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Work-related psychosocial factors that are measured once may not provide an accurate estimate of long-term exposure. Thus, we used repeated measures of organizational justice to evaluate its association with disability pension in a cohort of 24 895 Finnish public sector employees. High organizational justice was associated with lower risk of disability pension due to depression and musculoskeletal diseases.

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Key terms: depression; disability; disability pension; disability retirement; early exit; Finland; Finnish cohort study; musculoskeletal disease; organizational justice; psychosocial work environment; public sector employee; work stress

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Organizational justice and disability pension from all-causes, depression and musculoskeletal diseases: A Finnish cohort study of public sector employees

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Objectives Work-related stress has been linked to increased risk of disability pensioning, but the association between perceived justice of managerial behavior and decision-making processes at the workplace (ie, organizational justice) and risk of disability pensioning remains unknown. We examined the associations of organizational justice and its relational and procedural components with all-cause and diagnosis-specific disability pensions with repeated measures of justice.

Methods Data from 24 895 employees responding to repeated surveys on organizational justice in 2000–2002 and 2004 were linked to the records of a national register for disability pensions from 2005–2011. Associations of long-term organizational justice (average score from two surveys) with disability pensions were studied with Cox proportional hazard regression adjusted for demographics, socioeconomic status, baseline health and health risk behavior, stratified by sex.

Results During a mean follow-up of 6.4 years, 1658 (7%) employees were granted disability pension (282 due to depression; 816 due to musculoskeletal diseases). Higher organizational justice was associated with a lower risk of disability pensioning [hazard ratio (HR) per one-unit increase in 5-point justice scale 0.87 (95% CI 0.81–0.94)]. For disability pension due to depression and musculoskeletal diseases, the corresponding HR were 0.77 (95% CI 0.65–0.91) and 0.87 (95% CI 0.79–0.97), respectively. Adjustment for job strain and effort–reward imbalance attenuated the HR by 20–80%.

Conclusions Supervisors' fair treatment of employees and fair decision-making in the organizations are associated with a decreased risk of disability pensioning from all-causes, depression and musculoskeletal diseases. These associations may be attributable to a wider range of favorable work characteristics.

Key terms disability retirement; early exit; Finland; psychosocial work environment; work stress.

Mental and musculoskeletal disorders are the two most common reasons for disability pensioning in developed societies (1, 2). Increasing evidence shows that being exposed to adverse psychosocial work environment may increase the risk of all-cause disability pensioning (3–8) and disability pensioning due to depression (8) and musculoskeletal diseases (7). The majority of this evidence is related to job strain and effort–reward imbalance (ERI), two major work-stress measures (5–8).

Along with job strain and ERI, low organizational justice is considered as a source of work stress, whereas high organizational justice may protect health (9–11). Organizational justice comprises both a relational and a procedural component. High relational justice indicates that employees are treated respectfully and considerately by their supervisors (12,13), while high procedural justice refers to situations in which decision-making is accurate, non-biased, ethical, amendable, and con-

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sistent, and those involved have a voice (14). Recent reviews and cohort studies have associated low levels of organizational justice with an increased risk of health problems (10, 11, 15–17), including risk factors for disability pensioning, such as common mental disorders, poor self-rated health and sickness absence (1, 10, 11, 15–20). At least one cross-sectional study has explored the association between organizational justice and musculoskeletal pain and reported an independent (from job strain and ERI) association of low organizational justice and musculoskeletal pain among white-collar workers (21). However, the association between organizational justice and disability pensioning is unknown.

Studies exploring the health effects of psychosocial work environment are often limited to measure the exposure at one time-point only. Single measurement may incompletely capture the long-term exposure to workplace stressors, while specifically long-term exposure is thought to cause the health effects (22). To address this limitation, some studies have used repeated measures to assess the long-term exposure to psychosocial factors (23–28), including one study on organizational justice (28).

We examined associations of long-term organizational justice, and its components, with disability pensioning from all-causes, depression and musculoskeletal diseases in a large cohort of Finnish public sector employees.

Study sample and design

The study population was drawn from the Finnish Public Sector (FPS) study cohort, which comprises of employees who were employed for a minimum of six months in the participating organizations (ten towns and six hospital districts) between 1991–2005. We collected survey responses from 29 172 cohort participants who responded to surveys in both 2000–2002 (48 598 respondents, response rate 68%) and 2004 (response rate 80% among baseline respondents who were eligible for follow-up survey). We excluded participants who had missing values in any of the baseline covariates (N=3865), had died or retired (N=237), or were on a long (>90 days) sick leave (N=175) at the beginning of the follow-up. Thus the final study sample comprised 24 895 employees. Participants were linked to the national health and pension registers by their personal identification codes, which are assigned to all permanent residents in Finland. The follow-up began on 1 January 2005 and ended in the event of disability pension, old age pension, death or 31 December 2011 (ie, the end of the study period), whichever occurred first. The Ethics Committee of the Hospital District of Helsinki and Uusimaa approved the study.

Organizational justice

As in our earlier studies, we used standard questionnaires of relational justice (six items) and procedural justice (seven items) (17, 29. See also Appendix 1, www.sjweh.fi/index.php?page=data-repository). Responses were given on a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). For each participant, we first calculated three scores of justice (i) relational justice (mean of six items), (ii) procedural justice (mean of seven items) and (iii) the total score of organizational justice (mean of its two components) for both Time 1 (T1, survey in 2000-2002) and Time 2 (T2, survey in 2004). In final analyses, the explanatory variables were long-term organizational, relational and procedural justice, which were calculated as a mean of the corresponding T1 and T2 justice scores. The values for long-term exposure varied from one to five, and the mean values (ie, central tendency) and their standard deviations for each exposure were 3.31 (0.66) for organizational justice, 3.65 (0.79) for relational justice, and 3.01 (0.74) for procedural justice.

Disability pension

Records of all disability pensions were obtained from the register held by the Finnish Centre for Pensions, which coordinates all earnings-related pensions for permanent residents in Finland irrespective of their place of work or employment status. As all gainful employment is insured in some pension scheme and accrues a pension, the pension data were available and the linkage was successful for all participants. In Finland, after being granted 300 reimbursed sickness absence days (Sundays excluded) during two consecutive years, an employee may apply for disability pension. However, partial disability pension may be granted with no reimbursed sickness absence days if sickness is long-term (ie, endures for at least one year). We obtained information on the dates and the main diagnoses (according to International Classification of Diseases, 10th Revision [ICD-10]) of all permanent or fixed-term (full-time or partial) disability pensions granted between 1 January 2005 and 31 December 2011; irrespective of the participants' employment status or workplace at follow-up. All-cause disability pension and disability pensions due to depression (ICD-10 codes F32-F34) and musculoskeletal diseases (ICD-10 codes M00-M99) were chosen as study outcomes.

Covariates

Age, sex, geographical location of workplace (Southern, Central or Northern Finland) and occupational title were derived from employers' registers. Socioeconomic status

was measured as occupational status, education and size of residence (30). Occupational status (higher non-manual, lower non-manual and manual) was categorized according to the classification of occupations by the Statistics Finland (31). The level of education (primary, secondary or tertiary) was obtained from Statistics Finland, and size of residence from the Population Register Centre.

As previously (7–8), baseline physical and mental illnesses were measured with data from the registers of the Social Insurance Institution of Finland (ie, data on sickness absence periods, reimbursement of prescribed medication, entitlement to special reimbursement of pharmacological treatment for chronic physical or mental diseases, and entitlement to psychotherapy), the Finnish Cancer Registry (ie, malignant tumors detected in Finland), and the Hospital Discharge Register (ie, inpatient hospitalization). These data from national registers were linked to each participant with personal identification codes. History of physical illness (yes/no) was determined by fulfilment of any of the following criteria: entitlement to special reimbursement for the costs of medication (for diabetes, asthma or chronic obstructive pulmonary disease, hypertension, cardiac insufficiency, or coronary heart disease) effective at the beginning of the follow-up; a diagnosis of cancer; or purchases of prescribed pain killers [purchases equal to at least 100 defined daily dosages (DDD) of drugs coded N02, M01A in the anatomical therapeutic chemical (ATC) classification of WHO] during the five years preceding the beginning of the follow-up. Prevalent mental disorder (yes/no) was indicated by fulfilling any of these conditions: entitlement to special reimbursement of antipsychotic medication effective in 2004 (entitlement is possible for antipsychotic medication only); or by a long-term sickness absence due to mental disorders (>90 days due to ICD-codes F00-F99), hospitalization due to mental disorders (ICD-10 codes F00-F99), reimbursement of psychotherapy, and prescribed antidepressant medication (>100 DDD, ATC code N06A) during the five years before the beginning of the follow-up.

Baseline health risk behaviors were assessed using standard survey measures from 2004. Health risk behaviors were current smoking status (smoker versus non-smoker), high alcohol consumption (average weekly consumption ≥210g of absolute alcohol), obesity [body mass index (BMI) from self-reports of height and weight ≥30 kg/m^2], and leisure-time physical inactivity [<2.0 metabolic equivalent task (MET)-hours per day, corresponding to approximately 30 minutes of walking per day]. These behavioral risks have been found to increase the risk of disability pensioning in the FPS-study cohort (3).

In supplemental analyses, long-term (mean of T1 and T2 measures) job strain and ERI were used as baseline covariates. For the measurement of job strain and ERI, please see Mäntyniemi (7) and Juvani (8).

Statistical analyses

The age-adjusted associations of the baseline covariates with all-cause disability pension were first estimated using Cox proportional hazard models. Cox proportional hazard models were also used in the main analyses to estimate the hazard ratios (HR) and their 95% confidence intervals (95% CI) for the associations between long-term organizational, relational and procedural justice and the risk of disability pensioning per one-unit increase in 5-point justice scale. Adjustments were made in three steps: Model 1 was adjusted for demographic factors [age (continuous), sex and location of workplace], Model 2 was additionally adjusted for socioeconomic status (occupational status, education and size of residence), and Model 3 was additionally adjusted for baseline physical and mental health and baseline health risk behaviors. Main analyses were stratified by sex, since the reasons for disability pensioning may differ between men and women. Moreover, concerning all-cause disability pension, a significant interaction between sex and organizational justice was found when adding the term "sex×organizational justice" to the models which already included the main effects (P<0.001).

To assess the time order of the exposure, health influences (mediating factors**)** and disability pensioning, we ran sensitivity analyses in two sub-cohorts, among participants who: (i) were healthy at the study baseline (no baseline mental disorders or physical illnesses when study end-point was all-cause disability pensioning, had no baseline mental disorders when exploring disability pension due to depression, and had no baseline physical illnesses when studying disability pension due to musculoskeletal diseases); and (ii) had no sickness absence spells (over nine days) during the year preceding study baseline (end-point was all-cause disability pension). Sensitivity analyses among the first sub-cohort were first adjusted for demographic factors (age, sex and location of workplace) and second for demographics, socioeconomic status, and baseline health and health risk behaviors. Among the second sub-cohort, we adjusted analyses for age, sex and place of residence.

Last, two supplemental analyses were ran. First, we studied if the association of organizational justice with disability pension was independent of work stress as indicated by job strain (7) and ERI (8) by further adjusting the models for long-term job strain and ERI. Finally, we examined if the association of organizational justice with disability pension was observed also using group-aggregated exposure (8). Aggregated analyses were restricted to the study participants (ie, survey respondents), who were from a work-unit with at least three respondents in both T1 and T2 (N=22 882). Work-unit aggregate was measured (independently for T1 and T2) as a mean of all respondents within the same work-unit.

The final aggregate was a mean of T1 and T2 aggregated scores. The SAS statistical software, version 9.3 (SAS Institute, Cary, NC, USA) was used in all analyses.

Results

Baseline characteristics and their age-adjusted associations with all-cause disability pensioning are presented in table 1. The majority of the participants were women (81%), 40–59 years old (79%) and worked in Southern or Central Finland (85%). During a mean follow-up of 6.4 years, altogether 1658 participants (6.7%) were granted disability pension. Women, older participants, participants with lower socioeconomic status in all indicators (occupational status, education and size of residence) and those with baseline physical or mental illnesses were at a higher risk of all-cause disability pensioning.

Organizational justice and all-cause disability pension

As shown in table 2, higher levels of organizational justice and its components were associated with a lower risk of all-cause disability pensioning. Among men, in models adjusted for demographic factors, socioeconomic status, health, and health risk behaviors, a one-unit increase in organizational justice was associ-

Table 1. Baseline covariates and their associations with all-cause disability pensioning. Hazard ratios (HR) and their 95% confidence intervals (95% CI) derived from Cox proportional hazard models.

	Participants		Cases			
Covariate	N	%	N	%	HR [a]	95% CI
All participants	24 895	100.0	1658	6.7	.	..
Sex						
Male	4624	18.6	268	5.8	0.81	0.71–0.92
Female	20 271	81.4	1390	6.9	1.0	..
Age (years)						
<40	4126	16.6	55	1.3	1.0	..
40–<50	9002	36.2	314	3.5	2.65	1.93–3.53
50– <60	10 590	42.5	1238	11.7	11.02	8.41–14.44
≥60	1177	4.7	51	4.3	13.11	8.93–19.25
Location of workplace						
Southern Finland	11 377	45.7	669	5.9	0.58	0.51–0.66
Central Finland	9675	38.9	658	6.8	0.72	0.63–0.82
Northern Finland	3843	15.4	331	8.6	1.0	..
Occupational status						
Upper non-manual	7503	30.1	241	3.2	1.0	..
Lower non-manual	13 420	53.9	886	6.6	2.25	1.95–2.60
Manual	3972	16.0	531	13.4	4.15	3.56–4.83
Education						
Primary	2106	8.5	267	12.7	2.39	2.06–2.77
Secondary	8513	34.2	810	9.5	2.34	2.11–2.61
Tertiary	14 276	57.3	581	4.1	1.0	..
Size of residence						
Small	5985	24.0	494	8.3	1.69	1.49–1.91
Medium	9440	37.9	669	7.1	1.37	1.22–1.54
Large	9470	38.0	495	5.2	1.0	..
Physical illnesses						
Yes	5991	24.1	831	13.9	2.85	2.59–3.15
No	18 904	75.9	827	4.4	1.0	..
Mental disorders						
Yes	1 739	7.0	296	17.0	3.08	2.72–3.49
No	23 156	93.0	1362	5.9	1.0	..
Smoking status						
Smoker	3842	15.4	336	8.8	1.51	1.34–1.70
Non-smoker	21 053	84.6	1322	6.3	1.0	..
High alcohol consumption						
Yes	2226	8.9	130	5.8	0.81	0.68–0.97
No	22 669	91.1	1528	6.7	1.0	..
Obesity (body mass index >30kg/m^2)						
Yes	3267	13.1	365	11.2	1.80	1.61–2.03
No	21 628	86.9	1293	6.0	1.0	..
Leisure-time physical inactivity						
Yes	5862	23.6	556	9.5	1.56	1.41–1.72
No	19 033	76.5	1102	5.8	1.0	..

[a] Adjusted for age (except for the analyses of age categories).

ated with a 0.83 times lower risk of disability pensioning; while among women, the reduction in risk was 0.88 fold. Regarding the components of justice, a one-unit increase in relational and procedural justice was associated with 0.84–0.88 fold lower risk of disability pensioning among men and 0.90–0.91 fold lower risk among women.

Organizational justice & cause-specific disability pension

Of the total 1658 disability pensions, 282 (17.0%) were granted due to depression (table 3). In fully-adjusted models, a one-unit increase in organizational justice associated with 0.77 fold risk of disability pensioning due to depression. This association was stronger among men (HR 0.55) than women (HR 0.80) (interaction with sex, P=0.04). The HR for the components of justice in all three models were close to those observed for total score of organizational justice, although only the associations with relational justice were statistically significant in analyses stratified by sex. Procedural justice was not associated with disability pension due to depression in analyses stratified by sex.

Of all disability pensions, 816 (49.2%) were granted due to musculoskeletal causes (table 4). Among all participants, a one-unit increase in organizational justice was associated with 0.87 fold risk of disability pension due to musculoskeletal disorders, when adjusted for demographic factors, socioeconomic status, physical and mental health, and health risk behaviors. The corresponding

Table 2. Associations of long-term organizational justice and its components with all-cause disability pensioning. [HR=hazard ratio for one-unit increase in the 5-point scale; 95% CI=95% confidence interval].

Participants (N)	N of cases	Risk of all-cause disability pensioning adjustment [a]					
		Model 1		Model 2		Model 3	
		HR	95% CI	HR	95% CI	HR	95% CI
Organizational justice							
All (24 895)	1658	0.83	0.77–0.89	0.82	0.76–0.88	0.87	0.81–0.94
Male (4624)	268	0.71	0.60–0.84	0.79	0.67–0.93	0.83	0.70–0.98
Female (20 271)	1390	0.85	0.79–0.92	0.82	0.76–0.89	0.88	0.81–0.95
Relational justice							
All (24 895)	1658	0.85	0.80–0.90	0.86	0.81–0.91	0.90	0.85–0.95
Male (4624)	268	0.77	0.67–0.89	0.84	0.73–0.97	0.88	0.75–1.01
Female (20 271)	1390	0.86	0.81–0.92	0.86	0.80–0.91	0.90	0.84–0.96
Procedural justice							
All (24 895)	1658	0.88	0.83–0.94	0.86	0.80–0.92	0.90	0.84–0.96
Male (4624)	268	0.75	0.65–0.88	0.82	0.70–0.96	0.84	0.72–0.99
Female (20 271)	1390	0.91	0.85–0.98	0.86	0.80–0.93	0.91	0.84–0.98

[a] Model 1 adjusted for demographic factors: age, sex (in models with all participants) and location of workplace. Model 2 additionally adjusted for socioeconomic status (occupational status, education and size of residence). Model 3 additionally adjusted for baseline physical and mental illnesses and baseline health risk behaviors.

Table 3. Associations of long-term organizational justice and its components with disability pensioning due to depression. [HR=hazard ratio for one-unit increase in the 5-point scale; 95% CI=95% confidence interval].

Participants (N)	N of cases	Risk of disability pensioning due to depression adjustment [a]					
		Model 1		Model 2		Model 3	
		HR	95% CI	HR	95% CI	HR	95% CI
Organizational justice							
All (24 895)	282	0.68	0.58–0.81	0.69	0.58–0.82	0.77	0.65–0.91
Male (4624)	28	0.48	0.29–0.78	0.49	0.30–0.81	0.55	0.33–0.91
Female (20 271)	254	0.71	0.60–0.85	0.71	0.59–0.86	0.80	0.67–0.96
Relational justice							
All (24 895)	282	0.74	0.65–0.85	0.75	0.65–0.86	0.80	0.70–0.92
Male (4624)	28	0.53	0.35–0.80	0.53	0.35–0.80	0.57	0.38–0.87
Female (20 271)	254	0.77	0.67–0.89	0.77	0.67–0.90	0.83	0.72–0.96
Procedural justice							
All (24 895)	282	0.76	0.65–0.89	0.76	0.65–0.89	0.83	0.71–0.97
Male (4624)	28	0.59	0.37–0.94	0.62	0.39–1.00	0.68	0.42–1.11
Female (20 271)	254	0.78	0.66–0.92	0.78	0.65–0.92	0.85	0.72–1.01

[a] Model 1 adjusted for demographic factors: age, sex (in models with all participants) and location of work place. Model 2 additionally adjusted for socioeconomic status (occupational status, education and size of residence). Model 3 additionally adjusted for baseline physical and mental illnesses and baseline health risk behaviors.

Table 4. Associations of long-term organizational justice and its components with disability pensioning due to musculoskeletal diseases. [HR=hazard ratio for one-unit increase in the 5-point scale; 95% CI=95% confidence interval].

Participants (N)	N of cases	Risk of disability pensioning due to musculoskeletal diseases adjustment [a]					
		Model 1		Model 2		Model 3	
		HR	95% CI	HR	95% CI	HR	95% CI
Organizational justice							
All (24 895)	816	0.85	0.77–0.94	0.83	0.75–0.92	0.87	0.79–0.97
Male (4624)	122	0.69	0.55–0.89	0.84	0.65–1.08	0.86	0.66–1.10
Female (20 271)	694	0.88	0.79–0.99	0.84	0.75–0.94	0.89	0.80–0.99
Relational justice							
All (24 895)	816	0.87	0.80–0.94	0.87	0.80–0.95	0.91	0.84–1.00
Male (4624)	122	0.76	0.62–0.94	0.88	0.71–1.09	0.91	0.73–1.12
Female (20 271)	694	0.89	0.81–0.97	0.88	0.80–0.96	0.92	0.84–1.00
Procedural justice							
All (24 895)	816	0.90	0.82–0.99	0.86	0.78–0.94	0.89	0.81–0.98
Male (4624)	122	0.74	0.59–0.92	0.85	0.67–1.07	0.86	0.68–1.09
Female (20 271)	694	0.94	0.85–1.04	0.87	0.79–0.96	0.91	0.82–1.01

[a] Model 1 adjusted for demographic factors: age, sex (in models with all participants) and location of workplace. Model 2 additionally adjusted for socioeconomic status (occupational status, education and size of residence). Model 3 additionally adjusted for baseline physical and mental illnesses and baseline health risk behaviors.

decrease in risk was 0.89–0.91 fold for the components of justice. In the analyses stratified by sex, the HRs were of similar magnitude but the confidence intervals included unity and no statistically significant associations were found, except for organizational justice among women.

Supplemental analyses

Sensitivity analyses with initially healthy participants were consistent with the main results: in the fully-adjusted model, a one-unit increase in organizational justice associated with 0.86 fold risk (95% CI 0.78–0.97) of all-cause disability pensioning (Appendix table A, www.sjweh.fi/index.php?page=data-repository). Moreover, among all participants free from baseline mental disorders, a one-unit increase in organizational justice was associated with a 0.71 fold lower risk of disability pensioning due to depression (95% CI 0.56–0.89) in the fully-adjusted model. Among participants free from baseline physical illnesses, the risk of disability pensioning due to musculoskeletal diseases was 0.86 times lower per one-unit increase in organizational justice (95% CI 0.74–1.01).

Sensitivity analyses with a sub-sample of 20 471 participants with no sickness absence spells during the year preceding study baseline also supported our main findings: the age, sex and place of residence adjusted HR (95% CI) for the association between organizational justice and all-cause disability pension was 0.79 (0.72–0.87). The corresponding figures for relational and procedural justice were 0.83 (0.76–0.89) and 0.84 (0.77–0.92), respectively.

After adjustment for job strain and/ or ERI, the HR in Model 3 attenuated by approximate 20–60% after additional controlling for job strain or ERI; and by approximate 20–80% after controlling for them both (Appendix table B, www.sjweh.fi/index.php?page=data-repository). None of the associations remained statistically significant after controlling for both job strain and ERI.

Supplemental analyses using aggregated measures for organizational justice and its components showed somewhat similar HR as did the main analyses (for the associations of all-cause disability pension adjusted for age, sex and place of residence) (Appendix table C, www.sjweh.fi/index.php?page=data-repository). However, the CIs were wider and in most cases non-significant. Only the association between aggregated organizational justice and all-cause disability pension among men was statistically significant (HR 0.63, 95% CI 0.43–0.94).

Discussion

In this prospective cohort study of over 24 000 public sector employees, we found a decreased risk of all-cause disability pensioning and disability pensioning due to depression and musculoskeletal diseases in men and women with high long-term organizational justice. The associations of the two components of organizational justice were in general the same. Previous studies have shown that low organizational justice is associated with various health outcomes, including common mental disorders, poor self-rated health, and sickness absence (10–11, 15–17, 23), which all are important risk factors for subsequent disability pensioning (1, 18–20). Low organizational justice has also been linked with low organizational commitment and intentions to withdraw or retire (32, 33). To the best of our knowledge, the present study is the first to examine the association between organizational justice and disability pensioning. However, a study by Elovainio et al showed that higher levels of long-term relational justice were asso-

ciated with lower risk of long-term sickness absence due to depression or anxiety disorders. The association between relational justice and sickness absence due to anxiety disorders was found also among initially healthy participants (23). Long-term sickness absence may be thought as a pathway to disability pension, as in Finland disability pension may be granted after approximately one year of sickness absence.

Our study showed a similar strength of association for relational and procedural justice and all-cause disability pension, even though some previous studies suggest, that procedural justice might be more relevant in predicting health consequences (34, 35). Indeed, in the present study, we observed an association between procedural justice and disability pensioning due to musculoskeletal diseases, but no corresponding association for relational justice. On the other hand, analyses stratified by sex showed that only relational justice was associated with disability pension due to depression among both men and women. Thus, our findings suggest that the association between the components of organizational justice and disability pension may vary depending on the cause for disability pension: relational justice might be more important for disability pensions due to depression, and procedural justice might be more relevant for disability pensions due to physical causes (such as musculoskeletal diseases).

Associations between organizational justice, and its relational component, and disability pension due to depression were stronger among men than women. Similarly, previous studies have shown a corresponding sex difference for the associations between organizational justice and psychological distress (36) and long-term sickness absence due to depression (17, 27). It has been suggested that work-related factors are more important risk factors for depression among men (37–38), while stressful events related private life are more important among women (38). Men tend to seek professional help for their depression more seldom than women (27, 38), and thus might profit more from beneficial working conditions (27), such as fair leadership.

The use of self-reported exposure is subject to reporting bias and/ or reversed causality as employees with health problems that subsequently lead to disability pension, may report more unfair decision-making and thus lower organizational justice. One way to reduce potential subjectivity bias is to define exposure using work unit-level aggregate (ie, assigning work-unit mean score to all members of the unit) (39). This approach decreases error due to reporting style but has also limitations. First, the aggregated measure used in FPS study is based on work unit average values at the lowest levels of the organizations (ie, the most accurate unit in the organizational hierarchy available for each employee), whereas justice of decision making procedures (ie, procedural justice) characterizes operations at the higher levels of the organization. Also, the concept of organizational justice includes the assumption of unequal decision-making and/ or worker-supervisor relationship. Thus, aggregated measures increase imprecision by capturing less accurately (than individual assessment) true differences in interactions between managers and employees within work-units. In spite of these limitations, HR for the associations of aggregated justice with all-cause disability pension were similar to those of self-reported justice, although with wider confidence intervals. This association was significant among men. Moreover, regarding self-reported justice, the exposure was based on repeated measurements over a 4-year time window, and the association with disability pensioning was observed not only among initially healthy participants but also among those with no sickness absence at baseline. Thus, reversed causality and reporting bias are unlikely to explain our findings.

Organizational justice may have implications for how employees perceive their work, because unfair management can cause a significant mismatch between demands, control, efforts, and rewards. Consistently with this reasoning, we found organizational justice to be correlated with ERI and job strain ($P<0.0001$), even though distributive justice [which is thought to count most of the similarity of justice and ERI (reward in special)] or social support (included in the extended version of job strain; and is thought to share similar background with relational justice) (10, 40) were not included in our measures of justice and job strain. In addition, the excess risk of disability pension in employees with low organizational justice was largely explained by the higher ERI and job strain in this group. This finding is in agreement with our presumption that job strain, ERI, and organizational injustice are overlapping and inter-related concepts that can lie on the same causal pathway (eg, unfair decisions may increase job strain and ERI which may increase the risk of disability pension). In fact, the conceptual and operational similarities between the different concepts of work-related stress have raised some critical comments whether justice is complementary or redundant to ERI and/or job strain as a health risk factor (40). Nonetheless, the accumulation of psychosocial stress (ie, combinations of work stress) has resulted in a further increased risk of health problems than any of the conditions alone (41).

There are several potential explanations to our findings. First, physiological and emotional stress reactions are plausible mechanisms that link low organizational justice and disability pensioning. Low justice has been associated with sleep problems, negative feelings and increased inflammatory factors in serum (42, 43). The physiological effects of long-lasting stress are mediated by dysfunction between the brain and the autonomous neural and the endocrine systems (ie, via allostatic load), which can cause depression, diabetes mellitus and heart diseases (44, 45). Allostatic load may also reduce blood flow to the muscles

(which may result in nerve and tissue damage caused by the lack of necessary nutrients), increase tension (which may cause muscle pain), and reduce effectiveness of the immune system (causing impaired tissue reparation) (46). Stress may also increase pain sensation or decrease pain threshold (which may, due to ignored warning signals, lead to tissue damage) (46) or lead to impaired ergonomics (which may cause musculoskeletal symptoms). Second, an alternative pathway is via adverse health behaviors: allostatic load may increase eating, smoking and alcohol intake, or lead to sedentary lifestyle (44). Third, fair treatment by supervisor (ie, high relational justice) may contribute to better perceived self-esteem and social support, which may act as protective factors against depression (44). Finally, previous studies suggest that high organizational justice may partly buffer the adverse health effects of other work-related stress factors, such as job strain and ERI (47), and help employees manage and pull through stressful events related to work or private life (48).

Although long-term exposure (ie, an average over two time points) resembles real life situations better than measures derived from a single time point (10, 22), we do not know if participants, who were granted disability pension, retired from the same work place in which they were exposed. Indeed, it is possible that some participants may have changed their employer after the surveys, and thereby justice perceived during the follow-up may differ from that during the surveys. However, such inaccuracies in exposure are likely to be random, few in number, and not to bias the results in any systematic way.

Although the association of organizational justice with disability pension was linear (P-value for trend <0.0001), the results of this study should not be interpreted to indicate a monotonic exposure-response pattern for each one-unit change in justice (49). Our analyses using quintile categories of justice show slight deviation from linearity. The HR (95% CI) were 0.59 (0.23–1.49), 0.20 (0.05–0.89), 0.26 (0.07–0.90), 0.31 (0.10–0.95) for 2nd, 3rd, 4th, and 5th categories, respectively, when compared to the first (lowest) category. The corresponding figures based on rounded 5-point scale values (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree) for those with values 2, 3, 4, and 5 were 0.49 (0.06–4.01), 0.23 (0.03–1.79), 0.13 (0.02–1.06), and 0.22 (0.01–3.47), respectively, when compared to those with value 1.

Limitations and strengths

Our study has some limitations that need to be taken into account when interpreting the results. First, our measure on organizational justice was incomplete as it did not include distributive justice (29). Second, although disability pension is illness based, also various non-medical factors may be associated with disability pensioning. Thus, unmeasured confounders, such as heavy workload (50), may account for some of the associations found in this study. Third, our study population was limited to Finnish public sector employees only. Thus, more studies on organizational justice among other countries, other social security systems and different employee groups (other than public sector employees) are needed to examine the generalizability of our findings. Also, the majority of our study population was women; hence more studies with various sex distributions are needed.

The strengths of this study include its large cohort size and prospective study design of over 24,000 employees followed-up for over six years on average, using records from reliable national registers on all earnings-related pensions (including diagnosis confirmed by more than one physician) in Finland. Thus, selective loss to follow-up and common method bias is not a plausible explanation to our findings.

Concluding remarks

This occupational cohort study showed that higher levels of organizational justice were associated with a lower risk of all-cause disability pensioning and disability pensioning due to depression and musculoskeletal diseases, ie, the two most common causes for disability pensions in most developed societies. Our study suggests that equal and justified decision-making in the organizations and fair treatment by the supervisors may be important factors in reducing disability pension and thereby in extending working careers of employees. However, no independent effect for organizational justice was found, suggesting that the favorable effect of organizational justice may be attributable to a wider range of favorable work characteristics.

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