4201 (100.0)	2.95 (0.25)	

Table 2. Relationships of WAS- and FWA-based work ability, background, work- and health-related factors with registered disability pension and long-term sickness absence across three years

	Disability pension awards (%)		χ^2 test p	Long-term sickness days		t/F-test p
	No[1]	Yes[2]		M	SD	
WAS-based work ability			<0.001			<0.001
poor (0-5)	2.2	35.7		63.4	93.1	
moderate (6-7)	10.2	24.9		26.7	63.7	
good/excellent (8-10)	87.6	39.5		11.3	37.7	
FWA-based work[3] ability			<0.001			<0.001
poor (1-2)	3.6	57.4		41.3	77.9	
good (3)	96.4	42.6		13.5	42.9	
Gender			0.886			0.012
male	46.5	46.0		13.2	44.6	
female	53.5	54.0		15.3	44.5	
Age			<0.001			<0.001
15-34	31.7	2.7		7.5	23.4	
35-49	42.6	26.2		14.3	43.3	
50-64	25.7	71.1		22.4	59.2	
Living with a partner			0.655			0.288
no	33.6	32.1		13.7	44.2	
yes	66.4	67.9		14.7	22.7	
Children living at home			<0.001			<0.001
no	57.5	80.2		15.7	48.0	
yes	42.5	19.8		12.5	39.2	
Socioeconomic status			<0.001			<0.001
blue-collar	33.8	47.1		19.3	53.1	
lower white-collar	39.7	36.9		13.9	42.2	
upper white-collar	26.5	16.0		8.6	33.6	
Weekly working hours			<0.001			<0.001
< 35	14.3	33.7		15.1	48.7	
35-40	77.0	60.4		14.4	44.1	
>40	8.8	5.9		12.3	41.9	
Physical demands			<0.001			<0.001
low	64.9	48.4		11.4	39.4	
high	35.1	51.6		19.7	52.3	
Mental demands			0.541			0.015
low	48.5	46.2		13.3	42.5	
high	51.1	53.8		15.3	46.4	
Time pressure			0.410			<0.001
1 low	23.8	22.5		13.8	44.9	
2	24.2	20.9		12.3	39.7	
3	25.6	25.1		13.6	44.2	
4 high	26.4	31.6		17.3	48.5	

Job control			<0.001			<0.001
1 low	23.6	36.9		17.9	50.6	
2	26.6	25.1		14.1	45.1	
3	25.1	19.8		12.6	39.6	
4 high	24.8	18.2		13.0	42.3	
Long-standing illness			<0.001			<0.001
no	71.3	19.9		10.1	34.9	
yes	28.7	80.1		24.7	30.6	
Psychosomatic symptoms			<0.001			<0.001
low	36.8	18.0		9.8	35.2	
medium	31.5	21.9		13.0	41.9	
high	31.7	60.1		20.7	54.3	
Previous yeas sickness absence			<0.001			<0.001
no	89.7	57.2		11.6	39.4	
yes	10.3	42.8		36.8	70.4	
Year at baseline			0.975			0.142
1997	26.3	26.2		13.0	41.4	
2003	35.9	35.3		15.0	46.1	
2008	37.7	38.5		14.6	45.2	

Note.

[1] n = 182

[2] n = 10944

[3] Concerns only 2008

Table 3. WAS- and FWA-based work ability at baseline predicting granting of disability pension (DP) over a 3-year follow-up

	n	Good/ excellent (8-10) HR	Moderate (6-7) HR	95% CI	Poor (0-5) HR	95% CI	Wald Chi-Square[1]	df	p
WAS									
Model 1	11124	1.00	5.30	3.66–7.66	31.36	24.48–43.76	411.11	2	<0.001
Model 2	11124	1.00	3.50	2.41–5.09	19.60	13.88–27.61	288.82	2	<0.001
Model 3	11096	1.00	3.31	2.26–4.83	17.91	12.50–25.66	248.79	2	<0.001
Model 4	11072	1.00	2.25	1.51–3.35	9.84	6.68–14.49	139.65	2	<0.001
FWA		Good (3)	-		Poor (1-2)				
Model 1	4159	1.00	-		31.23	19.30–50.52	196.72	1	<0.001
Model 2	4159	1.00	-		17.33	10.42–28.81	120.95	1	<0.001
Model 3	4144	1.00	-		13.98	8.17–23.90	92.79	1	<0.001
Model 4	4144	1.00	-		8.19	4.71–14.23	55.63	1	<0.001

[1] The Wald Chi-Square tests the effect of WAS and FWA on disability pension. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Note. Model 2 adjusted for background factors (gender, age, living with a partner, having children living at home, socioeconomic status, year of data collection).

Model 3 additionally adjusted for work-related factors (weekly working hours, physical demands, mental demands, time pressure, job control).

Model 4 additionally adjusted for health-related factors (long-standing illness, psychological symptoms, self-reported sickness absence in previous year).

Table 4. WAS- and FWA-based work ability at baseline predicting long-term sickness absence days over a 3-year follow-up

		Good/ excellent (8-10)		Moderate (6-7)				Poor (0-5)				Wald Chi-Square[1]	df	p
	n	IRR	Predicted days	IRR	95% CI		Predicted days	IRR	95% CI		Predicted days			
WAS														
Model 1	10958	1	11.28	2.37	1.98	2.84	26.72	5.62	4.00	7.89	63.39	65.76	2	<0.001
Model 2	10958	1	10.32	2.08	1.74	2.49	21.48	4.71	3.36	6.58	48.54	55.47	2	<0.001
Model 3	10935	1	10.21	2.06	1.72	2.47	21.02	4.59	3.27	6.43	46.80	53.45	2	<0.001
Model 4	10912	1	9.73	1.59	1.32	1.92	15.45	3.08	2.19	4.32	29.92	29.67	2	<0.001
FWA		Good (3)		-				Poor (1-2)						
Model 1	4096	1	13.46	-				3.06	1.96	4.79	41.25	9.13	1	0.003
Model 2	4096	1	12.04	-				2.29	1.47	3.57	27.60	6.43	1	0.011
Model 3	4082	1	11.76	-				2.26	1.45	3.53	26.59	6.28	1	0.012
Model 4	4082	1	10.92	-				1.51	0.97	2.36	16.51	2.26	1	0.113

[1] The Wald Chi-Square tests the effect of WAS and FWA on accumulated sickness absence days. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Note. Model 2 adjusted for background factors (gender, age, living with a partner, having children living at home, socioeconomic status, year of data collection).

Model 3 additionally adjusted for work-related factors (weekly working hours, physical demands, mental demands, time pressure, job control).

Model 4 additionally adjusted for health-related factors (long-standing illness, psychological symptoms, self-reported sickness absence in previous year).