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We found that procedural justice had a significant effect on self-rated health and that changes in justice went hand in hand with changes in self-rated health. Our findings support the idea that procedural justice at work is a crucial aspect of the psychosocial work environment and that changes towards more procedural justice could potentially influence employees' health positively.

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Key terms: organizational justice; procedural justice; psychosocial work environment; repeated measurement; self-rated health; self-rated health trajectory; Swedish Longitudinal Occupational Survey of Health

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The influence of and change in procedural justice on self-rated health trajectories: Swedish Longitudinal Occupational Survey of Health results

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Objectives Procedural justice perceptions are shown to be associated with minor psychiatric disorders, long sickness absence spells, and poor self-rated health, but previous studies have rarely considered how changes in procedural justice influence changes in health.

Methods Data from four consecutive biennial waves of the Swedish Longitudinal Survey of Health (SLOSH) (N=5854) were used to examine trajectories of self-rated health. Adjusting for age, sex, socioeconomic position, and marital status, we studied the predictive power of change in procedural justice perceptions using individual growth curve models within a multilevel framework.

Results The results show that self-rated health trajectories slowly decline over time. The rate of change was influenced by age and sex, with older people and women showing a slower rate. After adjusting for age, sex, socioeconomic position, and marital status, procedural justice was significantly associated with self-rated health. Also, improvements in procedural justice were associated with improvements in self-rated health. Additionally, a reverse relationship with and change in self-rated health predicting procedural justice was found.

Conclusions Our findings support the idea that procedural justice at work is a crucial aspect of the psychosocial work environment and that changes towards more procedural justice could influence self-rated health positively. The reciprocal association of procedural justice and self-rated health warrants further research.

Key terms organizational justice; psychosocial work environment; repeated measurement.

The association between organizational justice perceptions and work outcomes has received considerable attention for the past three decades (1). Organizational justice perceptions have been shown to be positively related to job satisfaction, organizational commitment, and performance (2). In the past ten years, a growing number of studies in public health and epidemiology have related justice perceptions to health outcomes (3).

Historically, research distinguishes between three dimensions of organizational justice (2). Distributive justice refers to the perceived fairness in decision outcomes (4). Interactional justice, sometimes also referred to as relational justice, is concerned with whether supervisors treat their subordinates with respect and dignity and provide rationales for their decisions. Procedural justice, which is in focus in this study, is commonly defined as the perceived fairness of the organizational processes and procedures that lead to decision outcomes (2). Procedural justice is a core and consistent predictor of employees' reactions to their employing organization (5) and is the most often studied justice dimension (1).

Different theoretical models, eg, the group engagement model (6, 7) and the fairness heuristics theory (8), have been suggested to explain why justice matters to individuals and may impact their health. Generally, these theories assume that justice may act as a resource to build employee health, whereas injustice can be viewed as a stressor (3, 9) that undermines psychological and physical functioning (10). Cross-sectional associations between organizational justice and different health outcomes are well-established (eg, 11, 12) and a number of studies have investigated the justice–health relationship

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over time. Prospective relationships between organizational justice and future health outcomes, eg, sickness absence (13–17), depressive symptoms (14, 18), sleeping problems (19), coronary heart disease (20) and self-rated health (16, 21) have been reported. However, those studies are often limited to one measure of exposure and one at follow-up.

Justice perceptions are not stable but fluctuate and exert time-dependent influence. These time-dependent influences can work in several ways in the justice–health relationship. There are only few studies investigating justice as a dynamic construct (22–24) and associations between changes in justice perceptions and health have hardly been studied. For example, Kivimäki et al (25) investigated the association between change in relational justice and self-rated health over three time points. They found that low and declining levels of relational justice predicted decreasing self-rated health among both men and women whereas a favorable change in justice was related to a reduced health risk only among men. Another study using data from two time points reported that a favorable change in interactional justice reduced the immediate risk of psychiatric morbidity while an adverse change increased the immediate and longer term risk (26). Still, what remains unclear in these studies is whether this relationship over time holds true for other justice facets such as procedural justice. Moreover, how change in justice perceptions parallels change in health over time within individuals has not been studied.

In the present study, we focus on procedural justice perceptions in relation to self-rated health, ie, a strong predictor of future morbidity and mortality (27, 28), functional decline, disability, and utilization of health care (29). Using data from four data collection waves covering a time span of six years, we are able to study whether procedural justice has an impact on self-rated health trajectories and how changes in justice experiences are linked to self-rated health trajectories.

Methods

Sample

The study population consisted of participants of the Swedish Longitudinal Occupational Survey of Health (SLOSH), a longitudinal cohort survey with a focus on the association between work organization, work environment, and health. SLOSH is a biennial postal survey that began in 2006 with follow-ups every second year. Today, the SLOSH sample includes all eligible respondents to the Swedish Work Environment Surveys (SWES) 2003–2011. SWES is a repeated cross-sectional survey that Statistics Sweden (SCB) conducts every second year. At baseline, SWES consist of a subsample of gainfully employed people aged 16–64 from the Labor Force Survey (LFS). These individuals were first sampled into LFS through stratification by county, sex, citizenship and inferred employment status. SLOSH can be regarded as approximately representative for the Swedish working population.

Since the start of SLOSH in 2006, eligible SWES participants were invited biennially to respond to a postal questionnaire in two versions, one for those currently in paid work and one for those permanently or temporarily outside the labor force. SCB conducts all data collection. Response rates varied from 65% in 2006 (N=5985) to 52% in 2014 (N=20 316). The current paper included participants who responded to at least three out of the four questionnaires for those in paid work between the 2008 (wave 2) and the 2014 (wave 5) data collection. After the exclusion of self-employed and farmers, the analytic sample consisted of 5854 participants. Both SLOSH and the present study have been approved by the Regional Research Ethics Board in Stockholm. All participants gave their informed consent.

Measures

The outcome variable *self-rated health* was measured with one item "How would you rate your general state of health?" answered on a 5-point scale with 1=very good, 2=quite good, 3=neither good nor bad, 4=quite poor, and 5=very poor. For analyses, the scale was reversed. The validity and reliability of this item has been shown in various studies and the item is considered a reliable and valid global health measure (28).

Organizational justice perceptions were measured by a 7-item scale (30). The items reflect whether the decision-making procedures at the workplace are accurate, correctable, consistently applied, and whether the procedures include opinions from the people involved (see Appendix table A, www.sjweh.fi/data_repository.php). Responses are given on a 5-point scale ranging from "totally agree" to "totally disagree". To calculate a procedural justice measure for each wave, responses were reversed and summed up when ≥4 of the 7 items were answered. Thus, higher values reflect more positive perceptions of procedural justice. A grand mean centered average-over-time justice measure for each person was obtained to reflect procedural justice perceived over the study years.

As we were further interested in the dynamics of justice, we constructed a time varying covariate, *change in justice*, by subtracting the baseline (ie, 2008) justice level for each individual from their justice level for the following years, ie, the years 2010, 2012 and 2014. This variable was centered within individuals on their baseline value (ie, organizational justice$_{it}$ - 2008 organizational justice$_{i}$).

Age, sex, socioeconomic position, and *marital status* were included in the analyses as these variables are likely to influence both the outcome and the exposure (eg, 31, 32). All covariates except marital status were obtained from register data. The covariates age and sex were time-invariant variables and the covariates socioeconomic position and marital status were time-variant variables. Age is age of respondents in 2008 and was centered on the sample mean in 2008. The measure for sex was coded into 0 for male and 1 for female. Socioeconomic position was based on the Swedish socioeconomic classification and re-coded into a dummy variable with values of 0 and 1 for manual and non-manual employees, respectively. Marital status was obtained by a single question with responses single or married/cohabiting coded as 0 and 1, respectively.

Statistical analysis

To investigate individual trajectories of self-rated health, we employed individual growth curve models within a multilevel framework (33–35). Our modelling strategy allows for the investigation of two levels of variability in self-rated health: within and between subjects. In our data, observations taken over time are nested within subjects giving a two-level hierarchical structure. The variation of responses within subjects over time is at the lowest level (level 1) and the variation of the underlying mean responses between subjects is at level 2 (36). Repeated measurements made on the same individual are correlated and it is this dependency that leads to the inadequacy of simple estimation procedures based on ordinary least squares and the necessity of using a multilevel modelling technique. Further, growth curve models allow capturing systematic change over time and allow exploring both intra-individual change and inter-individual differences of that change.

As described above, a 2-level model is defined in which the level 1 sub-model describes how individuals change over time and the level 2 describes how these changes vary across individuals. In level 1, parameters of individual change are estimated using measures assessed at multiple time points for a given individual. In this model, change describes the underlying growth for each person as a function of time and a set of growth parameters that define the change function (37). We adopted the following steps in the development of our model. First, we estimated an unconditional means model (model 1) which describes and partitions the variation in self-rated health. The model contains no predictors at any level and helps us to examine whether there is systematic variation in the outcome, and if so, if that variation lies between or within individuals (34). Model 1 describes the change in each individual's self-rated health over time as a flat line with a slope of zero located at each individual's average self-related health score. We continue by examining an unconditional growth model (model 2), ie, a model with time as a level-1 predictor but no predictors at level 2. This helps us to evaluate the amount of change in self-rated health over time. Time is coded as 0, 1, 2, 3 and it is defined as a 2-year interval from 2008. This model estimates two parameters that reflect the average level of the corresponding within-person growth parameters. Therefore, the model characterizes the person's self-rated health trajectory over time. In a next step, we investigated between-person variation by expanding the unconditional growth model by the addition of procedural justice, measured as the grand-mean centered mean of every individual's procedural justice perception over all waves, and the other covariates, ie, age, sex, socioeconomic position, marital status (model 3). Finally, we were interested in investigating procedural justice as a dynamic experience. Hence, to investigate if change in procedural justice perceptions predicts change in self-rated health, we added a time-varying covariate procedural justice change (model 4).

Further, to test for reversed causation, the same models as described above were run with self-rated health and change in self-rated health predicting procedural justice as the dependent variable.

Non-response analyses were performed to see whether the longitudinal sample deviates from the sample including participants who answered the questionnaire for those in paid work in 2008 but where not followed over time. All analyses were estimated using SAS (SAS Institute, Cary NC, USA).

Results

Background factors for the study sample over the different waves are presented in table 1. At baseline, the mean age of the study sample was 47.2 (range 20–69) years. Fifty-eight percent of all participants were female and a majority (69%) were non-manual workers. The proportion of working participants who provided answers to the questionnaire dropped between 2012 and 2014 due to unknown reasons. Average levels of procedural justice did not change much over the years, from 23.0 in 2008 to 22.3 in 2014 (range 7–35); mean self-rated health declined slightly over time, from 4.09 in 2008 to 3.98 in 2014 (range 1–5). Thus, on average, participants rated their health as "quite good". Non-response analyses showed that those who only responded in 2008 were, compared to the full analytic sample, older, more often men, more often manual workers, and had slightly higher procedural justice and slightly lower self-rated health scores (see Appendix table B, www.sjweh.fi/data_repository.php).

Table 1. Descriptive statistics for the cohort. [SD=standard deviation.]

	2008				2010				2012				2014			
	N	%	Mean	SD	N	%	Mean	SD	N	%	Mean	SD	N	%	Mean	SD
Did not participate in wave	235	4.01			383	6.54			304	5.19			679	11.60		
Not working	129	2.20			111	1.90			93	1.59			428	7.31		
Working	5490	93.78			5360	91.56			5457	93.22			4747	81.09		
Sex																
Men	2337	41.61			2285	41.78			2333	42.05			2134	41.25		
Women	3280	58.39			3280	58.22			3280	57.95			3039	58.75		
Married/cohabiting																
Yes	58.22	79.29			4259	79.34			4368	79.22			4061	79.10		
No	1152	20.71			1109	20.66			1146	20.78			1073	20.90		
Socioeconomic position																
Manual	1686	31.16			1668	31.26			1687	31.11			1502	29.75		
Non-manual	3722	68.84			3665	68.74			3733	68.89			3547	70.27		
Age (20–75 years)			47.24	9.28			49.32	9.27			51.28	9.33			53.38	9.28
Procedural justice (range 7–35)			23.02	6.08			23.08	6.2			23.13	6.37			22.34	6.75
Self-rated health (range 1–5)			4.09	0.77			4.00	0.79			4.02	0.80			3.98	0.82

Table 2 shows the multilevel models results. Following our analytical strategy, we first estimated an unconditional means model (model 1) in order to examine whether there is systematic variation in self-rated health between individuals. The results indicate that individuals displayed considerable heterogeneity in self-rated health levels, 55% of the total variation in self-rated health was attributable to between-individual differences.

The unconditional linear growth model (model 2) revealed that health scores changed at an average rate of -0.03 for every two years ($P<0.001$). The estimated values of the intercept and slope variances were 0.358 ($P<0.0001$) and 0.017 ($P<0.0001$), respectively, indicating that individuals differed significantly both in their starting points and change in self-rated health over time. The covariation between intercept and slope was also significant and negative, suggesting that participants with better initial self-rated health (intercept) have a slower rate of decrease (slope). The addition of a quadratic term for time did not improve the model fit (results not shown). Also the investigation of models with different covariance structures in comparison to the used unstructured specification did not justify the need for models with more complex covariance structures (results not shown). Hence, the linear growth curve specifying a constant rate of change in health over time was adopted for further analyses.

Next, we examined to what extent procedural justice and other covariates account for variation in the intercept and slope in self-rated health (model 3). We found that procedural justice, age, socioeconomic position, and marital status, were significantly associated with self-rated health. Our results indicate that individuals with higher procedural justice reported better self-rated health. For age, each additional year at baseline decreased the mean level of self-rated health. Non-manual and married/cohabiting employees rated their health as better than manual and married/cohabiting employees, respectively. No difference in self-rated health between women and men was found. Neither sex, socioeconomic position, nor marital status affected the rate of change in self-rated health. Age was statistically significantly associated with change in self-rated health, indicating a decline at a slower rate with increasing age. Tests for interactions revealed that neither sex nor socioeconomic position in interaction with procedural justice was statistically significantly associated with self-rated health.

In the next step, we were interested in the dynamic component of procedural justice. Therefore, we added an additional predictor "change in procedural justice" – calculated as the perceived justice at each wave relative to baseline levels for each person – to our growth curve model (Model 4). This model was the one with the best fit according to fit criteria. The results suggest that self-rated health improved at any given point in time as procedural justice increased relative to initial procedural justice. Additionally, the inclusion of change in procedural justice did alter some of the influences of the covariates. In model 4, being married/cohabiting was no longer positive associated with self-rated health. Sex did show a weak but statistically significant association with the slope in self-rated health, indicating that men had a slightly steeper decrease in self-rated health. The adjusted trajectories of both procedural justice and self-rated health are provided as figures in the Appendix (www.sjweh.fi/data_repository.php).

In a last step, we investigated for a possible reversed causation, ie, self-rated health predicting procedural justice perceptions. Results for the main covariates of interest are presented in table 3. Analyses revealed that procedural justice changed at an average rate of -0.17 for every two years of study ($P<0.001$). Test for reversed causation indicated that individuals with consistently higher self-rated health reported more favorable scores of procedural justice. Also age ($\beta=0.042$; $P<0.001$) and

Table 2. Estimated fixed and random effects of average-over-time procedural justice and change in procedural justice on self-rated health, SLOSH 2008–2014. [Est=estimate; SE=standard error; AIC=Akaike information criteria; BIC=Bayesian information criteria.]

Fixed effect	Model 1 (N=5854)			Model 2 (N=5854)			Model 3 (N=5569)			Model 4 (N=5143)		
	Est	SE	Model fit stats	Est	SE	Model fit stats	Est	SE	Model fit stats	Est	SE	Model fit stats
Initial level												
Intercept mean	4.024	0.008 [a]		4.068	0.010 [a]		3.942	0.025 [a]		3.804	0.034 [a]	
Age in 2008							-0.005	0.001 [a]		-0.005	0.001 [a]	
Female							0.019	0.020		0.006	0.020	
Non-manual							0.115	0.019 [a]		0.125	0.020 [a]	
Married/cohabiting							0.044	0.021 [a]		0.039	0.022	
Procedural justice							0.029	0.002 [a]		0.030	0.002 [a]	
Change in procedural justice										0.006	0.001 [a]	
Linear change												
Intercept mean (slope)				-0.030	0.004 [a]		-0.026	0.010 [b]		-0.035	0.011 [b]	
Age in 2008							0.002	0.000 [a]		0.001	0.000 [b]	
Female							0.008	0.008		0.019	0.008 [b]	
Non-manual							-0.012	0.008		-0.009	0.009	
Married/cohabiting							-0.003	0.009		-0.001	0.010	
Random effect												
Initial level (intercept)	0.350	0.008 [a]		0.358	0.010 [a]		0.327	0.01 [a]		0.327	0.011 [a]	
Linear change (slope)				0.017	0.002 [a]		0.017	0.002 [a]		0.014	0.002 [a]	
Within-person residual	0.281	0.003 [a]		0.252	0.004 [a]		0.252	0.004 [a]		0.244	0.004 [a]	
Covariance				-0.012	0.003 [a]		-0.010	0.003 [c]		-0.008	0.003 [b]	
Deviance statistics (-2 log likelihood)			43 968.0			43 728.8			40 477.3			34 359.5
AIC			43 972.0			43 736.8			40 485.3			34 367.5
BIC			43 985.3			43 763.5			40 511.8			34 393.7

[a] <0.0001.
[b] <0.05.
[c] <0.001.

sex (β=-0.352; P<0.05) were statistically significantly related to procedural justice. None of the covariates related significantly to the rate of change in procedural justice. Additionally change in self-rated health was positively related to procedural justice.

Discussion

The present study assessed trajectories of self-rated health in a large sample approximately representative of the Swedish working population. Utilizing data collected between 2008–2014, we examined if patterns of self-rated health declined over time and diverged according to procedural justice and changes in procedural justice perceptions while taking other risk factors into account.

On average, self-rated health declined slowly but significantly over the years, starting from a "good" health level. This finding is in line with earlier research which has shown that, in the general population, the average cross-sectional level of self-rated health tends to fluctuate between "good" and "very good" (38, 39). Despite the considerable number of studies on self-rated health, little is known about the typical trajectory of self-rated health across the adult life course (40). A general decline in self-rated health over time has, however, been shown in some previous studies (41, 42). Still, a considerable variation in self-rated health trajectories between individuals would be expected. Indeed, findings based on a US population reported significant individual differences in the rate of change in self-rated health (43). Likewise, we found that individuals displayed considerable heterogeneity in self-rated health levels with >50% of the variance attributable to individual differences.

In accordance with our expectations, we found that procedural justice statistically significantly predicted self-rated health, ie, those who experienced more average-over-time procedural justice reported better self-rated health. Our results support earlier findings showing positive associations between organizational justice perceptions and self-rated health (eg, 12, 16). Further we found that change in procedural justice predicted self-rated health, thus indicating that changes in procedural justice were in parallel with changes in self-rated health. In other words, participants who experienced a deterioration in procedural justice relative to baseline also experienced a deterioration in self-rated health. Our findings are in line with others based on Finnish and British data, which found that a favorable change in (relational) justice was associated with reduced risk of poor self-rated (25) and psychiatric morbidity (26). In contrast, one Danish study found no statistically significant relationship between change in organizational justice and long-term sickness absence. However, in that study, change was calculated in terms of moving from one justice group (eg, high justice) to another (eg, low justice) and consequently a large majority did not experience any change in justice at all (44).

Table 3. Estimated fixed and random effects of average-over-time self-rated health and change in self-rated health on procedural justice, SLOSH 2008–2014. [Est=estimate; SE=standard error; AIC=Akaike information criteria; BIC= Bayesian information criteria.]

Fixed effect	Model 1 (N=5854)			Model 2 (N=5854)			Model 3 (N=5596)			Model 4 (N=5579)		
	Est	SE [a]	Model fit stats	Est	SE [a]	Model fit stats	Est	SE [a]	Model fit stats	Est	SE [a]	Model fit stats
Initial level												
Intercept mean	22.949	0.068		23.187	0.079		23.539	0.210		22.235	0.350	
Self-rated health							1.789	0.102		1.766	0.109	
Change in self-rated health										0.316	0.069	
Linear change												
Intercept mean (slope)				-0.166	0.033		-0.359	0.099		-0.344	0.350	
Random effect												
Initial level (intercept)	20.425	0.501		21.047	0.694		19.5527	0.6857		19.545	0.686	
Linear change (slope)				1.512	0.130		1.4934	0.1348		1.511	0.136	
Within-person residual	20.106	0.243		17.689	0.269		17.6850	0.2813		17.622	0.282	
Covariance				-1.055	0.237		-1.2297	0.2426		-1.221	0.243	
Deviance statistics (-2 log likelihood)			122 229.8			121 995.7			113 884.3			112 833.1
AIC			122 233.8			122 003.7			113 892.3			112 841.1
BIC			122 247.2			122 030.4			113 918.8			112 867.6

[a] <0.0001.

Whereas the above-mentioned studies used logistic regression analyses to study the association between change in organizational justice levels with health, we took the interdependence of measures into account by using individual growth curve analyses, ie, analyses included random subject effects. These random subject effects describe each person's trend across time, and can thus better explain the complex nature of the correlational structure inherent in longitudinal data. Additionally, they indicate the degree of subject variation that exists in the population of subjects. To our knowledge, the study presented here is the first using growth curve models to examine the prospective association of organizational justice perception on health over time.

Although most studies assume a causal relationship going from organizational justice to health, it is reasonable to assume that also health may affect the perception of organizational justice (19). Indeed, our results support the idea of a reversed in addition to a "normal" relationship from justice perceptions to health, ie, procedural justice perceptions not only influence self-rated health but also that self-rated health influence perceptions of procedural justice. Some previous research have suggested reversed causal relationships between organizational justice and health, eg, one study found that sickness absence contributed to a lower perception of distributive justice, whereas no such reversed relationship was found for depressive symptoms (14). In contradiction, results reported by Kivimäki et al (16) could not provide any evidence supporting a reverse causation between organizational justice and health. Another study reported that the direction of the association was from low justice to decreasing well-being rather than the reverse (19). Thus, future research is warranted to clarify the direction of the associations between organizational justice and health.

Both the association between procedural justice and self-rated health and the association of changes in procedural justice with self-rated health trajectories explained variance in the outcome when important covariates were taken into account, and some of these covariates showed significant associations with intercept and slope in self-rated health. As expected, age was negatively related to self-rated health. Similarly, McCullough & Laurenceau (40) found that until the age of 50 years, men and women maintain relatively high levels of self-rated health, but that levels decline after this age in an accelerating fashion. Somewhat surprising, we found that older participants declined in self-rated health at a slower rate. This finding might be partly explained by the fact that our study cohort consisted of working men and women, ie, people at old ages, and those who might show a faster decline (ie, long-term sick) were not included.

Regarding sex, a majority of studies have shown that women report worse self-rated health than men (eg, 45, 46). In contrast, in our study we saw no difference in intercept values for self-rated health between women and men, but in similarity to McCullough & Laurenceau (40) we found that men showed a faster decline in self-rated health compared to women. Our somewhat unexpected finding indicating a faster deterioration in men's self-rated health can potentially be explained by women with poorer health leaving employment, whereas men might continue working despite poor health (47).

In accordance with other studies, we found a positive relationship between socioeconomic position and self-rated health. The association between being in a more disadvantageous socioeconomic position and having poorer health is a consistent finding across different time periods, countries and measures (48, 49). However, while many studies have reported diverging patterns of self-rated health trajectories between individuals in different socioeconomic groups (eg, 43, 50), we did not find any association with socioeconomic position on rate of change in self-rated health. This somewhat surprising result is in accordance to findings reported from Switzerland (39) which were explained by the fact that Switzerland is characterized by high levels of well-being, wealth, and security. Something that is also true for Sweden (51). One could also argue that the absence of an association between socioeconomic position and rate of change in self-rated health could be explained by the rather broad categories measuring socioeconomic position. However, analyses using more categories did not result in considerably different findings.

We found married/cohabiting participants reporting better self-rated health, which is in line with previous studies (52, 53). However, although being married/cohabiting was positively related with self-rated health in model 3, the association dropped below the significance level in the final model (P=0.07). Two main explanations for why being in a partnership might be associated with better health have been discussed in the literature: first, couples might benefit from sharing resources, and second, partnerships provide caregivers, confidants, and regular social interactions (52). Yet another hypothesis suggests that it is not partnership per se that affects health, rather the association is a result of health selection where persons at higher risk of poor health have poorer possibilities to enter a partnership (52). Contradictory to all of these explanations, we did not find any association between being married/cohabiting and self-rated health, indicating that partnership is neither positively nor negatively associated with self-rated health.

Strengths and weaknesses

We used multi-level growth curve modelling to investigate the impact of justice dynamics on self-rated health trajectories. The use of growth models within a multilevel framework is an advantage to regression analyses as it considers the nested structure of the data. Despite the strength of the design and analytical strategy of this paper, some limitations should be discussed. First, we measured self-rated health by a one-item question with five response options. However, this is a common way to measure self-rated health in surveys and, despite this simplicity, self-rated has been shown to be a useful predictor of mortality in the UK, USA, Scandinavia, Japan, and Australia (28, 54, 55). Also, the treatment of the ordinal variable self-rated health as a continuous variable could be questioned. Still, it has been suggested that it is reasonable to assume that the ordinally measured self-rated health reflects a continuous variable that is normally distributed (43). Both the measure of procedural justice perceptions and the measure of health are based on self-reports which may involve biases due to social desirability, response bias, and common method bias. Thus, future studies might want to expand on our efforts to study the impact of procedural justice perceptions on health via including objective health measures. Also, though our choice of confounding variables was based on the literature, it is still possible that other (not included here) factors could have influenced the relationship between justice perceptions and health, eg, smoking, alcohol, sedentary lifestyle, and body mass index. Also, despite the longitudinal nature of our study, the question of causality cannot be answered and the possibility of reverse causation cannot be clarified. Our results give some support to the idea of a vicious circle, but more research is strongly warranted.

Concluding remarks

In conclusion, our study shows that self-rated health declined slowly over time in the Swedish working population with diverging paths according to age and sex, but also in relation to justice. Procedural justice perceptions and changes thereof were prospectively associated with changes in self-rated health. Additionally, a reverse relationship with self-rated health and change in self-rated health predicting procedural justice was found. The findings reported here support the idea that procedural justice at work is a crucial aspect of the psychosocial work environment and that changes towards more procedural justice could potentially influence self-rated health positively. The finding of a reciprocal association of procedural justice and self-rated health warrants further research.

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