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Cumulated and most recent job control and risk of disability pension in the Danish Work Life Course Cohort (DaWCo)

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Background: Previous studies have found low job control to be associated with a higher risk of disability pension (DP). Most studies have measured job control only at one time-point, and there is a lack of knowledge regarding the role of exposure duration. This study examines the prospective association between job control and DP measuring exposure both cumulated throughout work life and most recent. **Methods:** We included 712 519 individuals (about 4.5 million person-years) from The Danish Work Life Course Cohort which follows young employees in Denmark from their entry into the labour market. Job control was assessed with a job exposure matrix and DP with register data on public transfer payments. We adjusted for several potential life course confounders, including physical demands at work and parental socioeconomic position and psychiatric and somatic diagnoses. **Results:** Employees in occupations with low job control had a higher risk of DP. There were effects of both cumulated and most recent job control when mutually adjusted. Fully adjusted hazard ratios (HRs) were 1.14 [95% confidence intervals (CIs) 1.11–1.17] and 1.15 (95% CI 1.02–1.29) for cumulated and most recent job control, respectively. Without mutual adjustment, estimates were 1.15 (95% CI 1.13–1.18) and 1.55 (95% CI 1.39–1.72) for cumulated and most recent low job control, respectively. **Conclusions:** Low job control predicts a higher risk of DP, even after adjustment for physical demands at work. The results indicate both gradual and short-term effects of low job control on DP risk.

Introduction

Job control is the combination of decision authority and skill discretion at work[1] and is a predictor of disability pension (DP).[2] A recent systematic review based on 39 studies concluded that low job control was consistently associated with DP with a weighted average relative risk of 1.40 (95% CI 1.21–1.61). When compared with other psychological, social and organizational factors included in the review job control showed the most robust association with risk of DP.[2]

Existing studies on the association between job control and DP are limited by several methodological concerns. First, most previous studies include little information on exposure duration which could lead to underestimation of associations, since studies indicate that longer, compared with shorter, duration is more harmful.[3,4] Second, most studies were based on populations that were not followed from labour market entry and consequently may be affected by healthy worker bias. Such bias likely leads to lower estimates due to not including individuals in the population who were already granted DP. Third, estimates from previous studies may be biased due to selection of employees into and/or out of jobs with low job control. Such a selection is probable, as research has demonstrated links between childhood social factors, educational attainment, labour market entry and psychosocial working conditions in adulthood.[5–9] Analyses failing to account for pre-existing DP risk factors among individuals with lower job control may overestimate the association between job control and DP. Fourth, most studies may be affected by reporting bias likely leading to overestimation of associations, since the psychological state of the individual may affect both the reporting of job control at baseline and DP risk during follow-up.[10]

Finally, physical demands at work may be associated with both job control and DP and might therefore confound associations between job control and DP; however, most previous studies have not adjusted for physical work demands.[2]

This study examines prospective associations between job control and DP while accounting for the mentioned limitations. We analyzed data from 712 519 young employees in Denmark, followed from their labour market entry. We included several measures on childhood social factors, measured job control repeatedly, assessed job control by a job exposure matrix (JEM) and adjusted for physical work demands. We hypothesized that low job control would be associated with a higher risk of DP, and that the association would remain after adjustment for physical demands. We included both cumulated and most recent job control in all main and pre-planned sensitivity analyses to analyze the effect of cumulated job control on DP risk beyond the effect of most recent job control and vice versa, allowing us to distinguish between gradual and short-term effects.

Methods

Design

We analyzed data from The Danish Work Life Course Cohort (DaWCo) consisting of nationwide registers and a questionnaire based JEM. DaWCo is described in details elsewhere.[11–13] Briefly, DaWCo consists of all individuals living in Denmark, who entered the labour market for the first time during 1995–2009 aged 15–30 years. Labour market entry was defined by being included in The Integrated Database for Labour Market Research[14] and simultaneously having gainful employment as main source of income for the first time in the Employment Classification Module.[14] Since DP is usually preceded by non-employment, we applied a 4-year time-lag between exposure and outcome. This is the average time from employment to first DP episode in DaWCo. Main analyses were based on a published study protocol.[11]

Population

Of the 979 257 individuals with labour market entry during the study period, we excluded individuals with missing information on sex or migration background ($n = 5176$). We also excluded individuals who died ($n = 71$), emigrated ($n = 13\,087$) or received DP ($n = 361$) during entry year, or had received DP previously ($n = 158$), yielding a cohort of 960 404 individuals. To ensure a 4-year time-lag between exposure and outcome, we excluded 247 885 individuals with <4 years of follow-up, yielding a final population of 712 519 individuals who entered the workforce in 1995–2006. Of the individuals that were excluded to ensure the 4-year time-lag between exposure and outcome, 80% entered the DaWCo in 2007–09. Less than 0.5% of excluded individuals were granted DP. When compared with the study population, excluded individuals were similar regarding distribution of sex, but were more likely to emigrate.

Job control

We measured job control with a JEM based on the Danish Work Environment Cohort Study (DWECS). DWECS was a survey on working conditions and health, conducted in a random sample of the Danish workforce from 1990 to 2010.15,16 Using multilevel modelling, we constructed JEMs as the predicted level of job control given occupation [according to DISCO-88, the Danish version of the International Standard Classification of Occupations (ISCO)-88 system], sex, age and year of data collection (2000 and 2005). Occupation explained a considerable proportion of the variation in job control (Intra-class correlation = 0.30), indicating that job control is suitable for JEMs.[17] DWECS items, response options and JEM construction are described in detail elsewhere.[11]

We assigned job control scores to each individual with yearly updates from 1995 to 2006 with higher scores indicating lower job control. Cumulated job control was measured as the sum of job control scores from each cohort year, whereas most recent job control was measured as the job control score valid for the given year. In years of non-employment, we assigned a score equal to the lowest score amongst employed individuals.

Disability pension

We identified DP in the Danish Register for Evaluation of Marginalization (DREAM) including weekly information on social transfer payments.[18] We measured DP as the first record coded '783' (DP) within the year 4 years after the exposure measurement year, throughout follow-up from 1 January 1999 to 31 December 2010. For example, exposures measured in 1995 were linked with outcomes that occurred in 1999.

In Denmark, DP is granted and payed for by municipalities based on an overall work ability assessment. Part-time DP and returning to work from DP is rare in Denmark.[19]

Covariates

Based on national registers,[14,20–25] we included information on the following covariates concerning the population: age (continuous), sex, migration background (individuals without migration background, immigrants/descendants of immigrants), cohabitation (yes, no), income (deciles), education (highest completed categorized into primary or lower secondary, upper secondary, short-cycle tertiary, bachelor, master, doctoral, missing), psychiatric disorder prior to 15 years (yes, no), employment status (employed, self-employed, unemployed, studying, other non-employment), years of non-employment since cohort entry (continuous), years of employment since cohort entry (continuous) and physical work demands (most recent, JEM based[17]).

We included information concerning parents of the population when the study individual was 15 years: parental labour market status (employed, un-/non-employed and missing), parental educational level (primary or lower secondary, upper secondary, short-cycle tertiary, bachelor or equivalent, master or doctoral, missing), diagnosed parental mental disorder (yes, no) and somatic diseases (yes, no) and, availability of parental information (non-missing, missing).

Supplementary figure S1 shows the analytical framework in form of a directed acyclic graph. All covariates were measured before or concurrently with exposures.

Statistical analysis

We conducted all analyses using SAS 9.4. Using Cox regression with calendar time as the underlying time axis accounting for period effects of the DP granting system, we calculated hazard ratios (HRs) and 95% CI for associations between job control and DP. We included each individual in the analyses with repeated observations relating job control during year 't' to first DP record during year $t + 4$ years, i.e. 4 years after exposure assessment. The population was followed from cohort entry until first DP episode ($n = 7305$), emigration ($n = 4937$), death ($n = 1743$) or end of study on 31 December 2010.

We included both cumulated and most recent job control in the models. In model 1, we adjusted for age, sex, ethnicity, cohabitation, income, education, employment status, psychiatric disorder prior to 15 years, years of non-employment and years of employment since cohort entry, parental labour market status and education, parental mental and somatic diagnosed diseases prior to individuals' cohort entry and finally, missing parental information. In model 2, we further adjusted for physical work demands.

Age, cohabitation, income, education, employment status, years of non-employment since cohort entry, years of employment since cohort entry and physical work demands were included as time-varying covariates. Remaining covariates were time-invariant.

Pre-planned sensitivity analyses

We repeated analyses by sex and industrial sector. Further, we analyzed job control as a dichotomous variable (median split) for each exposure year. Finally, we analyzed associations between job control and DP in the presence of mental and/or musculoskeletal disorders using a competing risks model. We did this because we wanted to explore whether job control was differently associated with DP due to mental disorders vs. DP due to musculoskeletal disorders. Diagnoses were retrieved from the National Patient Register[24] from birth and prior to DP granting, since DREAM does not include this information. We included diagnoses according to ICD-10 classification system for the following two groups: mental disorders (F00–F99) and musculoskeletal disorders (M00–M99), the two most frequent reasons for granting DP.[26,27] We defined four events: diagnosed mental disorder(s), diagnosed musculoskeletal disorder(s), a combination of diagnosed mental and musculoskeletal disorders and no diagnosed disorder(s).

Post-hoc sensitivity analyses

We repeated the fully adjusted main analysis while only including one exposure measure in the model; that is cumulated job control not controlled for most recent and vice versa.

Results

Population

Table 1 shows characteristics of the population at cohort entry year. About half of the population was women (49.2%). Mean age was 20.0 years. Most individuals were born in Denmark (88.7%) and had primary or lower secondary education as highest completed education (73.9%). Two thirds were cohabiting (66.7%). Most individuals' parents had primary or lower secondary or upper secondary education as highest completed education (in total, 45.4% and 37.7% for maternal and paternal education, respectively) and were employed (71.1% and 76.7% for maternal and paternal employment, respectively).

Cumulated and most recent job control and DP

During 4 461 058 person-years of follow-up, we identified 7305 DP cases (16.38 per 10 000 person-years). Table 2 shows that both cumulated and most recent job control were associated with risk of DP. Comparing individuals in occupations with lower cumulated job control to individuals in occupations with higher cumulated job control yielded a HR for DP of 1.14 (95% CI 1.11–1.17) per 1 point lower job control after accounting for most recent exposure. The HR for the association between most recent job control and DP after accounting for cumulated exposure was 1.51 (95% CI 1.36–1.67).

Job control and DP accounting for physical demands

Table 2 also shows results for the associations with further adjustment for physical demands. The estimate for cumulated job control was not affected by adjustment for physical demands (HR = 1.14, 95% CI 1.11–1.17). The estimate for most recent job control (HR = 1.15, 95% CI 1.02–1.29) attenuated.

Pre-planned sensitivity analyses

Table 2 further shows associations between exposures and DP risk by sex. Cumulated job control predicted a higher DP risk in model 2 in both sexes. The estimate was, however, higher in men (HR = 1.24, 95% CI 1.20–1.29) than women (HR = 1.04, 95%CI 1.00-1.08). Associations between most recent exposure and DP were similar in men (HR = 1.54, 95% CI 1.33–1.77) and women (HR = 1.48, 95%CI 1.28–1.72) in model 1, and were strongly attenuated in both sexes in model 2.

Table 1 Characteristics of the study population in their year of entry into the workforce

	n	%	Mean
Total sample	712 519		
Sex			
Men	361 642	50.8	
Women	350 877	49.2	
Age			20.0
15–17	80 257	11.3	
18–19	286 096	40.2	
20–24	287 329	40.3	
25–30	58 837	8.3	
Cohabitation			
Yes	475 516	66.7	
No	219 174	30.8	
Unknown	17 829	2.5	
Ethnicity			
Danish	631 790	88.7	
Non-Danish	80 729	11.3	
Education			
Primary or lower secondary	526 366	73.9	
Upper secondary	137 729	19.3	
Short-cycle tertiary	3374	0.5	
Bachelor or equivalent	9601	1.4	
Master or equivalent	4161	0.6	
Doctoral or equivalent	8	0.0	
Not classified/unknown	31 280	4.4	
Maternal psychiatric diagnosis			
Yes	44 028	6.2	
No	622 147	87.3	
Paternal psychiatric diagnosis			
Yes	40 818	5.7	
No	616 696	86.6	
Maternal somatic diagnosis			
Yes	30 288	4.3	
No	635 887	89.2	
Paternal somatic diagnosis			
Yes	41 172	5.8	
No	616 342	86.5	
Maternal education			
Primary or lower secondary	158 885	22.3	
Upper secondary	164 884	23.1	
Short-cycle tertiary	11 068	1.6	
Bachelor or equivalent	79 999	11.2	
Master or doctoral	15 327	2.2	
Not classified/unknown	282 356	39.6	
Paternal education			
Primary or lower secondary	86 682	12.2	
Upper secondary	181 964	25.5	
Short-cycle tertiary	15 535	2.2	
Bachelor or equivalent	40 236	5.7	
Master or doctoral	32 492	4.6	
Not classified/unknown	355 610	49.9	
Maternal occupational position			
Employed	506 728	71.1	
Non-employed	147 511	20.7	
Unknown	58 280	8.2	
Paternal occupational position			
Employed	546 818	76.7	
Non-employed	92 483	13.0	
Unknown	73 218	10.3	
Missing maternal data	46 344	6.5	
Missing paternal data	55 005	7.7	

Note: Maternal and paternal diagnosis, education and occupational position at the time when the study participant was 15 years old.

When analyzing risk of DP in relation to job control as a dichotomous variable, the HR for low job control was 1.13 (95% CI 1.05–1.22) in model 1. In model 2, there was no longer an association.

Table 3 shows estimates for DP risk by industry. There was a higher DP risk for either cumulated or most recent exposure in six of eight industries (Manufacturing, Construction, Retail trade, Financial intermediation, Public and personal services, and Activity

Table 2 Risk of DP in relation to cumulated and most recent levels of job control

	PY	Cases	Cases per 10 000 PY	Model 1 HR	95% CI	Model 2 HR	95% CI
Total population							
Cumulated level of job control, per point decrease	4 461 058	7305	16.38	1.14	1.11–1.17	1.14	1.11–1.17
Most recent level of job control, per point decrease	4 461 058	7305	16.38	1.51	1.36–1.67	1.15	1.02–1.29
Men							
Cumulated level of job control, per point decrease	2 257 749	3733	16.53	1.24	1.20–1.29	1.24	1.20–1.29
Most recent level of job control, per point decrease	2 257 749	3733	16.53	1.54	1.33–1.77	1.17	1.00–1.38
Women							
Cumulated level of job control, per point decrease	2 203 310	3572	16.21	1.04	1.00–1.07	1.04	1.00–1.08
Most recent of level of job control, per point decrease	2 203 310	3572	16.21	1.48	1.28–1.72	1.06	0.90–1.26
Most recent job control, dichotomized							
Low (≤ median job control)	2 632 858	5699	21.65	1.13	1.05–1.22	1.01	0.94–1.09
High (ref.) (>median job control)	1 828 200	1606	8.78	1.0	Ref.	1.0	Ref.

Notes: Cumulated and most recent levels of job control are included in the same models (mutually adjusted). Model 1: estimates are adjusted for age, sex, ethnicity, cohabitation, income, education, employment status, psychiatric disorder prior to the age of 15, years of non-employment, years of employment, parental labor market status and educational level, parental mental and somatic diagnosed diseases and missing parental information. Model 2: estimates are further adjusted for physical demands at work. PY, Person-years.

Table 3 Risk of DP in relation to cumulated and most recent levels of job control by industry

	PY	Cases	Cases per 10 000 PY	Model 1		Model 2	
				HR	95% CI	HR	95% CI
Agriculture, fishing and quarrying							
Cumulated level of job control, per point decrease	115 410	154	13.34	1.19	(0.95–1.47)	1.18	(0.95–1.47)
Most recent level of job control, per point decrease	115 410	154	13.34	1.63	(0.73–3.62)	1.34	(0.52–3.43)
Manufacturing							
Cumulated level of job control, per point decrease	537 488	904	16.82	1.22	(1.15–1.29)	1.21	(1.14–1.28)
Most recent level of job control, per point decrease	537 488	904	16.82	1.20	(0.96–1.50)	0.76	(0.55–1.04)
Construction							
Cumulated level of job control, per point decrease	295 850	256	8.65	1.13	(0.99–1.31)	1.14	(0.99–1.31)
Most recent level of job control, per point decrease	295 850	256	8.65	2.29	(1.19–4.40)	2.35	(1.22–4.55)
Retail trade; hotels and restaurants							
Cumulated job control, per point decrease	1 119 213	931	8.32	1.20	(1.10–1.30)	1.20	(1.10–1.30)
Most recent level of job control, per point decrease	1 119 213	931	8.32	1.38	(1.02–1.87)	1.19	(0.85–1.66)
Transport, storage and communication							
Cumulated level of job control, per point decrease	219 464	259	11.80	1.12	(0.98–1.29)	1.12	(0.97–1.28)
Most recent level of job control, per point decrease	219 464	259	11.80	1.11	(0.68–1.82)	1.06	(0.60–1.86)
Financial intermediation, business etc.							
Cumulated level of job control, per point decrease	490 868	508	10.35	1.21	(1.10–1.32)	1.19	(1.09–1.31)
Most recent level of job control, per point decrease	490 868	508	10.35	1.76	(1.25–2.50)	0.73	(0.48–1.09)
Public and personal services							
Cumulated level of job control, per point decrease	1 192 806	1346	11.28	0.99	(0.94–1.04)	1.00	(0.94–1.05)
Most recent level of job control, per point decrease	1 192 806	1346	11.28	1.82	(1.49–2.23)	1.36	(1.08–1.72)
Activity not stated							
Cumulated level of job control, per point decrease	483 025	2944	60.95	1.15	(1.10–1.20)	1.15	(1.10–1.20)
Most recent level of job control, per point decrease	483 025	2944	60.95	1.50	(0.49–4.59)	0.79	(0.20–3.08)

not stated). Figure 1 illustrates model 2 estimates by industry and shows HRs ranging from 1.19 (95% CI 1.09–1.31, cumulated exposure, Financial intermediation industry) to 2.35 (95% CI 1.22–4.55, most recent exposure, Construction industry).

For job control and risk of DP in the presence of mental disorder(s), musculoskeletal disorder(s), both or no disorder(s), we found largely similar associations (results shown in Supplementary e-Table S1).

Post hoc sensitivity analyses

When repeating the fully adjusted model while not mutually adjusting cumulated and most recent low job control, we found estimates of 1.15 (95% CI 1.13–1.18) and 1.55 (95% CI 1.39–1.72) for cumulated and most recent low job control, respectively.

Discussion

This study was based on DaWCo following 712 519 employees from labour market entry, measuring job control repeatedly using a JEM and included several measures of childhood social factors. Including both cumulated and most recent job control in the statistical models, we found that there was an association between cumulated job control and risk of DP independent of most recent exposure, and that there was an association between low most recent job control and risk of DP independent of cumulated exposure. Associations remained after adjustment for physical demands, the estimate for most recent exposure; however, attenuated strongly.

Fully adjusted sex-stratified analyses showed that cumulated job control predicted DP in both sexes, but estimates were higher in men. A higher DP risk in relation to most recent exposure was seen in both sexes before, but not after adjustment for physical demands. Associations were seen in most but not all industries, and no substantial differences were seen when distinguishing between DP preceded by diagnosed mental or musculoskeletal disorder or both. Finally, *post-hoc* sensitivity analyses including only one exposure measurement in each model showed similar results for cumulated job control but a stronger association for most recent exposure.

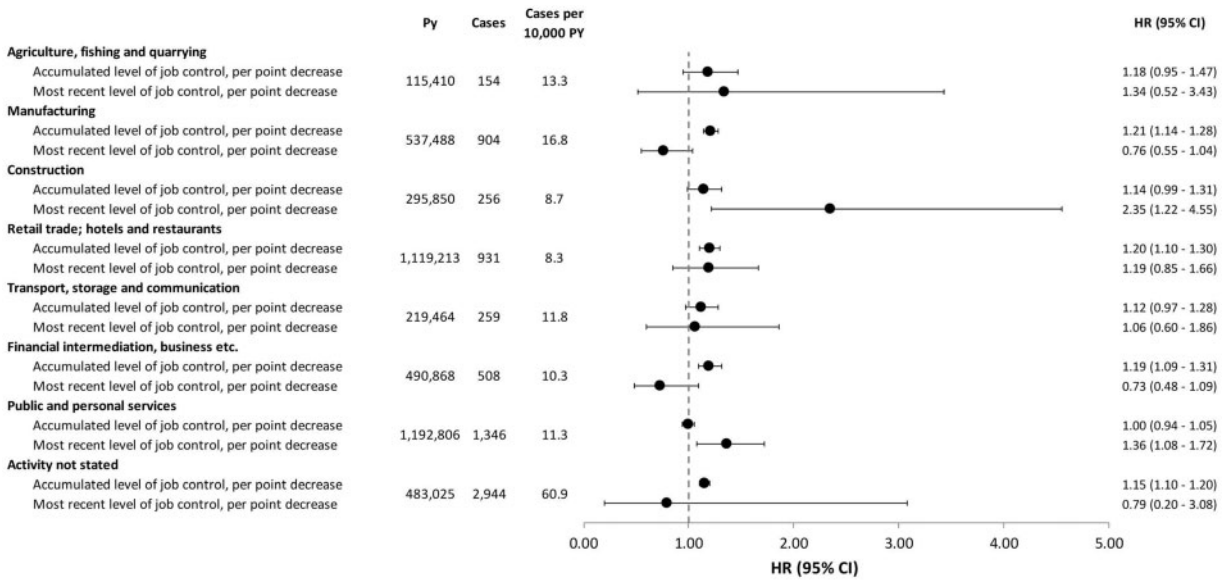

Figure 1 DP in relation to cumulated and most recent level of job control by industry. Cumulated and most recent levels of job control are included in the same models (mutually adjusted). HRs are adjusted for age, sex, ethnicity, cohabitation, income, education, employment status, psychiatric disorder prior to the age of 15, years of non-employment, years of employment, parental labour market status and educational level, parental mental and somatic diagnosed diseases, missing parental information and physical demands at work. PY, Person-years; HR, hazard ratio

Comparison with previous studies

Our results are in agreement with a systematic review concluding that low job control predicts DP.[2] We added new knowledge by accounting for limitations in previous studies related to healthy worker bias, selection of employees into and/or out of jobs with low job control, lack of exposure duration information and reporting bias. Further, our results are also in agreement with register-based twin studies concluding that associations between psychosocial working conditions and DP seem independent of familial confounding.[28,29]

To the best of our knowledge, this study is the first to analyze effect of cumulated job control on DP using repeated exposure measurements. Previously, one study[4] reported an association between job control throughout working life and DP. That study, however, measured job control only once, in midlife, when participants were asked to retrospectively assess job control. Our study contributes with new insights on effects of cumulated and most recent job control, as we found independent effects of both. This suggests that effects of job control on DP are both gradual and short term, simultaneously, and that including exposure history is important to gain a more complete picture. It should be noted that cumulated and most recent job control are highly correlated, but due to the large number of observations, identification of the effect of both cumulated and most recent job control is possible simultaneously. The estimate for most recent job control when not mutually adjusting for cumulated job control (HR = 1.55, 95% CI 1.39–1.72) may be the most comparable estimate in relation to estimates found in previous studies (weighted average RR = 1.40, 95% CI 1.21–1.61).[2]

Studies on job control and DP differ regarding included covariates.[2] Some studies included adjustment for physical demands, others did not, and among studies adjusting for physical demands results were mixed.[2] Our results suggest that effects of cumulated job control on DP are independent from those of physical demands in both sexes. For most recent job control that was not the case. The reason may be that the measurement of physical demands better captures recent than historical physical job demands.

We found low job control to predict a higher DP risk in most, but not all industries. A study by Clausen *et al.*[30] found influence at work to predict DP in a large sample of the Danish workforce and in most, but not all, subtypes of work. It appears that associations are robust at the population level, although more research is needed to establish if these associations hold in all subgroups of industries and different types of work.

Strengths and limitations

Strengths include the large, nationwide cohort of employees followed from labour market entry onwards and the use of annually repeated exposure and covariate measurements allowing us to examine cumulated and most recent exposure. Moreover, we accounted for several childhood social factors, physical demands and changes over time in the DP granting system by using calendar time as time axis.

Some limitations should be mentioned. First, we assessed job control using a JEM. Therefore, associations should be interpreted in relation to occupations, i.e. as risk of DP in employees in occupations with lower job control compared with employees in occupations with higher job control. The use of the JEM methodology results in some exposure misclassification, as some employees could have a low level of individual exposure while working in occupations with an average high level of exposure and vice versa, likely leading to underestimation of the observed associations.[31] Second, the register used for outcome measurement did not include information on medical causes of DP. Therefore, we do not know whether DP was due to mental disorders, somatic diseases or both. We tried to address this limitation by adding information on diagnosed somatic diseases and psychiatric disorders from The National Patient Register and found largely similar associations. Third, while the present study included information on childhood social factors, DaWCo does not include information on childhood adversities, such as alcohol-related problems, which have been shown to be associated with DP.[7] Fourth, we did not include adjustments for other psychosocial factors at work in our analyses. A recent review reported that while the evidence for the role of job control in relation to DP is more robust than the evidence for other psychological and organizational factors at work, those other factors may also play a role in relation to risk of DP.[2] However, other psychosocial work factors, e.g. repetitive tasks or bullying or violence at work, are not necessarily confounders, they could also partly be consequences of low job control and therefore could be mediators in the association between low job control and risk of DP. We suggest that future

studies examine how job control relates to other psychosocial factors in relation to DP. Finally, generalizability is a limitation. We consider our results generalizable to the Danish workforce, but since national DP granting systems differ, our results may not be generalizable to other countries' workforces.

Conclusions

Cumulated and most recent lower job control predict a higher DP risk after mutual adjustment and after adjustment for physical demands at work in this cohort following young employees in Denmark from labour market entry onwards. Our analyses accounted for reporting bias and selection of employees with a higher DP risk into occupations with lower job control. Our findings suggest that mechanisms linking job control with DP are both gradual and short term and that including exposure history is important to gain a more complete picture of the effects of job control on DP.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

- Both cumulated and most recent job control independently predicted risk of disability pension (DP), indicating that mechanisms linking job control with DP are both gradual and shorter term.
- Including exposure history is important to gain a more complete picture of the effects of job control on DP.
- Job control remained associated with a higher risk of DP after adjustment for physical demands at work.
- Associations between job control and DP were not explained by risk factors pre-existing labour market entry.
- Increasing job control may help prevent DP in younger employees in Denmark.

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Socioeconomic factors in disability retirement due to mental disorders in Finland

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Background: Previous research has identified low socioeconomic status (SES) as an epidemiological risk factor for early retirement and disability pension (DP) due to mental disorders. This study aims to examine these associations in greater detail, with separate consideration of the risk factors for mood disorders (F30–39) and non-affective psychotic disorder (F20–29) DP. **Methods:** In this case–control setting the subjects ($N = 36\ 879$) were all those granted DP due to a mental disorder for the first time between 2010 and 2015 in Finland. All the subjects were matched with three controls for their gender, age and hospital district ($N = 94\ 388$). Three measures of dimensions of SES were used: education, income and occupational status, as well as family type as a control factor. Differences between DP recipients and controls, and between diagnostic groups, were studied using calculated characteristics and conditional logistic regression models. **Results:** DP recipients often lived alone and had low educational and income levels. These characteristics were more prominent in non-affective psychotic disorder than in mood disorder DP. In white-collar occupational groups, the risk of DP was greater compared with blue-collar workers. Students were associated with the highest level of risk for all mental and mood disorder DPs. **Conclusions:** We found evidence of SES factors associating with mental disorder-related severe loss of working and studying ability in a disorder-specific way. Notably, white-collar workers had an increased risk of mental disorder DP. This could be related to the psychosocially demanding contemporary working life in non-manual work.

Introduction

Mental disorders are the leading cause of disability retirement in Finland. In 2018, over half (52%, 103 000 people) of all disability pensions (DPs) and over one-third (37%, over 8000 people) of all new DPs in Finland were granted primarily on the basis of a mental disorder diagnosis.[1] In the Finnish DP scheme, the applicant is required to have impaired working ability and sickness benefits for 300 days before applying for DP. The application for temporary or permanent DP is then evaluated nationally by medical insurance specialists.

Previous research has identified low socioeconomic status (SES) and social/income inequality as important epidemiological risk factors for mental disorders.[2–11] Definitions of SES vary and several factors contribute to it, the most common in the literature being education, occupation and income.[12] In addition to SES, a person's living arrangement or type of family can be an important factor affecting mental health. In Finland, people living alone and/or unmarried have been shown to have more psychiatric symptoms and disorders than those who are cohabiting.[8,13,14]

Low SES consequently also predicts a greater risk of mental disorder DP. Studies have found a link between low occupational status,[15–18] unemployment,[19,20] low education[15,21,22] or low income[23] and increased risk of DP. Interestingly, a study by Leinonen *et al.*[24] identified a non-linear link between occupational status and mental disorder DP, whereas in the same study the link was linear in the case of DP for all reasons and due to musculoskeletal diseases. In this study, semi-professionals and routine white-collar employees had a higher risk of mental disorder DP than managers, professionals and blue-collar workers. This may indicate that the association between occupational status and DP might not be as straightforward as in the case of other SES factors.

The effects of individual SES factors on health and DP can to some extent be explained and mediated through the other SES factors, especially because a person's education and occupational status