RESEARCH ARTICLE

Effort–Reward Imbalance and Mental Health Problems in 1074 German Teachers, Compared with Those in the General Population

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Abstract

High degrees of premature retirement among teachers warrant investigating the occupational burden and the mental health status of this profession.

A sample of 1074 German teachers participated in this study. Two samples of the general population ($N = 824$ and $N = 792$) were used as comparison groups. Work distress was assessed with the Effort–Reward-Imbalance questionnaire, and mental health problems were measured with the General Health Questionnaire (GHQ-12).

Teachers reported more effort–reward imbalance ($M = 0.64$) compared with the general population ($M = 0.57$), and they perceived more mental health problems (GHQ: $M = 12.1$) than the comparison group ($M = 9.5$). School type was not associated with work stress and mental health. Teachers with leading functions perceived high degrees of effort and reward, resulting in a moderate effort–reward ratio and no heightened mental health problems. Teachers working full time reported more effort than teachers working part time, but the reward mean values of both groups were similar. This results in a somewhat unfavourable effort–reward ratio of teachers working full time. Moreover, teachers working full time reported more mental health problems.

The results support the appropriateness of the effort–reward conception, applied to the profession of teachers. The higher degree of effort–reward imbalance and the level of mental health problems warrant preventive measures. Copyright © 2014 John Wiley & Sons, Ltd.

Introduction

Teaching is a stressful occupation (Kyriacou, 2001). Special features of work stress among teachers are the emotional demands of coping with behaviour and discipline of pupils, unsatisfactory social support from colleagues and parents of the pupils, high work load, changes in the educational system and large classes (Bauer et al., 2007; Bellingrath, Weigl, & Kudielka, 2009; Guglielmi & Tatrow, 1998; Mahan et al., 2010; Montgomery & Rupp, 2005). The percentage of German teachers reaching the normal retirement is markedly lower than the percentage of other employees in public services (Unterbrink et al., 2007), and about 50% of the cases of premature retirement of teachers is caused by psychiatric or psychosomatic disorders (Weber, Weltle, & Lederer, 2004).

The effort–reward imbalance (ERI) model (Siegrist, 2008; Siegrist, Wege, Puhlhofer, & Wahrendorf, 2009; Siegrist et al., 2004) has been successfully applied to assess work-related stress, also in the profession of teachers (Godin, Kittel, Coppieters, & Siegrist, 2005; Unterbrink et al., 2007; Unterbrink et al., 2012; Zurlo, Pes, & Siegrist, 2010). This model is based on the concept of social reciprocity and claims that stress occurs if there is a perceived mismatch between demands to be performed and reward gained for the accomplishment of this demand. The reward includes esteem, money and career opportunities, and job security. According to this model, lack of reciprocity occurs frequently under specific conditions and elicits negative emotions and related psychobiological stress responses. ERI was predictive of cardiovascular disease

(Peter, Siegrist, Hallqvist, Reuterwall, & Theorell, 2002; Siegrist, 2010), musculoskeletal pain (Joksimovic, Starke, Von dem Knesebeck, & Siegrist, 2002), fatigue (Sembajwe et al., 2012), and anxiety and depression (Kivimäki, Vahtera, Elovainio, Virtanen, & Siegrist, 2007). A recent summarizing report of seven prospective epidemiologic studies concludes that work stress, assessed with the effort–reward model, predicts a two-fold elevated risk of incident depressive disorder (Siegrist, 2013).

An Italian work group (Zurlo et al., 2010) applied the effort–reward model to a sample of teachers and found associations between ERI and psychological strain, leaving intentions, the presence of diseases in the last 12 months, anxiety and depression. The authors constructed four subscales of the ERI questionnaire according to the results of their factorial analysis. They performed their further calculations on the basis of these newly derived scales, which, however, hinders the comparability with other studies that used the questionnaire in its original form. An investigation with 949 German teachers (Unterbrink et al., 2007) also used the ERI model and found 21.6% of the teachers having a score above the cut-off, indicating too much effort and too little reward. Older teachers (45 years and above) and teachers working full time were affected by work stress more than younger teachers and teachers working part time. Male teachers reported (non-significantly) more distress than female teachers.

Since these studies did not include control groups of other professions or of the general population, it remains unclear whether the effects concerning age and gender are specific for the teachers' profession. This paper contributes to the literature by examining age and gender differences in teachers' stress in the context of general age and gender effects of work-related stress.

The aims of this study were

- to determine the degree ERI and mental health problems, compared with the results of the general population and
- to analyse sociodemographic and work-related features associated with ERI and mental health problems, on the basis of a large sample of German teachers.

Methods

Sample of teachers

All schools ($N = 328$) of the regional school district Chemnitz (Saxony, Germany) were asked to support the study. Only classical school types were considered: primary school (Grundschule), comprehensive school (Mittelschule) and grammar school (Gymnasium). Of these, 182 schools agreed to participate. The teachers of these schools ($N = 3836$) were informed about the study and asked to participate. After obtaining informed consent, the teachers received a questionnaire concerning their working conditions and health

state. The necessary ethics committee approval was secured by the Saechsische Bildungsagentur.

In total, 1074 of the teachers (28%) took part in the study and filled in the questionnaires. Table I presents main characteristics of the study sample. A subsample of the sample presented here has already been analysed in a previous paper (Seibt, Matz, Hegewald, & Spitzer, 2012), with the focus on several medical parameters and the relationship between full-time and part-time teachers. Compared with that paper, the data presented here include male teachers, a larger sample and the comparison with data from the general population.

Comparison groups

We used two separate samples of the general population as comparison groups for the ERI questionnaire and the General Health Questionnaire (GHQ-12). For both samples, the area of Germany was separated into 201 sampling points, representing the different regions of the country. Households and target persons within the households were selected with the random route technique and the Kish selection grid technique. The selected samples were representative of the German adult population (age range: 14–92 years) in term of age, gender and education for both samples. For sample 1 (ERI), a response rate of 66.5% was obtained, and 2066 subjects were included. For the present study, we selected those people in the sample who were

Table I. Sociodemographic characteristics of the sample of teachers

	Men ($N = 148$)		Women ($N = 926$)		Total ($N = 1074$)	
	N	%	N	%	N	%
Age mean (SD)	48.6	(6.9)	46.6	(7.2)	46.9	(7.2)
Age category						
≤40 years	18	12.2	202	21.8	220	20.5
41–50 years	68	45.9	402	43.4	470	43.8
≥51 years	62	41.9	322	34.8	384	35.8
Living with a partner						
No	10	6.8	84	9.1	94	8.8
Yes	138	93.2	842	90.9	980	91.2
School type						
Primary school	20	13.5	416	44.9	436	40.6
Comprehensive school	73	49.3	287	31.0	360	33.5
Grammar school	55	37.2	223	24.1	278	25.9
School education						
<12 years	27	18.2	414	44.7	441	41.1
≥12 years	121	81.8	512	55.3	633	58.9
Employment						
Full time	96	64.9	344	37.1	440	41.0
Part time	52	35.1	582	62.9	634	59.0
Leading function						
No	118	79.7	813	87.8	931	86.7
Yes	30	20.3	113	12.2	143	13.3

SD: standard deviation.

between 25 and 65 years old, who were at least half-time working and who filled in the ERI questionnaire completely. This resulted in a subsample of 824 subjects, mean age 43.0 years, 42% women.

In sample 2 (GHQ-12), the response rate was 73.5%, and the original sample size was 2034 subjects. The sampling procedure was the same as that of sample 1 described earlier. After reducing the sample to subjects between 25 and 65 years, working at least half-time and having filled in the GHQ-12 completely, 792 subjects (mean age: 42.8 years; 46% women) were considered for further analysis. The main aim of the two surveys was to test psychometric properties of the ERI (Rödel, Siegrist, Hessel, & Brähler, 2004) and the GHQ (Romppel, Braehler, Roth, & Glaesmer, 2013).

Questionnaires

ERI

The ERI inventory was used in this study. It consists of two main scales, a six-item effort scale and an 11-item reward scale. All items are scored with values between 1 and 5. Therefore, the scores of the effort scale range between 6 and 30, whereas the reward scores vary between 11 and 55. Three subscales of the reward scale can be considered: 'salary and career' (four items, indicating financial and status-related reward), 'esteem' (five items) and 'job security' (two items) (Unterbrink et al., 2007). The ERI ratio is calculated as the quotient between the reward and the effort scale, applying a certain correction factor that accounts for the different numbers of items in the scales. A high ERI ratio is indicative of an imbalance between (too little) reward and (too much) effort.

Meanwhile, a shortened form of the ERI questionnaire with three effort items and seven reward items has been developed (Leineweber et al., 2010), but for reasons of comparability with other investigations, we used the original version of the questionnaire in this study.

GHQ-12

Mental health problems were assessed with the GHQ-12 (Goldberg & Williams, 1988), a screening instrument for minor psychiatric morbidity. We used the German version of the GHQ-12 (Schmitz, Kruse, & Tress, 1999) with a four-point Likert scale (0–1–2–3). Psychometric properties of this questionnaire have been tested in several studies (Makikangas et al., 2006; Rocha, Perez, Rodriguez-Sanz, Borrell, & Obiols, 2011; Romppel et al., 2013; Smith, Fallowfield, Stark, Velikova, & Jenkins, 2010). A cut-off is defined for the dichotomous 0–0–1–1 scoring procedure, coding response options 1 and 2 with 0 and options 3 and 4 with 1. Scores of 4 and above were chosen to indicate mental health problems (Bauer et al., 2007).

Statistical analyses

Effect sizes d (Cohen, 1988) were calculated to indicate the difference between mean scores, divided by the pooled standard deviations. The comparison between the teachers' group and the comparison groups of the general population was performed with three-way analyses of variance (ANOVAs) with the factors group (teachers versus controls), age group and sex. Four-way ANOVAs were calculated to test the impact of four job-related factors on ERI and GHQ-12. The association between ERI scales and GHQ-12 was calculated with Pearson correlations.

Results

ERI distress

Teachers reported more effort (15.2 versus 13.8) and less reward (45.4 versus 47.3) than the general population (cf. Table II). This results in a higher ERI ratio (0.64 versus 0.57), indicating higher work stress. The effect size of the ERI ratio according to Cohen was $d = 0.25$. Figure 1 shows that the higher mean score of the teachers' sample occurs in all age groups and both sexes.

The effect of the groups (teachers versus general population) was much stronger than the effects of sex and age group (Table III), indicated by highest F values. Women generally perceived less ERI distress (lower effort reward ratio) than men ($p < 0.01$), and the

Table II. ERI and GHQ-12 mean scores of teachers and the general population, broken by sex and age group

	ERI effort		ERI reward		ERI ratio		GHQ-12	
	M	SD	M	SD	M	SD	M	SD
Teachers								
Men								
≤40 years	15.7	2.74	40.0	8.53	0.77	0.27	11.9	5.6
41–50 years	14.2	3.49	41.9	8.31	0.68	0.35	12.5	5.1
≥51 years	15.8	3.81	45.5	5.93	0.65	0.21	11.9	4.4
Women								
≤40 years	14.8	3.80	46.0	6.54	0.62	0.24	11.2	4.2
41–50 years	15.1	3.96	44.7	6.94	0.65	0.25	12.1	5.1
≥51 years	15.6	4.20	46.9	6.42	0.63	0.24	12.7	4.6
Teachers total	15.2	3.93	45.4	6.91	0.64	0.25	12.1	4.8
General population								
Men								
≤40 years	13.9	4.95	46.0	8.33	0.59	0.28	8.9	5.5
41–50 years	14.8	5.48	47.1	7.55	0.62	0.34	9.1	4.2
≥51 years	14.2	5.25	48.7	7.11	0.56	0.27	10.0	4.9
Women								
≤40 years	12.8	4.60	48.1	7.05	0.52	0.30	9.4	4.5
41–50 years	14.1	5.35	47.1	8.73	0.60	0.38	10.6	5.3
≥51 years	12.8	4.92	47.8	7.14	0.52	0.29	9.8	4.1
Gen. popul. total	13.8	5.10	47.3	7.78	0.57	0.31	9.5	4.8

ERI: effort–reward imbalance; GHQ-12: General Health Questionnaire; SD: standard deviation.
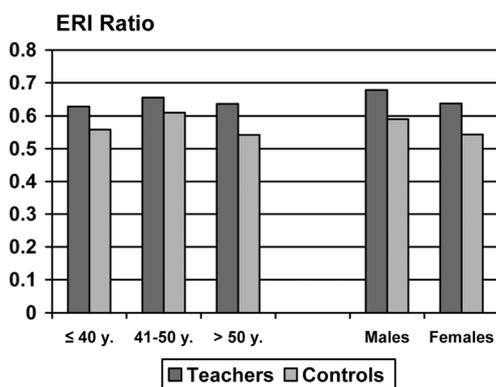
Figure 1. Comparison between teachers and controls with respect to the effort–reward imbalance (ERI) ratio
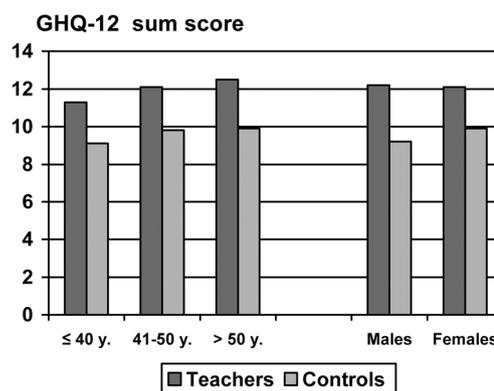
Figure 2. Comparison between teachers and controls with respect to the General Health Questionnaire (GHQ-12)

Table III. The influence of group (teachers or general population), sex and age on ERI and GHQ-12

	ERI effort		ERI reward		ERI ratio		GHQ-12	
	F	p	F	p	F	p	F	p
Group	25.2	***	52.1	***	31.5	***	63.1	***
Sex	3.7	n.s.	17.5	***	9.2	**	0.7	n.s.
Age	0.3	n.s.	10.3	***	2.9	n.s.	2.0	n.s.
Group × Sex	3.5	n.s.	10.1	**	0.5	n.s.	1.4	n.s.
Group × Age	5.9	**	2.1	n.s.	2.0	n.s.	0.0	n.s.
Sex × Age	1.6	n.s.	5.0	**	2.3	n.s.	0.2	n.s.
Group × Sex × Age	0.5	n.s.	0.2	n.s.	0.6	n.s.	2.3	n.s.

Analysis of variance results.
ERI: effort–reward imbalance; GHQ-12: General Health Questionnaire.
**$p < 0.01$;
***$p < 0.001$.

influence of the age group was not statistically significant. There was no significant interaction between group and sex or age concerning ERI ratio.

Reward is composed of three components (cf. Methods section). The mean values of the teachers' sample in comparison with the controls were 21.8 versus 22.3 (esteem), 7.1 versus 8.2 (job security) and 16.5 versus 16.6 (salary and career).

Mental health problems (GHQ-12)

Teachers perceive more health problems (GHQ-12) than the general population (Table II and Figure 2). The ANOVA results (Table III) show that the group effect (teachers versus comparison group) is the only significant effect. The difference between teachers and comparison group is similar for all age groups and for both sexes (Figure 2), with an effect size of $d = 0.54$. According to the cut-off ≥ 4 for the dichotomous scoring, 281 (26.2%) of the teachers had mental health problems; the corresponding numbers of the comparison group was 104 (13.1%).

Reliability and associations between ERI and GHQ-12

The reliability coefficients (Cronbach's alpha) of the two ERI subscales in the teachers' sample were 0.61 (effort) and 0.76 (reward). The corresponding coefficients in the general population were 0.74 and 0.83, respectively. Concerning the GHQ-12, the reliability was 0.87 in the teachers' sample and 0.89 in the general population.

Table IV presents the Pearson correlations between the ERI scales and the GHQ-12, obtained in the teachers' sample. Mental health problems (GHQ-12) were positively associated with effort ($r = 0.37$) and negatively associated with reward ($r = -0.34$). This results in a positive correlation between the ERI ratio and mental health problems ($r = 0.43$).

Prognostic factors for ERI and GHQ-12 scores in the teachers' sample

The relationship between four putative prognostic factors on work stress (ERI) and mental health are given in Table V. On the basis of univariate calculations, the ERI ratio and mental health problems were highest among grammar school teachers, among teachers with 12 and more years of school education and among teachers with a full-time job. Teachers with leading positions reported more effort and received more reward, which results in no effect on the ERI ratio and only a small effect on mental health.

Table IV. Correlations between ERI scales and GHQ-12

	ERI effort	ERI reward	ERI ratio	GHQ-12
ERI effort		−0.34 ***	0.83 ***	0.37 ***
ERI reward			−0.75 ***	−0.34 ***
ERI ratio				0.43 ***

ERI: effort–reward imbalance; GHQ-12: General Health Questionnaire.
***$p < 0.001$.

Table V. ERI and GHQ-12, broken by school type, education, full-time/part-time working and leading function

	ERI effort		ERI reward		ERI ratio		GHQ-12	
	M	SD	M	SD	M	SD	M	SD
School type								
Primary school	14.7	4.0	47.9	6.1	0.58	0.21	11.6	4.5
Comprehensive school	15.2	4.0	43.5	6.8	0.67	0.27	11.8	4.6
Grammar school	16.0	3.8	43.9	7.1	0.70	0.26	13.3	5.2
School education								
<12 years	14.6	3.9	47.5	6.2	0.58	0.22	11.6	4.5
≥12 years	15.6	3.9	43.9	7.0	0.68	0.27	12.5	4.9
Employment								
Part time	14.5	3.9	45.9	6.5	0.61	0.24	11.7	4.4
Full time	16.2	3.8	44.7	7.4	0.70	0.26	12.7	5.2
Leading function								
No	14.9	3.9	44.8	6.9	0.64	0.26	12.2	4.8
Yes	17.1	3.6	49.3	5.2	0.65	0.17	11.7	4.9

ERI: effort–reward imbalance; GHQ-12: General Health Questionnaire; SD: standard deviation.

The putative prognostic factors are interrelated. High education is associated with working in a grammar school and with a leading position. Therefore, the statistical analysis had to test these factors in a multivariate approach. ANOVA results are given in Table VI. Teachers with higher degree of education and teachers working full time reported a higher ERI ratio, and working full time was associated with mental health problems. Taking into account education and full-time/part-time working, the influence of school type had no significant influence on ERI and mental health.

Discussion

Teachers showed a less favourable *effort–reward ratio* ($M = 0.64$) than the comparison group of the general population ($M = 0.57$). However, a similar study of

German teachers (Unterbrink et al., 2007) in the region of Freiburg found an even higher degree of distress according to the ERI ratio. Employees of German companies (Kudielka, Von Kanel, Gander, & Fischer, 2004) showed a mean ERI ratio (0.65) that was similar to that of our teachers.

Moreover, the teachers of this study reported more mental health problems (*GHQ*-12: $M = 12.1$) than the general population ($M = 9.5$) with an effect size of $d = 0.54$, indicating a mean score difference of about half a standard deviation. This criterion is often used to describe clinically important differences (Norman, Sloan, & Wyrwich, 2003). The percentages above the GHQ-12 cut-off (4 and above) were 26% for the teachers and 13% for the comparison group. Another large study with 949 German teachers (Bauer et al.,

Table VI. Influence of school type, education, full-time/part-time working and leading function on ERI and GHQ-12

	ERI effort		ERI reward		ERI ratio		GHQ-12	
	F	p	F	p	F	p	F	p
School type	0.4	n.s.	2.3	n.s.	1.0	n.s.	0.2	n.s.
School education	4.6	*	4.1	*	5.5	*	5.1	n.s.
Full time/part time	9.4	**	0.9	n.s.	6.4	*	5.7	*
Leading function	11.8	***	17.2	***	0.0	n.s.	0.3	n.s.
School type × Education	4.2	*	1.5	n.s.	1.6	n.s.	0.6	n.s.
School type × Full time/part time	3.3	*	1.4	n.s.	4.3	*	1.8	n.s.
School type × Leading	1.7	n.s.	3.0	*	3.0	*	0.9	n.s.
Education × Full time/part time	1.7	n.s.	1.6	n.s.	2.4	n.s.	0.4	n.s.
Education × Leading	0.7	n.s.	4.9	*	1.8	n.s.	0.1	n.s.
Full time/part time × Leading	3.7	n.s.	0.3	n.s.	0.7	n.s.	5.1	*

Analysis of variance results.
ERI: effort–reward imbalance; GHQ-12: General Health Questionnaire; n.s.: not significant.
*$p < 0.05$;
**$p < 0.01$;
***$p < 0.001$.

2007) found an even slightly higher percentage of 29.8% for teachers above that cut-off criterion.

There was a significant *association* between ERI and mental health problems ($r = 0.43$). With this cross-sectional study, we cannot derive a causal relationship. Job stress may have a negative impact on mental health, but the other interpretation (mental health problems produce perceived job stress) is possible as well. Both components of the imbalance model, effort and reward, contributed roughly equally to the variance explanation of mental health with correlations of 0.37 and −0.34, respectively. This supports the basic idea of the imbalance model to consider both components together in terms of a ratio.

The figures and the ANOVA results demonstrate that the differences between teachers and the general population in terms of ERI and mental health problems were similar for all age groups and both genders.

Although the *reliability* of the GHQ-12 was very good in both samples, the reliability coefficients of the ERI scales were not. In such cases, one can adapt the scale structure of the questionnaire to the own data to obtain more reliable scales. This procedure was chosen in the study of Italian teachers (Zurlo et al., 2010). On the basis of factorial analyses, the Italian researchers created new scales. However, the disadvantage of this procedure is that it is difficult or impossible to compare the results with other examinations. In the Zurlo et al. study, the assignments of the items to the newly built scales are given in the article. Recalculating our results according to the Zurlo et al. scale definitions, we obtain the following scores: effort ($M = 11.9$), job security prospects reward (27.5) and esteem reward ($M = 17.9$). Compared with the corresponding Italian mean scores ($M = 11.6$, $M = 25.6$ and $M = 16.8$, respectively), our mean values are very similar with regard to effort and slightly higher in the two reward subscales. However, such comparisons are difficult to establish. It seems to be more appropriate to maintain the original scale structures. Sometimes, item 5 that refers to physical effort is excluded from the effort scale (e.g. Rödel et al., 2004), but this procedure also raises the problem of insufficient comparability of the studies. Therefore, we believe that it is better to maintain the original scales.

Teachers with *leading functions* reported more effort and more reward than teachers without such functions. According to the reciprocity concept, these teachers with leading functions show no elevated ERI, and there were only marginal mental health differences between both groups (with and without leading functions). Well-educated teachers reported slightly more effort but markedly more reward, resulting in a significant better ERI ratio than teachers with lower education. These facts indicate an advantage of the ERI model. Although other job stress models focus on demands and stress factors, the inclusion of the reward helps better assessment of the impact of the working conditions. Teachers *working full time* reported higher effort

than part-time teachers, but the reward scores were nearly equal. This resulted in a worse ERI ratio, and teachers working full time also experienced more mental health problems. One should take into account that there are interrelations among the factors. In the grammar school, the proportion of men is higher, education is higher and teachers with leading functions are better educated. Nevertheless, such interactions were accounted for in the ANOVA (Table VI), and the remaining independent main effects of education and full-time/part-time working were nevertheless statistically significant. Since this study was focused on teachers, it is not possible to derive conclusions concerning the importance of ERI in other professions. The relationship between teachers with and without leading positions (higher effort and higher reward in leading teachers, resulting in a similar ERI ratio) and the relationship between teachers working full time and part time (better ERI ratio for part-time working teachers because of lower effort) might also be found in other professions, but testing the generalizability of these effects remains a task of the future.

Age effects on ERI and GHQ-12 are only weak in the teachers' sample. Teachers between 41 and 50 years reported slightly higher ERI than teachers from the other age groups, but this effect was lower than the group effect (teachers versus general population). Male teachers perceived a higher ERI than female teachers. Figure 1 shows that this effect is also valid for the general population. There were only marginal sex differences concerning mental health problems (GHQ-12). Taken together, the age and sex effects were markedly smaller than the difference between teachers and the general population. The lack of significant ERI ratio and GHQ-12 interaction effects in Table III also indicates that the higher job stress and strain of the teachers were similar for all age and gender groups and can be considered a problem of the teaching profession as a whole.

Some *limitations* of this study should be mentioned. The response rate was low. We have no information about the mental health situation of the non-respondents and cannot rule out the possibility that there is a bias. Since ERI ratios and the GHQ scores of our sample indicated lower distress than that of a comparable group from the region of Freiburg, Germany (Unterbrink et al., 2007), we assume that this response rate effect of our study did not produce a bias towards an overestimation of teachers' distress in the present sample, but there remains some uncertainty. The percentage of women was higher than the typical women to men ratio of 2:1 among teachers. Therefore, we compared teachers and the general population separately for men and women. Although some of the independent factors analysed here (sex, school type and leading function) are interrelated, the combined multivariate analyses in the ANOVAs supply information of the independent contributions of these factors to ERI and mental health problems. A

further limitation is the use of two separate comparison groups for the two questionnaires. Therefore, it was not possible to calculate associations between GHQ and ERI scores in the general population.

In summary, the ERI model proved to be appropriate to describe occupational distress for this occupational group. Teachers showed a higher burden of ERI and more mental health problems than the general population. This should be considered in the configuration of working conditions such as class sizes and the offer of preventive measures.

Conflict of interest

The authors have declared that they have no conflict of interest.

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