Direct and indirect effects of organizational justice on work ability

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Background Organizational justice (OJ), involving transparent workplace procedures and treating staff members with respect, has been of growing concern in recent epidemiological research as a determinant of health-related outcomes.

Aims To examine the factorial validity of the German version of Moorman's Organizational Justice Questionnaire (OJQ), to investigate the direct cross-sectional effect of OJ on self-rated work ability and to analyse if there is an additional indirect effect of OJ on work ability mediated by effort–reward imbalance.

Methods An analysis of cross-sectional data from the Second German Sociomedical Panel of Employees, involving white-collar workers employed at least half time. We performed confirmatory factor analyses to test the factorial validity of the OJQ and analysed the direct and indirect associations of OJ and self-rated work ability by path model analysis.

Results Of the 1217 participants (47% female; mean age: 51) 36% had poor work ability. Factor analyses confirmed the two-factor structure of the German OJQ. Work ability was explained directly by OJ ($\beta = 0.30$) and effort–reward imbalance ($\beta = -0.27$). Additionally, we identified an indirect effect of OJ that was mediated by effort–reward imbalance ($\beta = 0.14$). The total effect of OJ on work ability was remarkably strong ($\beta = 0.44$). Associations remained unchanged after adjustment for sociodemographic parameters.

Conclusions This study showed the importance of considering additional indirect pathways when examining the impact of OJ on the work ability of employees.

Key words Effort–reward imbalance; organizational justice; path model; structural equation model; validation; work ability.

Introduction

The European population is ageing with the proportion of people aged 65 and over increasing from 9.6% in 1960 to 16% in 2010. A recent projection of the demographic trends in European Union member states and European Free Trade Association countries assumes that in 2060 one in every three European inhabitants will be 65 or over [1]. At the same time, the proportion of the population of current working age (15–64 years) will decrease. This development challenges our social welfare systems. Whereas there were only 15 older people per 100 of working age in 1960, there were already 24 in 2010. It is probable that fewer than two people will work for every older person by 2060 [1]. This demographic development promotes interest in effective preventive strategies to maintain the occupational health and work ability of employees. In this regard, epidemiological research has increasingly focused on the health-related relevance of just and fair work, particularly the effects of distributive, procedural and relational justice [2]. Distributive justice refers to Adam’s equity theory, which is based on the reciprocity of inputs one provides and the outputs one receives [3]. Siegrist’s effort–reward imbalance (ERI) model is the best known empirical representation of this concept [4]. There is strong evidence from longitudinal...
studies that imbalance between efforts and rewards, as characterized by a high effort–reward ratio, induces emotional distress and increases the risk of coronary heart disease and depression [5,6]. In this context, rewards not only include salary but also esteem, job security and the possibility of promotion. Recent research has also acknowledged the negative effects of ERI on employee work ability [7]. Procedural justice (PJ) and relational justice (RJ) are usually understood as representations of organizational justice (OJ) [8–10]. PJ requires the existence of formal, ethical and transparent principles, structures and procedures at the workplace and their consistent and unbiased application to all employees. RJ describes the fair and respectful behaviour of supervisors towards their staff [2]. OJ as a comprehensive score or its indicators PJ and RJ are important predictors of certified sick leave [10–12], self-rated [9,10,13] and mental health [2,9–11,14]. OJ was also shown to be associated with smoking [15], problematic alcohol consumption [16], sleeping problems [17], metabolic syndromes [18] and increased inflammatory markers [19]. In all these studies, the effect estimates were adjusted for sociodemographic characteristics. Most of these studies also adjusted for the effects of other work stress models like ERI or job strain as described by Karasek’s demand-control model [20]. In some studies, the effects of OJ were substantially decreased after adjusting for ERI. Nonetheless, studies on the impact of OJ on self-rated work ability are still lacking.

Though both the OJ model and the ERI model focus on work-related justice, differences can be identified between these models. People can make their evaluation of OJ without being directly affected by injustice by considering representative experiences involving similar people in comparable situations. ERI is, however, a personal experience. Recent research has therefore investigated whether OJ and ERI are complementary risk factors for health and health-related problems. However, we suggest that individual experiences of ERI can also be a consequence of poor OJ [8]. Consequently ERI could be interpreted as a mediating factor of the association between OJ and health-related outcomes. To our knowledge, an analysis of this more sophisticated model of the associations between OJ, ERI and self-rated work ability is still lacking. We therefore developed and validated a German version of the Organizational Justice Questionnaire (OJQ) to analyse the effects of OJ on self-rated work ability and to clarify the mediating role of ERI in this association.

Methods

The Second German Sociomedical Panel of Employees (GSPE-II) is an epidemiological study, which investigates environmental and personal risk factors for work disability and health-related early retirement [7,21]. The gross sample, drawn from the register of the federal German Pension Insurance, consisted of 3750 men and 3750 women aged 45 to 59. Data collection was performed by postal surveys in 2009 and 2010. Data for the present analyses were collected during the second wave of the GSPE-II. Socio-demographic data were added from the initial survey. The study was approved by the data protection commissioner of the German Pension Insurance.

Moorman’s OJQ [8], consisting of a seven-item subscale of PJ and a six-item subscale of RJ, was translated to produce a German OJQ. Each item is rated on a 5-point scale where higher values represent greater OJ at work. Items were independently translated by two German researchers. Back-translation was done by two English speakers. Finally, all involved discussed and approved the final version. ERI at work was assessed by the white-collar version of the Effort–Reward Imbalance Questionnaire (ERIQ) by Siegrist [22]. Effort was measured using five items. As recommended, the sixth item that refers to physical work demands was omitted [22]. The reward scale comprised 11 items representing three dimensions: esteem (five items), job security (two items) and promotion/salary (four items). ERI was calculated as the ratio of the sum of scores of the effort and reward scales (ER ratio), whereby the reward sum score was multiplied by a correction factor to account for the different number of items in the numerator and denominator. An ER ratio >1 indicates that efforts are higher than rewards. The Work Ability Score (WAS) is the first item of the Work Ability Index (WAI) [23] and assesses the current work ability compared with the lifetime best. This item has an 11-point scale, where 0 represents complete incapacity to work and 10 represents lifetime best work ability. WAS values can be categorized as very good (10 points), good (9 points), moderate (8 points) and poor work ability (0–7 points). WAS correlates highly with the overall WAI score [24]. Age, sex, partnership and educational level were considered as relevant socio-demographic parameters. Educational level was assessed as defined by the International Standard Classification of Education (ISCED-97) [25], which considers the highest level of schooling as well as vocational and academic qualifications. The level of education was categorized as high if the ISCED-97 grade was ≥4, i.e. a grade that allows access to universities or comparable institutions providing higher education plus some kind of vocational or academic qualification, and otherwise as low. Additionally, the amount of working time was classified as either full- or part-time.

Descriptive statistics were used to characterize the study population. To test the factorial validity, a central facet of construct validity, of the German version of the OJQ, confirmatory factor analyses were conducted [26]. The 13 items were assigned to the first-order factors PJ and RJ following the original specifications (Figure 1). A second-order factor OJ was assumed to affect the
first-order factors. The error terms were assumed to be uncorrelated. Factorial validity was evaluated by the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI) and the root mean square error of approximation (RMSEA). To be interpreted as acceptable, the CFI and the TLI needed to be equal to or higher than 0.95; and the RMSEA needed to be below 0.08 [26]. In a first step, the initial model was estimated in the total sample, and goodness-of-fit was evaluated. The total sample was then randomly divided into two equally sized sub-samples—a calibration and a validation sample. The model was modified and tested in the calibration sample until acceptable model fit was obtained. Modification indices were inspected to improve model fit by correlating error terms and/or adding cross loadings [26]. The modified model was rechecked in the validation sample for cross-validation. If model fit was acceptable, a final test for the total sample was performed. The maximum likelihood estimator was used to calculate all parameters. Additionally, Cronbach’s α was calculated to assess internal consistency of the PJ and RJ scales. Path analyses were used to investigate the association between OJ and WAS. The measurement model of OJ was the predictor in this model, the ER ratio was chosen as an observed mediator

and the WAS as the endogenous observed variable. The objective was to identify direct effects of OJ and indirect effects of OJ, which were mediated by the ER ratio. A second model was calculated with adjustment for socio-demographic parameters (age, sex, partnership and educational level). Confidence intervals (CI) of path coefficients were estimated by bootstrapping with 1000 bootstrap samples. Test statistics were regarded as significant if the P-value was less than 0.05. Confirmatory factor analyses and path model analyses were performed by IBM SPSS AMOS 20, and all other analyses with IBM SPSS 20.

Results

In the second wave of the GSPE-II study, 2301 people were contacted by mail and 1636 (71%) responded. The analysis was restricted to people who worked at least half-time, were white-collar workers and had never received a disability pension (n = 1217). The confirmatory factor analyses were performed on 1180 subjects with complete data on all OJQ items, and the path model analysis was performed on 1118 subjects with complete data on all relevant parameters. The characteristics of the sample are summarized in Table 1. Participants had a mean age of 51 (SD = 4), 47% were female, 82% lived

Figure 1. Hypothesized two-factor structure of the German Organizational Justice Questionnaire.

Table 1. Characteristics of the sample

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
<th>Mean</th>
<th>SD</th>
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<tbody>
<tr>
<td>Sex (n = 1217)</td>
<td></td>
<td></td>
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<tr>
<td>Male</td>
<td>645 (53)</td>
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<tr>
<td>Female</td>
<td>572 (47)</td>
<td></td>
<td></td>
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<tr>
<td>Partnership (n = 1216)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>997 (82)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>219 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational level (n = 1217)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>767 (63)</td>
<td></td>
<td></td>
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<tr>
<td>Low</td>
<td>450 (37)</td>
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<tr>
<td>Working time (n = 1217)</td>
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<tr>
<td>Full time</td>
<td>974 (80)</td>
<td></td>
<td></td>
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<tr>
<td>Part-time</td>
<td>243 (20)</td>
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<tr>
<td>Work ability (n = 1211)</td>
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</tr>
<tr>
<td>Very good</td>
<td>139 (12)</td>
<td></td>
<td></td>
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<tr>
<td>Good</td>
<td>277 (23)</td>
<td></td>
<td></td>
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<tr>
<td>Moderate</td>
<td>364 (30)</td>
<td></td>
<td></td>
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<tr>
<td>Poor</td>
<td>431 (36)</td>
<td></td>
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<tr>
<td>ER ratio (n = 1149)</td>
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<tr>
<td>ER ratio ≤1</td>
<td>931 (81)</td>
<td></td>
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</tr>
<tr>
<td>ER ratio &gt;1</td>
<td>218 (19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (n = 1217)</td>
<td>50.9</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Work Ability Score (n = 1211)</td>
<td>7.8</td>
<td>1.7</td>
<td></td>
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<tr>
<td>Procedural justice (n = 1180)</td>
<td>3.2</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Relational justice (n = 1180)</td>
<td>3.6</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>ER ratio (n = 1149)</td>
<td>0.7</td>
<td>0.4</td>
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</table>

ER ratio, effort–reward ratio; SD, standard deviation.
with a partner and 63% had a high educational level. The large majority (80%) worked full-time. The mean WAS score was 7.8 (SD = 1.7). About 36% of the participants had poor, 30% moderate, 22% good and 12% very good work ability.

The initial factor model had the following goodness-of-fit statistics: CFI = 0.95, TLI = 0.94, RMSEA = 0.09 and $\chi^2$/df = 709.5/64 = 11.09. No paths had to be deleted from the model because of non-significant loadings. Acceptable model fit was achieved in the calibration sample after three runs of modification (CFI = 0.96, TLI = 0.96, RMSEA = 0.08 and $\chi^2$/df = 272.5/61 = 4.45). This was confirmed in the validation sample (CFI = 0.97, TLI = 0.96, RMSEA = 0.08 and $\chi^2$/df = 296.1/61 = 4.85). The following goodness-of-fit measures were obtained for the total sample: CFI = 0.97, TLI = 0.96, RMSEA = 0.08 and $\chi^2$/df = 483.7/61 = 7.93. The final model with all factor loadings is shown in Figure 2. Three minor modifications were added based on modification indices: a cross-loading of item 1 on the latent PJ construct and covariances between items 3 and 7 as well as items 5 and 6 of the PJ scale. The factor loadings of PJ and RJ on OJ were $\lambda = 0.90$ and $\lambda = 0.78$ and indicated a very good representation of the second-order factor. Factor loadings between PJ and the observed PJ items were high ($\lambda = 0.71$ to $\lambda = 0.90$); loadings between RJ and its related items were high as well ($\lambda = 0.65$ to $\lambda = 0.92$). The path between PJ and item 1, which was additionally inserted, showed a rather low factor loading of $\lambda = 0.26$. This indicates a stronger influence by RJ ($\lambda = 0.65$). Furthermore, both the PJ scale and the RJ scale showed a very good internal consistency with Cronbach’s $\alpha$ being equal to 0.93 (PJ) and 0.93 (RJ), respectively.

Figure 3 shows the path model of the cross-sectional associations between OJ and the WAS with all standardized coefficients (CFI = 0.97, TLI = 0.96, RMSEA = 0.07 and $\chi^2$/df = 498.9/84 = 5.94). Variance of the WAS was explained by direct regression paths of OJ ($\beta = 0.30$; 95% CI 0.23 to 0.37) and the ER ratio ($\beta = -0.27$; 95% CI -0.34 to -0.20). Additionally, a direct negative effect was measured from OJ on the ER ratio with $\beta = -0.52$ (95% CI -0.56 to -0.47). Moreover, we identified an indirect effect of OJ mediated by the ER ratio with $\beta = 0.14$ (95% CI 0.10 to 0.18). Hence, the total effect of OJ on the WAS was $\beta = 0.44$ (95% CI 0.39 to 0.49).

Adjustments for age, sex, partnership and educational level produced no substantial changes in any of the direct (ERI $\rightarrow$ WAS: $\beta = -0.27$; 95% CI -0.36 to -0.20; OJ $\rightarrow$ WAS: $\beta = 0.29$; 95% CI 0.23 to 0.36; OJ $\rightarrow$ ERI: $\beta = -0.52$; 95% CI -0.56 to -0.47) or indirect associations (OJ $\rightarrow$ ERI $\rightarrow$ WAS: $\beta = 0.14$; 95% CI 0.10 to 0.18; total: $\beta = 0.43$; 95% CI 0.38 to 0.48).

**Discussion**

Our findings confirm the factorial validity of the German OJQ, i.e. its two-factor structure. This corresponds to findings from Japanese [27] and Chinese [14] studies on the factorial structure of the OJQ. Furthermore, the two-factor structure was also shown in a recent German study on an abbreviated version of the OJQ in a blue-collar worker sample [13]. All factor loadings except the additionally inserted cross-loading ranged from $\lambda = 0.65$ to 0.92. These values are higher than those found in the Japanese [27] and Chinese studies [14] and correspond to the findings of Moorman’s original OJQ study [8]. Although we inserted an additional path from the...
PJ factor to item 1 of the RJ factor, the corresponding factor loading was quite low and the additional path did not contradict the anticipated two-factor structure. These findings are in line with the results of the exploratory and confirmatory factor analyses of the Japanese validation study [27]. Moreover, the high effects of both factors on the OJ factor indicate that OJ integrates both dimensions as a global construct. Additional analyses showed that the PJ and RJ scales had very good internal consistency. Cronbach’s $\alpha$ coefficients were somewhat higher than those which were reported for both scales in comparable validation studies (e.g. Finnish, Japanese, English and Chinese [10,14,27,28]) and are approximately the same as reported by Moorman’s original paper on the OJQ [8].

Furthermore, our findings revealed a substantial association between OJ and the WAS. In addition to this direct effect, an indirect effect mediated by ERI was also identified. These results remained unchanged after adjustment for socio-demographic variables. Previous epidemiological studies on the impact of work on health and work-related outcomes preferentially used the ERI model by Siegrist and the demand-control model by Karasek. They placed less emphasis on the perceived justice of processes, procedures and supervisor behaviours. This was especially true for studies that investigated risk factors for restricted work ability. We included our modified measurement model of OJ as well as the ER ratio as predictors in our path model. Direct paths of OJ and the ER ratio on self-rated work ability were similarly important. Hence our findings are in line with recent studies analysing the effects of OJ or at least one dimension of OJ after adjusting for ERI and could confirm complementary and independent effects [9,15]. The pathway from low OJ to reduced work ability might be explained in line with Lazarus’ model of cognitive appraisal and coping [29]. We assume that low OJ provokes feelings of uncertainty and unpredictability and is therefore perceived as a threat. Moreover, action-oriented coping is hardly feasible if responsibilities are diffuse and non-transparent. Both threat appraisal and the lack of action-oriented coping strategies will finally induce negative stress reactions and health complaints. Therefore, we assume that long-term exposure to low OJ will have stronger effects on health. Since Moorman pointed out that perceptions of OJ influence the perception of distributive justice in the prediction of job satisfaction, we additionally added an indirect path from OJ to the WAS via the ER ratio. Our findings indicate that low OJ is a strong determinant of ERI and that part of the association between OJ and WAS is mediated by ERI. This indirect effect was small to moderate but the total effect of OJ on WAS was remarkably strong.

Any comprehensive discussion must acknowledge that our study has some limitations. Firstly, only cross-sectional data were considered. Secondly, the sample was restricted to older white-collar workers working at least part-time. This limits the extent to which our findings can be generalized. Thirdly, according to general measurement theory, underestimation of the “true values” must be taken in account if observed variables are used as predictors in path models. Several indicators influenced by latent constructs approximate the true values with increasing number and reliability. As we inserted the ER ratio as an observed variable in our model, it is possible that the coefficient of the ER ratio was underestimated relative to the coefficient of OJ, which was included as a latent variable. Fourthly, we used the WAS as a proxy for the complete WAI. Though the WAS and the complete WAI correlate strongly, one recent study by Roelen et al. [30] suggested that the complete WAI is a better predictor for subsequent disability pension. In view of this, epidemiological research that aims to analyse risk factors for work ability should where possible use the complete WAI. Fifthly, our analyses concentrated on the association of OJ and work ability and the potential mediating role of ERI in this association. Although we considered a set of socio-demographic variables as potential confounders, other established risk factors were not included in our analyses.

Nonetheless these limitations are balanced by strengths in other areas. Firstly, our participants were recruited by random sampling. Secondly, our analyses were based on a relatively large sample. Thirdly, our path modelling approach enabled us to investigate direct as well as indirect effects. Furthermore integration of the complete modified OJ measurement model as a predictor was only possible by using the chosen approach.

In conclusion, our study showed that OJ at work affects work ability directly and indirectly via the mediation of ERI. Therefore when investigating the determinants of reduced work ability it is not only important to include OJ and ERI as complementary risk factors but also essential to consider indirect causal pathways. Further independent studies are needed to replicate our findings and cohort studies should be conducted to investigate the impact of OJ on further health- and work-related outcomes.

### Key points
- This study confirmed the two-factor structure of the German Organizational Justice Questionnaire.
- Work ability was explained directly by organizational justice and indirectly by effort–reward imbalance.
- This study showed the importance of considering additional indirect pathways when examining the impact of organizational justice on the work ability of employees.

### Funding
The federal German Pension Insurance.
Conflicts of interest

None declared.

References