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ORIGINAL ARTICLE

Primary school teachers in China: associations of organizational justice and effort–reward imbalance with burnout and intentions to leave the profession in a cross-sectional sample

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Abstract
Objective We examined associations of organizational justice (OJ) and effort–reward imbalance (ERI) with burnout and intentions to leave the teaching profession (ILTP) among primary school teachers in China.
Methods Six primary schools located in Wuhan, China, were randomly selected from three different socioeconomic areas in 2010. In total, these schools employed 533 teachers, and 436 of these (82 %) participated in a cross-sectional survey. OJ and ERI were assessed by 13-item and 10-item questionnaires, respectively. Burnout was measured using the emotional exhaustion subscale of the Chinese Maslach Burnout Inventory. ILTP were operationalized based on the frequency of thoughts about turnover during the past year. Logistic regression-based odds ratios (ORs) with 95 % confidence intervals (CIs) were estimated separately for OJ and ERI. In a second step, these work stress scales were entered into the same regression model.
Results Separate regression models suggested moderate to strong associations of OJ and ERI with burnout and ILTP. After simultaneous adjustment, the overall OJ score remained associated with burnout and ILTP, but ERI appeared to be the stronger and more consistent determinant of both outcomes. For instance, an increase of 1 standard deviation of the ERI score was associated with an OR of 2.60 (95 % CI 1.97–3.43) for burnout and with an OR of 2.26 (95 % CI 1.66–3.08) for ILTP.
Conclusions Organizational justice and in particular ERI appeared to be determinants of burnout and ILTP among primary school teachers in China.

Adrian Loerbroks and Heng Meng have contributed equally to this study.

Requests of the Chinese version of the Organizational Justice questionnaire and the Effort–Reward Imbalance Questionnaire to Dr. Jian Li.

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Keywords People's Republic of China · Effort–reward imbalance · Organizational justice · Professional burnout · Teachers · Turnover intention

Introduction

High levels of work-related stress have been observed among teachers in various regions of the world, including European countries (Pithers and Soden 1998; Unterbrink et al. 2007; Zurlo et al. 2010), North America (Abel and Sewell 1999), and Australia (Pithers and Soden 1998). The burden of work stress among teachers is not only substantial in absolute terms, but also relative to other professions. For instance, a study among more than 25,000 individuals from 26 occupational groups ranked teaching as the second most stressful occupation (Johnson et al. 2005). Teachers exposed to high levels of work stress may perform cognitively poorer at work (Feuerhahn et al. 2012) and have an impaired quality of life (Yang et al. 2009). If work stress is experienced chronically, teachers are put at increased risk of various physical and mental health problems, including burnout (Burke et al. 1996), which generally includes emotional exhaustion, depersonalization, and reduced sense of personal accomplishment (Maslach et al. 2001). Furthermore, teachers exposed to chronic work stress are more likely to express turnover intentions (Fang and Wang 2006), which may be conceptualized as affective and behavioral responses to work stress closely correlating with actual turnover (Alexander et al. 1998). From a public health perspective, there is the need to explore which specific psychosocial work characteristics of the teaching profession represent the most pertinent independent determinants of work stress-related adverse sequels, such as burnout or intentions to leave the teaching profession (ILTP). Such insights are needed to inform the development of targeted interventions to improve teachers' psychosocial work conditions and to consequently reduce the risk of unfavorable health-related and organizational outcomes.

The model of organizational justice (OJ) and the effort–reward imbalance (ERI) model are among the most widely used work stress models and have been found to consistently predict health outcomes in various occupational groups (Colquitt et al. 2001; Siegrist et al. 2004). The OJ model focuses on employees' perceptions of fairness in the workplace (Colquitt et al. 2001). OJ has initially been characterized according to four subdimensions, these are, distributive, informational, procedural, and interactional justice (Colquitt et al. 2001). The latter two subdimensions have emerged from subsequent research as those that are the most important determinants of health (Elovainio et al. 2009; Ferrie et al. 2006; Kivimaki et al. 2008). In brief, procedural justice (PJ) captures the perceived fairness of the procedures underlying decision making (Folger and Greenberg 1985) (e.g., are the interests of those affected by the decisions considered? Are the procedures consistent?). Interactional justice (IJ) refers to how employees are treated interpersonally (e.g., with politeness, dignity, and trustworthiness), in particular by their supervisor. The second work stress model, the ERI model, is based on the reciprocity between work-related efforts of an employee and the rewards received (Siegrist et al. 2004). Efforts may include the need to perform one's work under time pressure, with frequent interruptions or under insecure contracting conditions. Examples of rewards include the salary, promotion prospects, job security, or recognition from colleagues and supervisors.

Little is known about the relationship of potentially stressful working conditions as captured by OJ and ERI with burnout and turnover intentions among teachers. To our knowledge, there is no scientific publication on the potential relationship between OJ and burnout among teachers. Similarly, evidence on the association between ERI and mental health among teachers remains sparse (Lehr et al. 2009; Tang et al. 2012; Zurlo et al. 2010). With regard to turnover intentions, there are at least two studies that have addressed OJ as a determinant among teaching staff (Hassan and Hashim 2011; Kumar and Gupta 2008). Both studies suggested inverse correlations between OJ and turnover intentions. We are not aware of any investigation, however, that has examined the association between ERI and turnover intentions.

A general limitation of the currently available empirical evidence on work stress among teachers is that it stems primarily from Western countries (Abel and Sewell 1999; Pithers and Soden 1998; Unterbrink et al. 2007; Zurlo et al. 2010). Generalizability of those studies' findings to non-Western societies, including Asian societies, may be very limited, e.g., due to cultural differences. With respect to work stress, one of the most important cultural differences relates to individualism, which prevails in the West, as opposed to collectivism, which is characteristic of many Asian societies. Individualism emphasizes personal autonomy and the accomplishment of the individual's goals and aspirations (Chun et al. 2006). By contrast, in collectivistic societies, in-groups are the central unit. The focus in collectivism is on the fulfillment of social roles and obligations toward that in-group (Chun et al. 2006). Individuals from collectivistic and individualistic societies have been found to differ with regard to both the appraisal of occupational stress (Mazzola et al. 2011) and the strategies to cope with stress (Chun et al. 2006).

It seems reasonable that OJ and ERI may capture some of the key components of work stress as it is experienced by teachers in China. It has been suggested that a lack of

recognition, poor promotion opportunities, and low salaries are among the key stressors of Chinese teachers (Jin et al. 2008; Liu and Onwuegbuzie 2012). These work-related stressors are captured by the reward component of the ERI model. In addition, the workload is another crucial occupational stressor for Chinese teachers (Liu and Onwuegbuzie 2012) and is incorporated in the effort component of the ERI model. Furthermore, evidence suggests that the ERI model has particular explanatory power when applied to occupational groups employed in service-related professions whose characteristic feature is frequent personal interactions (Marmot et al. 1999). This feature constitutes a key component of the teaching profession. Representing an important aspect of an organization's psychosocial work climate (Elovainio et al. 2011), OJ may capture additional sources of stress among Chinese school teachers. For instance, in a study among Chinese teachers, only 12 % reported not to be stressed by the management style of their school principal (Meng and Liu 2008). This finding highlights the need to explore occupational stressors related to organizational structures in Chinese schools. Targeting organizational stressors has been suggested as a promising approach to improve teachers' health (Tang et al. 2012).

As evidence on the associations of OJ and ERI with burnout and ILTP among teachers is either markedly sparse or lacking, we sought to examine these relationships. We were able to draw on data from a thus far understudied population for our investigation, that is, teachers in China.

Methods

Study sample

In 2010, we conducted a cross-sectional survey in Wuhan, a city with a population of 9 million inhabitants located in Central China. In total, there were 639 primary schools and 27,235 primary school teachers in Wuhan in 2010, and the teacher–student ratio was about 1:15 (Wuhan Education Bureau 2013). In urban cities in China, teachers generally have qualified licenses and long-term working contracts. In order to balance varying socioeconomic profiles, six schools were randomly selected from three geographic strata representing areas with different levels of socioeconomic development within the city, i.e., two schools were randomly drawn from areas with low, intermediate, and high socioeconomic levels, respectively. All teachers employed by the six selected schools were invited to participate in the survey ($n = 533$). A total of 53 teachers were not present at the time of data collection. With the support of the local educational authority, a trained researcher visited the schools to explain the study and to distribute questionnaires to the remaining 480 teachers. In total, 436 teachers filled out and returned the questionnaires (response rate: 436/533 = 82 %). After completion of the data analysis, the trained researcher visited the schools again to present the findings to the teachers and to the school administration and to offer consultations based on the study findings. The current investigation is based on a sample of 425 participants with complete data on all key variables, including potential confounders (see below). The study protocol was approved by the Ethical Committee of the Huazhong University of Science and Technology, and the research was performed in accordance with the Declaration of Helsinki.

Questionnaire data

A modified version of Moorman's organizational justice (OJ) questionnaire (Elovainio et al. 2002) was used to measure procedural justice (PJ; 7 items) and interactional justice (IJ; 6 items). The original OJ questionnaire was translated from English into Chinese and back-translated into English by two independent translators. Inconsistencies between the original version and the back-translated version were discussed until a consensus was reached. The response categories were five-point Likert-scaled, ranging from "strongly disagree" to "strongly agree." The potential score range was 7–35 points for the PJ subscale, 6–30 points for the IJ subscale, and 13–65 points for the overall OJ scale. Higher scores reflect higher levels of perceived justice. Since the OJ scale developed for this study had not been psychometrically evaluated yet, we examined its properties. We performed exploratory factor analysis (EFA) to investigate its structural validity and calculated Cronbach's alpha coefficients to assess the internal consistency of the derived factors. Briefly, in EFA the expected seven PJ items loaded on one factor while the six items hypothesized to measure IJ clustered into an independent second factor. Factor loadings for the individual items were 0.50 or above (see Table 4 in the "Appendix"). The Cronbach's alpha was 0.96 for the overall OJ scale, 0.92 for the PJ subscale, and 0.96 for the IJ subscale, which indicates high internal consistency for these three scales.

Effort–reward imbalance (ERI) was measured by a short questionnaire (Siegrist et al. 2009), which has been validated in Chinese (Li et al. 2012). This questionnaire consists of subscales capturing effort (3 items) and reward (7 items). Item responses are scored on a four-point Likert scale (ranging from "1 = strongly disagree" to "4 = strongly agree"). Consequently, the potential score range equals 3–12 points for the effort subscale and 7–28 points on the reward subscale. Higher scores imply higher effort and higher reward, respectively. A ratio between the two subscales effort and reward (weighted by the number of items) was calculated to quantify the degree of an

unfavorable mismatch between effort and reward, that is, effort–reward imbalance (Siegrist et al. 2009).

Burnout was assessed by the emotional exhaustion subscale derived from the Maslach Burnout Inventory (Maslach et al. 2001), whose Chinese version is available (Tang 1998). Emotional exhaustion is regarded as the central quality and the most salient manifestation of burnout (Maslach et al. 2001). The response categories are scored on a five-point Likert scale, and burnout was defined as a score within the highest tertile (Vercambre et al. 2009). Intentions to leave the teaching profession (ILTP) were measured by the following item: "How often during the course of the past year have you thought about leaving teaching?". The response categories were "never," "a few times per year," "a few times per month," "a few times per week," "everyday." Teachers specifying "a few times per month," "a few times per week," or "everyday" were considered to express ILTP. This one-item measure has been used previously in studies among Chinese and European employees (Li et al. 2010, 2011).

Statistical analysis

We conducted logistic regression modeling to compute odds ratios (ORs) with 95 % confidence intervals (CIs) for the associations of OJ and ERI as well as their respective subscales (independent variables) with burnout and ILTP (the dependent variables). The models were adjusted for potentially confounding variables, including age, gender, education, marital status, professional rank, smoking status, alcohol consumption, and physical exercise. First, four separate multivariable models were calculated for OJ and burnout; ERI and burnout; OJ and ILTP; and ERI and ILTP, respectively. In a second step, OJ and ERI were entered into the same multivariable model to predict either burnout or ILTP. This simultaneous adjustment was performed in order to test the independent contribution of OJ and ERI to the odds of burnout or the odds of the ILTP. In line with previous epidemiological studies (Niedhammer et al. 2004), we employed the work stress scales as both categorized variables (divided into tertiles) and continuous variables in statistical analyses. For the continuous analyses, OJ and ERI scores were z-transformed. Thus, ORs calculated for these scores reflect the OR associated with a change of the respective score by 1 standard deviation (SD). We verified the fit of each model using the Hosmer–Lemeshow goodness-of-fit test. In all cases, the models fitted the data appropriately ($p > 0.05$). In sensitivity analyses, we accounted for multiple testing using Bonferroni adjustments. This approach suggested similar patterns of association as the primary analyses and these results are therefore not shown. All analyses were performed with the statistical program SAS 9.2.

Results

Descriptive statistics

Table 1 shows key characteristics of the study participants. On average, participants were aged in the mid-30s. Most were female, married, had advanced educational backgrounds and an intermediate professional rank. About one-quarter of the participants specified they engaged in physical exercise, while smoking and alcohol drinking were reported by roughly one out of ten respondents, respectively. The perceived levels of overall organizational justice (OJ) as well as procedural justice (PJ) and interactional justice (IJ) were moderate. The mean effort–reward imbalance (ERI) ratio score was fairly high (mean = 1.17, SD = 0.35). In 67 % of the respondents ($n = 285$), the perceived efforts at work exceeded the rewards, as reflected by an ERI ratio above 1.0. This high prevalence of ERI seemed to be predominantly driven by high efforts (mean score = 8.68, SD = 1.69) rather than low rewards (mean score = 17.87, SD = 2.54).

Table 1 Characteristics of the study sample ($n = 425$)

Characteristics		
Age, mean ± SD	Years	35.74 ± 6.65
Gender, *n* (%)	Men	84 (19.76)
	Women	341 (80.24)
Education, *n* (%)	College and high school and below	144 (33.88)
	University	281 (66.12)
Marital status, *n* (%)	Single	38 (8.94)
	Married	370 (87.06)
	Others	17 (4.00)
Professional rank, *n* (%)	High	125 (29.41)
	Intermediate	225 (52.94)
	Low	75 (17.65)
Smoking, *n* (%)	No	384 (90.35)
	Yes	41 (9.65)
Alcohol drinking, *n* (%)	No	375 (88.24)
	Yes	50 (11.76)
Physical exercise, *n* (%)	No	318 (74.82)
	Yes	107 (25.18)
Overall OJ score, mean ± SD		42.30 ± 10.12
Procedural justice, mean ± SD		22.73 ± 5.51
Interactional justice, mean ± SD		19.57 ± 5.15
ERI score, mean ± SD		1.17 ± 0.35
Effort, mean ± SD		8.68 ± 1.69
Reward, mean ± SD		17.87 ± 2.54

OJ Organizational justice

ERI Effort–reward imbalance

The ERI ratio score and the overall OJ score correlated moderately (Pearson's correlation coefficient [r] = −0.39, $p < 0.001$). The ERI ratio score showed comparably pronounced correlations with the PJ subscale ($r = -0.36$, $p < 0.001$) and the IJ subscale ($r = -0.39$, $p < 0.001$). The overall OJ score correlated more strongly with the reward subscale ($r = 0.48$, $p < 0.001$) than with the effort subscale ($r = -0.18$, $p < 0.001$).

Multivariable analyses

Multivariable analyses, based on separate regression models for OJ and ERI, suggested a pronounced association between the overall OJ score and burnout (see Table 2). For instance, the odds of burnout increased by 77 % with every 1 SD decrease in the OJ score (OR = 1.77, 95 % CI 1.41–2.22). Likewise, ERI seemed to be a strong determinant of burnout (OR for the continuous ERI score = 2.60, 95 % CI 1.97–3.43). When OJ and ERI were entered into the same statistical model, all ORs were somewhat attenuated. Nevertheless, both OJ and ERI remained independent determinants of burnout. Notably, the ORs were stronger for ERI than for OJ. Separate analyses of the OJ subscales suggested stronger associations between IJ and burnout than between PJ and burnout. With regard to ERI components, we observed particularly pronounced associations between effort and burnout and moderate associations between reward and burnout (see Table 2).

Overall, we found similar patterns of associations when we used intentions to leave the teaching profession (ILTP) as outcome of the statistical analysis (see Table 3). Multivariable analyses performed separately for each work stress model suggested strong associations of the overall OJ score and the ERI score with ILTP. After simultaneous adjustment, the strength of the ORs for the overall OJ score and ILTP was considerably reduced toward the null value, but remained significant. The attenuation of the ORs for the ERI model was less substantial. Accordingly, we still observed marked associations between ERI and ITLP (e.g., OR for a 1 SD increase of the ERI score = 2.26, 95 % CI 1.66–3.08) with more pronounced associations for the effort component than for reward.

Table 2 Odds ratios (ORs) and 95 % confidence intervals (CIs) for burnout by organizational justice and effort–reward imbalance

	Model I OR (95 % CI)	Model II OR (95 % CI)
Organizational justice		
High	1.00	1.00
Intermediate	1.83 (1.02, 3.28)	1.51 (0.81, 2.81)
Low	3.46 (2.00, 6.01)	2.29 (1.26, 4.14)
Decreased per SD	1.77 (1.41, 2.22)	1.38 (1.08, 1.78)
Procedural justice		
High	1.00	1.00
Intermediate	1.33 (0.71, 2.51)	1.22 (0.62, 2.44)
Low	1.55 (0.78, 3.08)	1.38 (0.65, 2.92)
Decreased per SD	0.97 (0.68, 1.39)	0.92 (0.62, 1.35)
Interactional justice		
High	1.00	1.00
Intermediate	1.51 (0.80, 2.85)	1.24 (0.62, 2.47)
Low	2.93 (1.35, 6.33)	1.75 (0.74, 4.12)
Decreased per SD	1.90 (1.32, 2.74)	1.61 (1.09, 2.38)
Effort–reward imbalance		
Low	1.00	1.00
Intermediate	2.50 (1.36, 4.60)	2.26 (1.21, 4.20)
High	8.44 (4.56, 15.62)	6.97 (3.70, 13.14)
Increased per SD	2.60 (1.97, 3.43)	2.31 (1.73, 3.09)
Effort		
Low	1.00	1.00
Intermediate	2.64 (1.48, 4.70)	2.50 (1.38, 4.52)
High	6.17 (3.41, 11.17)	5.94 (3.25, 10.83)
Increased per SD	2.10 (1.61, 2.72)	2.06 (1.58, 2.69)
Reward		
High	1.00	1.00
Intermediate	1.27 (0.65, 2.48)	1.10 (0.55, 2.20)
Low	2.91 (1.52, 5.59)	2.09 (1.02, 4.28)
Decreased per SD	1.64 (1.27, 2.12)	1.39 (1.05, 1.86)

Model I: adjustment for age, gender, education, marital status, professional rank, smoking, alcohol drinking, and physical exercise

Model II: additional simultaneous adjustment for organizational justice and effort–reward imbalance

SD standard deviation

Discussion

In the present study among primary school teachers in China, we observed decreasing levels of organizational justice (OJ) and increasing levels of effort–reward imbalance (ERI) to be independently related to increased odds of both burnout and the expression of intentions to leave the teaching profession (ILTP). ERI seemed to be a stronger determinant than OJ of both outcomes.

Findings in light of the literature

We are not aware of previous studies on the potential link between OJ and burnout in teachers. Our observation of an inverse association, however, receives support from studies conducted in other populations with service-related professions, such as civil servants (Aghaei et al. 2012) and hotel staff (Moliner et al. 2005). With regard to ERI, our findings add to the existing research among teachers suggesting that the ERI model is associated with psychological outcomes related to the burnout syndrome such as poor general mental health (Seibt et al. 2012). Furthermore, a

Table 3 Odds ratios (ORs) and 95 % confidence intervals (CIs) for intentions to leave the teaching profession by organizational justice and effort–reward imbalance

	Model I	Model II
Organizational justice		
High	1.00	1.00
Intermediate	1.95 (1.03, 3.69)	1.59 (0.81, 3.14)
Low	3.01 (1.65, 5.51)	1.89 (0.99, 3.61)
Decreased per SD	1.74 (1.38, 2.20)	1.36 (1.06, 1.76)
Procedural justice		
High	1.00	1.00
Intermediate	1.59 (0.79, 3.19)	1.47 (0.70, 3.07)
Low	1.70 (0.79, 3.66)	1.48 (0.66, 3.35)
Decreased per SD	1.08 (0.75, 1.56)	1.00 (0.68, 1.48)
Interactional justice		
High	1.00	1.00
Intermediate	1.14 (0.56, 2.28)	0.96 (0.45, 2.02)
Low	2.40 (1.05, 5.47)	1.57 (0.64, 3.84)
Decreased per SD	1.67 (1.15, 2.43)	1.37 (0.93, 2.03)
Effort–reward imbalance		
Low	1.00	1.00
Intermediate	1.89 (0.93, 3.85)	1.72 (0.84, 3.54)
High	8.51 (4.32, 16.78)	7.26 (3.52, 14.60)
Increased per SD	2.55 (1.90, 3.41)	2.26 (1.66, 3.08)
Effort		
Low	1.00	1.00
Intermediate	2.02 (1.09, 3.74)	1.94 (1.03, 3.64)
High	4.47 (2.42, 8.28)	4.30 (2.30, 8.01)
Increased per SD	1.84 (1.41, 2.42)	1.84 (1.40, 2.43)
Reward		
High	1.00	1.00
Intermediate	1.25 (0.60, 2.59)	1.07 (0.50, 2.29)
Low	2.72 (1.35, 5.48)	1.95 (0.90, 4.23)
Decreased per SD	1.88 (1.43, 2.46)	1.62 (1.20, 2.19)

Model I: adjustment for age, gender, education, marital status, professional rank, smoking, alcohol drinking, and physical exercise

Model II: additional simultaneous adjustment for organizational justice and effort–reward imbalance

SD standard deviation

number of studies in other occupational groups than teachers, e.g., health-care professionals (Hammig et al. 2012; Klein et al. 2010; Schulz et al. 2009), have suggested positive relationships between ERI and burnout. Explanations of this association involve, among other, mediation along various psychophysiological pathways (Chandola et al. 2010), such as a reduction in vagal tone (Kemp et al. 2010; Loerbroks et al. 2010). We found a negative association between OJ and ILTP, which is in keeping with earlier research (Hassan and Hashim 2011; Kumar and Gupta 2008). With regard to ERI in relation to intentions to leave the profession, evidence from teacher samples is lacking, but results from other occupational samples, e.g., nurses (Li et al. 2011), support our finding of a positive association.

The work stress scales: independent or interdependent?

Notably, most of the earlier investigations of OJ and ERI in relation to burnout or ILTP reported association measures that were unadjusted or minimally adjusted for confounders (e.g., only for age). By contrast, we were able to account for a fairly large set of potentially confounding variables. Most importantly, ours is the first study on burnout and turnover intentions, which presented estimates simultaneously adjusted for OJ and ERI. Such simultaneous adjustment is crucial to quantify the independent contribution of each model to the explanation of the distribution of burnout or ILTP. It has been a matter of debate whether the OJ model captures elements of stressful experiences at work that are complementary to the ERI model or whether OJ is redundant if ERI is considered (Kawachi 2006; Kivimaki et al. 2007). The ERI model emphasizes the employee's costs which remain imbalanced by rewards and postulates that this perceived lack of reciprocity is a key source of occupational stress (Siegrist et al. 2004). As such, ERI could be viewed as reflecting unfairness of outcomes in terms of money, promotion, and security, which is somewhat overlapping with the concept of distributive injustice, as noted before (Kivimaki et al. 2007). Key components of the OJ model, especially procedural justice (PJ) and interactional justice (IJ), are in contrast concerned with unfavorable social interactions within organizations, that is, fairness of the decision-making procedures and equity in the interpersonal treatment in hierarchies (Head et al. 2007).

To date, only few studies have explored the potential independence or interdependence of ERI's and PJ's or IJ's health-related explanatory power (Head et al. 2007; Inoue et al. 2013; Kivimaki et al. 2007). Kivimäki et al. (2007) observed that PJ, IJ, and ERI were independent predictors of the incidence of poor self-rated health, minor psychiatric morbidity, and doctor-diagnosed depression. In another prospective study utilizing IJ and ERI, Head et al. (2007) confirmed these scales' ability to independently predict sickness absence. Thus, these two studies, conducted in Western countries, suggested that OJ and ERI are complementary models. In a recent cross-sectional study from Japan, Inoue et al. (2013) have observed associations of PJ, IJ, and ERI with major depressive episodes in univariate analysis. However, after simultaneous adjustment, IJ was a strong and the only remaining determinant, indicating redundancy of the two models. Our study adds to this body of literature. We observed that, after simultaneous adjustment, both overall OJ and ERI were independent determinants of burnout and ILTP, but ERI showed stronger associations with both outcomes. Moreover, we also found in this study

from China that PJ showed no meaningful association with any of the two outcomes. It has been pointed out that PJ is conceptually connected to the construct "decision authority" of the well-established demand-control model (Kawachi 2006; Ndjaboue et al. 2012), which is crucial to workers' health as indicated by evidence from Western countries (Karasek and Theorell 1990). Interestingly, an earlier occupational study from China (Li and Shi 2003) found that distributive justice (which overlaps with ERI) explained much more variance of burnout than PJ (which overlaps with decision authority). Our previous cross-sectional and prospective studies in China also confirmed that, compared to the demand-control model, the ERI model appears to have higher explanatory power related to mental health and turnover intentions (Li et al. in press; Li et al. 2006). One may speculate that in collectivistic societies such as China (Chun et al. 2006; Mazzola et al. 2011), personal autonomy and fairness perceptions related to decision-making procedures may be less relevant than in Western societies. In contrast to PJ, we found independent associations of both IJ and ERI with burnout, indicating complementarity of these models.

Limitations

The main limitation of our study is its cross-sectional design. This design does not allow the introduction of a temporal sequence between presumed causes and effects into the analytical approach, which is an indispensable condition for causal interpretation. Another limitation is the relatively small sample size which limited the statistical power to detect weak associations. The good response rate in our study reduces the likelihood of selection bias. As mentioned above, OJ and ERI are likely to capture important sources of stress among Chinese teachers and were determinants of burnout and ILTP in our study. There may nevertheless be additional context-specific stressors which are assessed by neither scale, such as students' misbehavior or poor cooperativeness of parents (Liu and Onwuegbuzie 2012; Meng and Liu 2008). Finally, as this study was based on a sample of primary school teachers from a single Chinese city, the generalizability of our study findings to the entire population of Chinese primary school teachers may be limited.

Conclusions

In conclusion, this study identified OJ and ERI as independent determinants of burnout and ILTP among primary school teachers in China. Further studies are needed, preferably based on longitudinal designs, to provide additional data on the explanatory power of OJ and ERI in relation to the incidence of burnout or the development of ILTP (or actual turnover) among teachers in China and elsewhere.

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Conflict of interest The authors declare that they have no conflict of interest.

Appendix

See Table 4.

Table 4 Exploratory factor analysis of the 13-item organizational justice questionnaire using principal axis extraction and varimax rotation

Scales	Items	F1	F2
Procedural justice	Decisions are made based on accurate information		0.50
	People are provided opportunities to appeal or challenge decisions they find unsuccessful		0.68
	All sides affected by the decision are represented in decision making		0.73
	Decisions are made with consistency (the rules are the same for every employee)		0.66
	The concerns of all those affected by the decision are heard before decision making		0.77
	Feedback is collected regarding the decision and its implementation		0.69
	It is possible to requests for clarification or additional information about the decision		0.72
Interactional justice	Our supervisor considers our viewpoint	0.75	
	Our supervisor is able to suppress personal biases	0.74	
	Our supervisor provides us with timely feedback about the decisions and their implications	0.72	
	Our supervisor treats us with kindness and consideration	0.84	
	Our supervisor shows concern for our rights as an employee	0.81	
	Our supervisor takes steps to deal with us in a truthful manner	0.81	
Variance explained (%)		36.6	33.3

Only items with factor loading $\geq$0.50 are shown

References

Abel M, Sewell J (1999) Stress and burnout in rural and urban secondary school teachers. J Educ Res 92:287–293

Aghaei N, Moshiri K, Shahrbanian S (2012) Relationship between organizational justice and job burnout in employees of Sport and Youth Head Office of Tehran. Adv Appl Sci Res 3:2438–2445

Alexander JA, Lichtenstein R, Oh HJ, Ullman E (1998) A causal model of voluntary turnover among nursing personnel in long-term psychiatric settings. Res Nurs Health 21:415–427

Burke R, Greenglass E, Schwarzer R (1996) Predicting teacher burnout over time: effects of work stress, social support, and self-doubts on burnout and its consequences. Anxiety Stress Coping: An Int J 9:261–275

Chandola T, Heraclides A, Kumari M (2010) Psychophysiological biomarkers of workplace stressors. Neurosci Biobehav Rev 35:51–57

Chun C-A, Moos R, Cronkite R (2006) Culture: a fundamental context for the stress and coping paradigm. In: Wong P, Wong L (eds) Handbook of multicultural perspectives on stress and coping. Springer, New York, pp 29–53

Colquitt J, Conlon D, Wesson M, Porter C, Ng K (2001) Justice at the millennium: a meta-analytic review of 25 years of organizational justice research. J Appl Psychol 86:425–445

Elovainio M, Kivimaki M, Vahtera J (2002) Organizational justice: evidence of a new psychosocial predictor of health. Am J Public Health 92:105–108

Elovainio M, Ferrie JE, Gimeno D, De Vogli R, Shipley M, Brunner EJ, Kumari M, Vahtera J, Marmot MG, Kivimaki M (2009) Organizational justice and sleeping problems: the Whitehall II study. Psychosom Med 71:334–340

Elovainio M, Pietikainen M, Luopa P, Kivimaki M, Ferrie JE, Jokela J, Suominen S, Vahtera J, Virtanen M (2011) Organizational justice at school and its associations with pupils' psychosocial school environment, health, and wellbeing. Soc Sci Med 73:1675–1682

Fang Y, Wang Y (2006) Teaching performance and turnover: a study of school teachers in Singapore. Employ Relat Rec 6:33–48

Ferrie JE, Head J, Shipley MJ, Vahtera J, Marmot MG, Kivimaki M (2006) Injustice at work and incidence of psychiatric morbidity: the Whitehall II study. Occup Environ Med 63:443–450

Feuerhahn N, Stamov-Rossnagel C, Wolfram M, Bellingrath S, Kudielka BM (2012) Emotional exhaustion and cognitive performance in apparently healthy teachers: a longitudinal multi-source study. Stress Health (in press)

Folger R, Greenberg J (1985) Procedural justice: an interpretative analysis of personnel systems. In: Rowland K (ed) Research in personnel and human resources management. JAI Press Inc., Greenwich, Conn., pp 141–183

Hammig O, Brauchli R, Bauer GF (2012) Effort-reward and work-life imbalance, general stress and burnout among employees of a large public hospital in Switzerland. Swiss Med Wkly 142:w13577

Hassan A, Hashim J (2011) Role of organizational justice in determining work outcomes of national and expatriate academic staff in Malaysia. Int J Commer Manag 21:82–93

Head J, Kivimaki M, Siegrist J, Ferrie JE, Vahtera J, Shipley MJ, Marmot MG (2007) Effort-reward imbalance and relational injustice at work predict sickness absence: the Whitehall II study. J Psychosom Res 63:433–440

Inoue A, Kawakami N, Tsuno K, Tomioka K, Nakanishi M (2013) Organizational justice and major depressive episodes in Japanese employees: a cross-sectional study. J Occup Health 55:47–55

Jin P, Yeung AS, Tang TO, Low R (2008) Identifying teachers at risk in Hong Kong: psychosomatic symptoms and sources of stress. J Psychosom Res 65:357–362

Johnson S, Cooper C, Cartwright S, Donald I, Taylor P, Millet C (2005) The experience of work-related stress across occupations. J Manag Psychol 20:178–187

Karasek R, Theorell T (1990) Healthy work: Stress, productivity, and the reconstruction of working life. Basic Books, New York

Kawachi I (2006) Injustice at work and health: causation or correlation? Occup Environ Med 63:578–579

Kemp AH, Quintana DS, Gray MA, Felmingham KL, Brown K, Gatt JM (2010) Impact of depression and antidepressant treatment on heart rate variability: a review and meta-analysis. Biol Psychiatry 67:1067–1074

Kivimaki M, Vahtera J, Elovainio M, Virtanen M, Siegrist J (2007) Effort-reward imbalance, procedural injustice and relational injustice as psychosocial predictors of health: complementary or redundant models? Occup Environ Med 64:659–665

Kivimaki M, Ferrie JE, Shipley M, Gimeno D, Elovainio M, de Vogli R, Vahtera J, Marmot MG, Head J (2008) Effects on blood pressure do not explain the association between organizational justice and coronary heart disease in the Whitehall II study. Psychosom Med 70:1–6

Klein J, Grosse Frie K, Blum K, Siegrist J, dem Knesebeck O (2010) Effort-reward imbalance, job strain and burnout among clinicians in surgery [German]. Psychother Psychosom Med Psychol 60:374–379

Kumar K, Gupta G (2008) Perceived organizational justice, job satisfaction and turnover intentions: a co-relational study. Gujarat J Psychol. http://ssrn.com/abstract=1408665. Accessed 13 Feb 2013

Lehr D, Hillert A, Keller S (2009) What can balance the effort? Associations between effort-reward imbalance, overcommitment, and affective disorders in German teachers. Int J Occup Environ Health 15:374–384

Li J, Shang L, Galatsch M, Siegrist J, Müller BH, Hasselhorn HM, NEXT study group (2012) Psychosocial work environment and intention to leave the nursing profession: a cross-national prospective study of 8 countries. Int J Health Serv (in press)

Li C, Shi K (2003) The influence of distributive justice and procedural justice on job burnout [Chinese]. Acta Psychologica Sinica 35:677–684

Li J, Yang W, Cho SI (2006) Gender differences in job strain, effort-reward imbalance, and health functioning among Chinese physicians. Soc Sci Med 62:1066–1077

Li J, Fu H, Hu Y, Shang L, Wu Y, Kristensen TS, Mueller BH, Hasselhorn HM (2010) Psychosocial work environment and intention to leave the nursing profession: results from the longitudinal Chinese NEXT study. Scand J Public Health 38:69–80

Li J, Galatsch M, Siegrist J, Muller BH, Hasselhorn HM (2011) Reward frustration at work and intention to leave the nursing profession–prospective results from the European longitudinal NEXT study. Int J Nurs Stud 48:628–635

Li J, Loerbroks A, Shang L, Wege N, Wahrendorf M, Siegrist J (2012) Validation of a short measure of effort-reward imbalance in the workplace: evidence from China. J Occup Health 54:427–433

Liu S, Onwuegbuzie A (2012) Chinese teachers' work stress and their turnover intention. Int J Educ Res 53:160–170

Loerbroks A, Schilling O, Haxsen V, Jarczok MN, Thayer JF, Fischer JE (2010) The fruits of ones labor: effort-reward imbalance but not job strain is related to heart rate variability across the day in 35–44-year-old workers. J Psychosom Res 69:151–159

Marmot M, Siegrist J, Theorell T, Feeney A (1999) Health and the psychosocial environment at work In: Marmot M, Wilkinson RG (eds) Social determinants of health. Oxford University Press, London, pp 105–131

Maslach C, Schaufeli WB, Leiter MP (2001) Job burnout. Annu Rev Psychol 52:397–422

Mazzola J, Schonfeld I, Spector P (2011) What qualitative research has taught us about occupational stress. Stress Health 27:93–110

Meng L, Liu S (2008) Mathematics teacher stress in Chinese secondary schools. J Educ Enq 8:73–96

Moliner C, Martinez-Tur V, Ramos J, Peiro JM (2005) Linking organizational justice to burnout: are men and women different? Psychol Rep 96:805–816

Ndjaboue R, Brisson C, Vezina M (2012) Organisational justice and mental health: a systematic review of prospective studies. Occup Environ Med 69:694–700

Niedhammer I, Tek M, Starke D, Siegrist J (2004) Effort-reward imbalance model and self-reported health: cross-sectional and prospective findings from the GAZEL cohort. Soc Sci Med 58:1531–1541

Pithers R, Soden R (1998) Scottish and Australien teacher stress and strain: a comparative study. Br J Educ Psychol 68:269–279

Schulz M, Damkroger A, Heins C, Wehlitz L, Lohr M, Driessen M, Behrens J, Wingenfeld K (2009) Effort-reward imbalance and burnout among German nurses in medical compared with psychiatric hospital settings. J Psychiatr Ment Health Nurs 16:225–233

Seibt R, Matz A, Hegewald J, Spitzer S (2012) Working conditions of female part-time and full-time teachers in relation to health status. Int Arch Occup Environ Health 85:675–687

Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, Peter R (2004) The measurement of effort-reward imbalance at work: European comparisons. Soc Sci Med 58:1483–1499

Siegrist J, Wege N, Puhlhofer F, Wahrendorf M (2009) A short generic measure of work stress in the era of globalization: effort-reward imbalance. Int Arch Occup Environ Health 82:1005–1013

Tang CS (1998) Assessment of burnout for Chinese human service professionals: a study of factorial validity and invariance. J Clin Psychol 54:55–58

Tang JJ, Leka S, Maclennan S (2012) The psychosocial work environment and mental health of teachers: a comparative study between the United Kingdom and Hong Kong. Int Arch Occup Environ Health (in press)

Unterbrink T, Hack A, Pfeifer R, Buhl-Griesshaber V, Muller U, Wesche H, Frommhold M, Scheuch K, Seibt R, Wirsching M, Bauer J (2007) Burnout and effort-reward-imbalance in a sample of 949 German teachers. Int Arch Occup Environ Health 80:433–441

Vercambre MN, Brosselin P, Gilbert F, Nerriere E, Kovess-Masfety V (2009) Individual and contextual covariates of burnout: a cross-sectional nationwide study of French teachers. BMC Public Health 9:333

Wuhan Education Bureau (2013) Report on Wuhanss education (2005–2010) [Chinese]. Wuhan University Press, Wuhan

Yang X, Ge C, Hu B, Chi T, Wang L (2009) Relationship between quality of life and occupational stress among teachers. Public Health 123:750–755

Zurlo MC, Pes D, Siegrist J (2010) Validity and reliability of the effort-reward imbalance questionnaire in a sample of 673 Italian teachers. Int Arch Occup Environ Health 83:665–674