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ORIGINAL ARTICLE

Working conditions of female part-time and full-time teachers in relation to health status

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Abstract
Purpose Teacher's volume of employment and health status are controversially discussed in the current literature. This study focused on female teachers with part-time versus full-time jobs in association with working conditions and health status depending on age.
Method A sample of 263 part-time and 367 full-time female teachers (average age 46.7 ± 7.8 vs. 46.0 ± 6.3) participated in an occupational health screening. Specific work conditions, stressors (job history-questionnaire) and effort–reward–imbalance ratio (ERI-Q) were measured and their relationships to mental and physical health were analysed. Health status was quantified by complaints (BFB questionnaire), general mental health status (GHQ-12) and cardiovascular risk factors.
Results On average, teachers in part-time positions reported 36 and in full-time positions 42 h per week. The effort–reward ratios were significantly associated with the volume of employment. Teachers in part-time jobs had only a slightly lower ERI-ratio. There were no differences between full-time and part-time teachers regarding health status. Eighteen percentage of both groups reported impaired mental health (GHQ ≥ 5), 48% of part-time teachers and 53% of full-time teachers suffered from high blood pressure. Low physical fitness was observed in 12% of part-time and 6% of full-time teachers. In this study, neither the volume of employment nor working conditions were found to be significantly correlated with health status.
Conclusion Part-time and full-time employment status did not appear to influence health in the teaching profession. Although there are differences in quantitative working demands, while the health status does not differ between both teacher groups.

Keywords Female teachers · Volume of employment · Work stress · Health

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Background

The health of teachers is not only a sociopolitical topic, but also an interdisciplinary challenge. With 766,000 people primarily employed as teachers, they make up the largest academic occupational group in Germany (Autorengruppe Bildungsberichterstattung 2008). They have the important responsibility to educate and prepare future generations for life and work in an increasingly complicated world.

Extensive literature is available regarding the work load and health situation in the teaching profession. These studies principally included subjective assessments of challenges, instead of objective comparisons of stress in the teaching profession and other occupational groups (Scheuch et al. 2010; Seibt et al. 2009). National and international studies of stress in the teaching profession have repeatedly reported that afflicted teachers find the teaching profession to be particularly stressful (Bellingrath et al. 2009; Benmansour 1998; Byrne 1999; Dunham and Varma 1998; Guglielmi and Tatrow 1998; Körner 2003; Kyriacou 1987; Montgomery and Rupp 2005; Travers and Cooper 1993). Over a quarter of the teachers in Great Britain reported their profession to be 'very' or 'extremely stressful' (Kyriacou 2001). Consequently, the teaching profession has one of the highest stress levels ('high stress profession'). However,

since few assessments compare teaching to other professions, the work load is sometimes misinterpreted and positive aspects of the teaching profession (e.g. variety of tasks) are neglected.

In Germany, in 2007, about 40% of teachers are employed part-time, with female teachers comprising a clearly higher share of the part-time teachers (68% of them are female and 32% male) (Statistisches Bundesamt 2007). There is no clear indication of how the volume of employment influences health. Studies of different occupational groups in the IGA report ('Initiative Gesundheit und Arbeit'—IGA, Initiative for Health and Work) reveal inconsistent results with little effect of employment volume on health status that requires further investigation (overview: Friedrichs and Schröder 2006). This was also observed for studies specifically of teachers (i.e. Körner 2003; Meierjürgen and Paulus 2002; Unterbrink et al. 2007). Furthermore, the results regarding health indicators for both forms of employment are inconsistent. Meierjürgen and Paulus (2002) found only an insignificantly lower number of sickness absences among part-time (female) teachers. Körner (2003), however, reports slightly higher emotional exhaustion in full-time teachers of grammar schools (AE: high schools, German: Gymnasium) in several German federal states. At the same time, part-time teachers tended to have a lower work performance than full-time female teachers. A study in Freiburg also found lower capability and less personal fulfilment in part-time teachers of vocationally oriented secondary general schools (German: Hauptschule) and grammar schools (Unterbrink et al. 2007).

Changing from full-time to part-time positions in order to prevent dismissals can have several disadvantages for the teachers concerned. In addition to reduced income and fewer entitlements to pension and employee benefits, these teachers could also have lower chances of promotion (Schmal 1997). Furthermore, the low predictability and insecurity associated with flexible employment can increase stress and bear risks for health impairments (Seibt et al. 2007b). On the other hand, beneficial aspects associated with (voluntary) part-time employment can arise from the increased time flexibility, like commitment to family, leisure time, self-fulfilment, family obligations (Macke 1999) or relief for health reasons (Friedrichs and Schröder 2006).

Although part-time employment in teachers can promote a more favourable work–life–balance, some studies found a situation of higher strain in these teachers (Hübner and Werle 1997; Schaarschmidt 2005; Schönwälder et al. 2003). According to their findings, the capability of part-time teachers is higher in comparison with their full-time colleagues—while receiving lower payment. Often, the only difference between part-time and full-time teachers is the number of lessons they give, whereas time spent preparing and revising lessons, attending teacher conferences, etc. are not considered. Bauer (2004) points out that communication with colleagues and their social support are reduced by part-time employment, thus an important resource for teachers' health is limited for part-time teachers.

Harmful strain in the teaching profession is identified by the following factors: time pressure, working time, too many pupils in a class, behavioural problems of pupils, noise in the lessons, the behaviour of parents, too little autonomy and the different expectations that pupils, parents and ministries have of teachers (Bauer 2004; Bauer et al. 2007; Kyriacou 2001; Scheuch et al. 2010; Seibt et al. 2004; Unterbrink et al. 2007). Furthermore, insufficient material and spatial equipment and a negative perception and evaluation of teachers in society are regarded as sources of negative strain (Bauer and Kanders 1998; Schaarschmidt and Fischer 2001; Scheuch et al. 2010; Sieland 2001). Additionally, inefficient coping strategies complicate the compensation of job-specific stress (von Känel et al. 2009). Insufficient social and professional support has a negative influence as well (Schönwälder et al. 2003; Stähling 1998). In recent times, fear of losing one's job or the 'flexibilization pressure' has added to the array of psycho-emotional stress.

Against this backdrop, the aim of this study was to examine female part-time and full-time teachers, regarding teacher-specific working conditions and components of psychological and physical health. Of particular interest is whether part-time teachers have a better state of health than full-time teachers (1) and considerably less working demands (2). In addition, it will be examined if relationships between increased teacher-specific working demands and indicators of poor health exist after adjusting for confounder variables (3).

Method

Sample

In this cross-sectional study, more than 1,000 teachers took part in a preventive occupational–medical and psychological check-up between 2006 and 2008. All public schools in a defined district of Saxony (Germany) were contacted by the collaborators from the *Institute and Clinic of Occupational and Social Medicine of the TU Dresden*. First, working conditions and the subjective health status were assessed in a standardised interview. After this interview, the participants had the possibility to take part in the occupational–medical and psychological health screening from September 2006 to March 2008. A total of 787 teachers from public schools aged 29–62 years participated in this screening programme (73%). A small number of male teachers, male and female head teachers as well as trainee teachers and participants with incomplete data were

excluded from the analyses to improve the comparability (internal validity) of the study sample. Thus, this study reports on 630 female teachers from general school types. This sample of female teachers consists of 303 (48.1%) primary school teachers (PS; German: Grundschule), 198 (31.4%) comprehensive school (CS; German: Mittelschule) teachers and 129 (20.5%) grammar school teachers (AE).

Every teacher in Germany is required to offer occupational–medical preventive examinations but the participation is on a *voluntary basis*, which means selection effects (in the form of positive selection) cannot be eliminated. In this examination, female teachers made up 81.5% of the examined participants. Signed consent forms were obtained from all study participants.

At the time of examination, 41.7% of the 630 female teachers were employed part-time (PT) and 58.3% full-time (FT). It must be considered that full-time jobs in primary schools comprise 28 lessons, in comprehensive and grammar schools 26 lessons per week.

The part-time sample consists only of female teachers working 50–70% the volume of a full-time employee according to the employment contracts. The classification as part-time or full-time was based on self-reported information and the number of lessons taught per week.

The average age of the female part-time teachers was 46.7 ± 7.8 years and did not differ significantly from full-time teachers (46.0 ± 6.3 years). Part-time employees have been working in a school for an average of 25.0 ± 8.8 years, full-time teachers for 23.2 ± 7.3 years. The majority (75%) of part-time employed teachers reported working part-time to prevent staff reductions in their schools. Here, primary school teachers were most strongly affected, having worked the longest in an 'involuntary' part-time position (PS: 11 years of part-time; CS: 6 years; GS: 1 year). In 25% of the cases, female teachers chose to work part-time due to very different reasons (i.e. high private stress and strain: 4%; health reasons: 3%; career overstress: 2%, semi-retirement: 2%; high status of leisure time: 2%; other unspecified reasons: 2%; no information: 10%). It was not possible to consider the reasons for working part-time as moderator for the relation between employment status and health outcomes because of data sparsity.

Part-time and full-time female teachers did not differ significantly with respect to selected private-life factors such as living with a partner, number of children in household and care of relatives. The majority of the female teachers were married (84%).

Instruments

For the evaluation of the occupational and health situation of teachers, the Institute of Occupational and Social Medicine developed and applied an occupational health screening. This article reports selected parameters and results from this screening.

Working conditions

Sociodemographic data and *working conditions* were assessed with a teacher-specific occupational history (Seibt and Dutschke 2005), and the effort–reward ratio was measured with the short version of the effort–reward–imbalance questionnaire (ERI-Q: Rödel et al. 2004). The occupational history consists of questions about type of school, class sizes, subjects, total number of weekly lessons, total number and time involved for additional and extra-curricular activities as well as total working hours per week. Additional activities are the responsibilities of classroom teachers, such as equipment maintenance, coordination of vocational training, support service for a subject, ordering material and other support services. Extra-curricular activities are preparing school lessons, correcting class tests, time spent participating in conferences, communicating with parents and pupils and administrative duties.

The short version of the ERI questionnaire comprised the effort and reward scales. The subscale 'effort' (range: 6–30; high values indicate a high effort at work) refers to the perceived time pressure, work interruptions and disturbances, responsibilities at work, overtime etc. The subscale 'reward' (range: 11–55; high values indicate a high gratification at work) measures satisfaction with financial and status-related aspects, esteem rewards and gratification of job security. The ERI-ratio as a summary value enables statements about the health risk of an occupation: the higher the imbalance between effort and reward, the higher the health risk. If the ratio between effort and reward at work is higher than 1 (high effort and low gratification) health risks can be expected.

Health status

The *health status* included psychological and physical health components. *Psychological health* was assessed as the number of psychological complaints and general psychological well-being.

Psychological well-being was evaluated with the General Health Questionnaire-12 (GHQ-12: Linden et al. 1996). The GHQ is a valid and reliable screening questionnaire for mental health problems and minor psychiatric disorders in general and clinic population samples (Goldberg et al. 1997; Goldberg and Williams 1988; Schmitz et al. 2001). The GHQ indicates psychological impairments but is not a tool for indicating a specific diagnosis. It is based on the self-reported state of well-being in the last 4 weeks in relation to general well-being. The GHQ-12 summary value ranges from 0 to 12 (classical GHQ scoring), with

higher values indicating increased psychological impairment. Following Üstün and Sartorius (1995), a GHQ value equal to or above five as a cut-off for impaired psychological health was used, although cut-offs equal to or above four have been applied in several European studies (British Heart Foundation 2006; Linden et al. 1996). The reliability of the GHQ scale for these data is similar to that reported in other studies (Goldberg et al. 1997) with a Cronbach's α of 0.85.

Physical health components were the number of physical complaints and cardiovascular risk factors reported. Current complaints were assessed with the BFB questionnaire (BFB: Höck and Hess 1975). This questionnaire (answer forms: 0 = No, 1 = Yes), consists of a physical (41 items) and psychological (28 items) subscale concerning complaints which could permanently impair well-being. The responses were evaluated for each teacher, separated by number and nature of the complaints (discomfort pattern). All of complaints were then ranked in order to find the main complaints.

Blood pressure, body mass index, waist circumference and fitness were assessed as *risk factors for cardiovascular diseases* (for the standardised screening method see Seibt et al. 2007a).

For examination of the capability of the cardiovascular system, two comparable submaximal stress tests were used: ergometer and knee bends. Both tests included measurements of stress and resting pulse rates [bpm] and stress time [s]. The stress pulse rate [bpm] was measured directly after finishing the exercise. The pulse performance index (PPI) was calculated with the following formula: PPI = (stress pulse rate [bpm]—resting pulse rate [bpm]/stress time [s]) (Meißner-Pöthig 1997). A PPI of more than 1 corresponds to a good physical fitness, a PPI of ≤ 1 to a bad fitness or inadequate training (Meißner-Pöthig 1997).

Statistical analysis

All analyses were done using commercially available software (SPSS for Windows, release 17.0). Descriptive analyses encompass means and standard deviations for quantitative measurements and percentages for categorical variables (Chi-square test χ^2). Normal distribution was assessed by inspecting skewness and kurtosis of the respective residuals. Skewness and kurtosis values between -1 and 1 suggest a normal distribution. Comparisons between the two groups were conducted using t tests or Chi-square tests according to the scaling of the target variable. All calculations were controlled for age and school type.

The associations between the components of working demands and health status were analysed in several steps. First, the associations were adjusted for age and school type (control variables). For the categorical variables, the Pearson's contingency coefficient was calculated (contingency tables also referred to as cross-tabulation). Next, bivariate correlations were calculated to describe potential work- and health-related associations and to weight positive and negative influences. For this, the widely used Pearson's product-moment correlation coefficient was calculated (typically denoted by r, giving a value between +1 and -1 inclusive). In the third step, the control variables were included in the correlation analyses (partial correlations). For the interpretation of the size of a correlation coefficient, several authors have offered guidelines for the interpretation of a correlation coefficient. The association between variables described by the correlation coefficients will be interpreted as follows (Cohen 1988): none: 0.0–0.09; small: 0.10–0.30; medium: 0.30–0.50; large: 0.50–1.0. However, all such criteria should not be observed too strictly (Cohen 1988).

Additionally, the current effect size (d) was calculated for all analyses by quantifying the size of the difference between the two teacher groups. The effect size emphasises the size of the difference regardless of sample size. That means, the effect size is just the standardised mean difference between two groups and can be used, for example, to accompany the t test results. The level of significance was 0.05 (two-sided) for all statistical tests. Thus, p values less than 5% lead to statistical significance.

Results

Working conditions of female part-time and full-time teachers

As expected, full-time teachers reported longer working hours and more lessons per week. Of the chosen working conditions, nearly all relevant work-related time variables differed significantly between the two teacher groups (Table 1). There were no significant differences between part- and full-time teachers observed for the amount of time available for extra-curricular activities and the number of additional activities (Table 1).

Compared with part-time teachers, full-time teachers work on average 6 h more in seven classes and four grades. Besides teaching, the total working hours of both groups comprise a high share spent with preparation and revision of lessons. In both teacher groups, it makes up about 22% of the working time, although full-time teachers give lessons in more classes and grades (Table 1). Part-time teachers spend a higher percentage of their work-time attending to additional activities with pupils, parents, projects, conferences and other tasks.

The mean values of the work-related ERI-ratio do not indicate a health risk in either of the groups (ERI ≥ 1),

Table 1 Work-related factors between female part-time and full-time teachers

Examined characteristics		Teacher groups		Significance		
		Part-time (n = 263)	Full-time (n = 367)	Test statistics (t)	p value	Effect size (d)
Working tasks[a]						
Additional activities						
Number (quantity)	AV ± SD	2.5 ± 1.2	2.5 ± 1.3	0.20	0.980	
Duration (hours per week)	AV ± SD	4.2 ± 4.6	3.2 ± 2.3	3.69	0.001***	0.30
Preparation and follow-up of lessons (hours per week)	AV ± SD	8.4 ± 4.8	9.7 ± 5.1	3.23	0.001***	0.26
Extra-curricular activities						
Duration (hours per week)	AV ± SD	17.6 ± 7.2	20.0 ± 8.0	3.97	0.001***	0.32
Working conditions[a]						
Class sizes (number of pupils)	AV ± SD	18.8 ± 3.8	20.0 ± 3.4	4.14	0.001***	0.33
Class number	AV ± SD	4.6 ± 2.8	7.1 ± 3.3	10.00	0.001***	0.81
Class level	AV ± SD	3.0 ± 1.2	4.1 ± 1.3	11.10	0.001***	0.90
School lessons (45 min) (lessons per week)	AV ± SD	16.1 ± 2.5	20 ± 2.1	31.5	0.001***	2.54
Total working hours (hours per week)	MW ± SD	36.2 ± 9.7	42.4 ± 9.2	8.19	0.001***	0.66
Effort–Reward–Imbalance[b]						
ERI-effort (range of values: 6–30)	AV ± SD	14.4 ± 4.0	15.2 ± 3.9	2.65	0.010**	0.21
ERI-reward (range of values: 11–55)	AV ± SD	47.2 ± 6.2	44.6 ± 6.7	4.9	0.001***	0.40
Status (range of values: 4–20)	AV ± SD	16.6 ± 2.9	16.4 ± 2.9	0.94	0.350	
Esteem (range of values: 5–25)	AV ± SD	22.2 ± 3.7	21.6 ± 3.7	2.26	0.020*	0.18
Job security (range of values: 2–10)	AV ± SD	8.4 ± 2.1	6.7 ± 2.6	8.69	0.001***	0.70
ERI-ratio	AV ± SD	0.58 ± 0.24	0.65 ± 0.25	3.58	0.001***	0.29
ERI-risk group (ERI ≥ 1)[a]	(%)	4.9	8.2	χ^2 = 2.52	0.110	

AV ± SD: means and SD; frequencies (%)

t paired two-sample t test; χ^2 frequencies. Chi-square test (Pearson)

Significance (two-tailed): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; d estimator of effect size

[a] Questionnaire of occupational history (Seibt and Dutschke 2005)

[b] Questionnaire of effort–reward–imbalance (ERI: Siegrist 1996); classification of the ERI-ratio from Siegrist (1996)

even though the values of part-time teachers were slightly more favourable (0.58 vs. 0.65; $p = 0.001$). Full-time teachers report slightly higher *effort* and lower *reward* (Table 1). The scores of 5% of part-time and 8% of full-time teachers demonstrated tendencies for an increased ERI health risk (Table 1). A differentiated examination of *reward* showed no significant difference for the subscale *status* ($p = 0.350$). There are, however, significant differences for *job security* ($p = 0.001$) and esteem ($p = 0.020$), suggesting that the difference in *reward* may mainly be caused by an increased fear of losing one's job among full-time teachers.

Health status of female part-time and full-time teachers

Overall, the *psychological health status* of the whole sample is favourable (Table 2) and did not differ significantly between the two employment groups. The GHQ-12-sum value indicates a general psychological well-being (PT: mean value of 2.1 points) with slightly more positive results observed among the part-time employees (FT: mean value of 2.3 points). Following the classification of Üstün and Sartorius (1995), 82% of female part-time and full-time teachers were regarded as psychologically stable (<5 points) and 18% as psychologically impaired (≥5 points). Based on the GHQ

Table 2 Health-related factors between female part-time and full-time teachers

Healthy factors	Dimensions	Teacher groups		Significance	
		Part-time (n = 263)	Full-time (n = 367)	Test statistics	p values Effect size
Mental health					
GHQ-12 score	AV ± SD	2.1 ± 2.6	2.3 ± 2.7	$t = 0.72$	0.470
Impairment of mental health (cases) GHQ-12 values ≥5	(%)	17.5	18.3	$\chi^2 = 0.06$	0.805
Analysed risk factors for cardiovascular diseases					
Blood pressure					
Systolic blood pressure (mmHg)	AV ± SD	131.2 ± 16.9	131.6 ± 16.9	$t = 0.260$	0.790
Diastolic blood pressure (mmHg)	AV ± SD	88.7 ± 11.2	90.2 ± 11.6	$t = 1.57$	0.120
Hypertension (>140/90 mmHg)[b]	(%)	48.3	52.6	$\chi^2 = 1.13$	0.287
Antihypertensive medication	(%)	19.0	11.2	$\chi^2 = 7.62$	0.006* $d = 0.220$
Fitness					
Fitness index (PPI)[a]	AV ± SD	1.9 ± 0.7	2.0 ± 0.7	$t = 1.38$	0.170
PPI < 1 (poor)	(%)	12.2	6.4	$\chi^2 = 5.60$	0.061
PPI > 2 (good)	(%)	44.8	47.9		
Body measures					
Body fat mass (kg)	AV ± SD	22.5 ± 8.3	23.0 ± 9.1	$t = 0.70$	0.480
Elevated body fat mass	(%)	73.2	73.0	$\chi^2 = 0.00$	0.949
Body mass index (BMI) (kg/m^2)	AV ± SD	24.9 ± 4.0	25.0 ± 4.3	$t = 20.0$	0.840
Overweight (BMI ≥ 25 kg/m^2)[c]	(%)	29.7	27.8	$\chi^2 = 3.00$	0.392
Adipositas (BMI ≥ 30 kg/m^2)[c]	(%)	11.4	12.5		
Waist Hip Ratio (WHR)	AV ± SD	0.82 ± 0.05	0.82 ± 0.06	$t = 1.89$	0.059
Complaints (number) (BFB)[d]					
Physical complaints (range: 0–41)	AV ± SD	3.1 ± 2.9	2.7 ± 2.8	$t = 1.93$	0.050
Psychological complaints (range: 0–28)	AV ± SD	8.0 ± 5.6	8.0 ± 6.3	$t = 0.12$	0.910

AV ± SD: means and SD; frequencies (%)

t paired two-sample t test; χ^2 frequencies. Chi-square test (Pearson)

Significance (two-tailed): *$p < 0.01$; d estimator of effect size

[a] PPI = pulse performance index: Ratio of pulse frequency difference (pulse at work load minus pulse at rest) to duration of work load

[b] The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (1997). *Archives of Internal Medicine*, 157:2413–2446

[c] Deutsche Adipositas-Gesellschaft, Deutsche Diabetes-Gesellschaft, Deutsche Gesellschaft für Ernährung. (2005). Evidenz basierte Leitlinie—Prävention und Therapie der Adipositas (2007) (German Adiposity Association, German Diabetes Association, German Association for Nutrition. Evidence based Guideline—Prevention and Therapy of Adiposity)

[d] Questionnaire of complaints (BFB: Höck and Hess 1976)

cut-off value equal to or above of four (British Heart Foundation 2006; Linden et al. 1996), 23% of the part-time and 24% of the female full-time teachers were identified as psychologically impaired.

Examination of cardiovascular risk factors showed that half of the female teachers had high blood pressure, about 40% were overweight or obese and 37% of part-time teachers and 31% of full-time teachers had an increased waist circumference (Table 2). On average, the female teachers had two cardiovascular risk factors. Among 16% of the female part- and 21% of the full-time teachers, all three risk factors were found. Although female full-time teachers tended to have all three risk factors more often, this did not lead to a statistical difference between the two groups of teachers. No risk factor was present in 16% of the whole teacher sample. In summary, there were no significant differences in cardiovascular risk factors across the levels of employment volume (Table 2).

The physical fitness of the whole sample could be regarded as favourable with an average pulse performance index (PPI) value of 1.9 (Table 2). The PPI indicated 81% of all the female teachers had a good physical fitness (PPI $\geq$ 1), whereas 12% of part-time and 6% of full-time teachers had an impaired physical fitness (PPI < 1). Additionally, it has to be considered that 7% of the study participations were excluded from the PPI-classification for health reasons (e.g. knee problems) and another 3% because of technical problems (e.g. delayed measurement of stress pulse rate). Seventy-three percentage of the teachers reported regular physical activities, i.e. a sports activity of at least 1 h once a week or half an hour twice a week (the minimum of physical activity required for achieving good physical fitness according to Schwarzer 2004). In this sample, only 46% of the teachers reporting regular physical activities demonstrated very good physical fitness (PPI > 2).

On average, the teachers reported eight physical (PT: 8.0 $\pm$ 5.6; FT: 8.0 $\pm$ 6.3; $p = 0.910$) and three psychological complaints (PT: 3.1 $\pm$ 2.9; FT: 2.7 $\pm$ 2.8; $p = 0.050$). The principle complaints were neck pain, backache and lower back pain (PT: 68%; FT: 66%), exhaustion and fatigue (PT: 66%; FT: 62%), forgetfulness, concentration difficulties (PT: 51%; FT: 42%) and sleep disorders (PT: 44%; FT: 40%). There was no significant difference in the number or kind of main complaints between part- and full-time teachers (Table 2), although part-time teachers tended to report a slightly higher number of complaints.

Correlations between working conditions and health-related factors in female teachers

The individual variables were examined and correlations between working conditions and components of health were analysed. Since no significant differences between part- and full-time female teachers in the examined correlations were observed, the final correlations were calculated for the whole sample of teachers ($n = 630$) controlling for age and school type (Tables 3, 5).

Control variables

As control variables age and school type were observed. The correlations found between age- and work-related variables ($r = -0.13$–0.06) were not or only slightly statistically significant (Table 3). Medium correlations between the school type and working conditions ($r = 0.29$–0.57) and small correlations with the ERI variables ($r = -0.21$–0.19) were observed. A progressive rise in the number of physical and psychological complaints was detected with increasing age ($r = -0.14$–0.23), but not for the school type ($r = -0.08$–0.04) (Table 3).

Table 3 Bivariate correlations of work- and health-related variables with confounder variables of the whole sample of female teachers ($n = 630$)

Studied variables	Age[a]	School type[b]
Working tasks		
Additional activities		
Number (quantity)	−0.13*	−0.06
Duration (hours per week)	0.02	0.00
Preparation and follow-up of lessons (hours per week)	0.04	0.09
Extra-curricular activities		
Duration (hours per week)	0.06	0.24**
Working conditions		
Class sizes (number of pupils)	0.01	0.32**
Class number	−0.04	0.43**
Class level	−0.05	0.57**
School lessons (hours per week)	−0.05	0.34**
Total working hours (hours per week)	0.03	0.29**
Effort–Reward–Imbalance		
ERI-effort (range of values: 6–30)	0.03	0.16**
ERI-reward (range of values: 11–55)	0.01	−0.21**
ERI-ratio	0.02	0.19 **
Psychological health components		
GHQ-12 score	0.06	0.08
Cardiovascular risk factors		
Systolic blood pressure (mmHg)	0.30**	−0.02
Diastolic blood pressure (mmHg)	0.22**	0.03
Fitness index	−0.35**	0.04
Body fat mass (kg)	−0.20**	−0.01
Body mass index (BMI) (kg/m^2)	0.23**	−0.00
Waist hip ratio	0.24**	−0.02
Complaints		
Physical complaints	0.23**	−0.08
Psychological complaints	0.14*	0.00

Correlation coefficients are considered as follows: School type: 1 = primary school (PS; German: Grundschule), 2 = comprehensive school (CS; German: Mittelschule), 3 = grammar school (GS: high school, German: Gymnasium)

Significance (two-tailed): * $p < 0.01$; ** $p < 0.001$

[a] r = Pearson product-moment correlation coefficient

[b] C = Pearson contingency coefficient

Working conditions and components of health in female teachers

The bivariate correlations of the selected work- and health-related variables of the whole teacher sample are summarised in Table 4. As expected, similar correlations were established for volume of employment and working conditions ($r = 0.16$–0.78) as well as ERI variables ($r = -0.19$–0.14), respectively. Small correlations seem to exist between volume of employment and working tasks

Table 4 Bivariate correlations of volume of employment, work- and health-related variables of the whole sample of female teachers ($n = 630$)

Studied variables	Volume of employment[a]	GHQ-12 score	SBP	DBP	Fitness index	Body fat mass	BMI	WHR	Physical complaints	Psychological complaints
Working tasks										
Additional activities										
Number (quantity)	−0.00	0.06	0.00	0.01	−0.00	−0.05	0.04	−0.04	0.04	−0.06
Duration (hours per week)	−0.15***	0.00	−0.02	−0.01	−0.03	−0.08*	0.00	0.02	−0.02	−0.05
Preparation and follow-up of lessons (hours per week)	0.13**	0.05	−0.07	−0.05	0.02	−0.01	−0.00	−0.03	0.12**	0.14***
Extra-curricular activities										
Duration (hours per week)	0.16***	0.10*	−0.05	−0.04	0.01	−0.03	−0.01	−0.03	0.19***	0.17***
Working conditions										
Class sizes (number of pupils)	0.16***	0.01	−0.01	−0.01	0.02	−0.05	−0.05	−0.06	0.01	0.02
Class number	0.37***	−0.05	0.00	0.04	−0.04	−0.01	0.07	−0.09*	−0.03	−0.04
Class level	0.41***	−0.02	0.06	0.06	−0.02	−0.06	0.02	−0.07	0.00	−0.02
School lessons (hours per week)	0.78***	0.04	0.05	0.07	0.00	0.05	0.04	−0.05	0.03	−0.02
Total working hours (hours per week)	0.31***	0.10*	−0.02	0.00	0.00	−0.06	0.01	−0.03	0.16***	0.12**
Effort–Reward–Imbalance										
ERI-effort (range of values: 6–30)	0.11**	0.30***	−0.03	−0.03	0.01	0.01	0.09*	−0.02	0.35***	0.32***
ERI-reward (range of values: 11–55)	−0.19***	−0.25***	0.01	0.04	−0.07	0.00	−0.06	0.06	−0.26***	−0.26***
ERI-ratio	0.14***	0.32***	−0.03	−0.04	0.08*	0.00	0.08*	−0.02	0.37***	0.35***
Volume of employment[a]		0.04	0.02	0.07	0.06	0.02	0.04	−0.06	−0.04	−0.09

Correlation coefficients are considered as follows: Volume of employment—0 = part-time; 1 = full-time

SBP systolic blood pressure (mmHg); *DBP* diastolic blood pressure (mmHg); *BMI* body mass index (kg/m^2); *WHR* waist hip ratio

r = Pearson product-moment correlation coefficient

Significance (two-tailed): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

[a] C = Pearson contingency coefficient

(exception: number of additional activities). But the volume of employment ($r = -0.09$–0.07) had no effect on health components (Table 4).

Work-related variables and cardiovascular risk factors showed very small or no statistical correlation ($r = -0.09$–0.11). The same was observed for the correlations between work-related variables and psychological health status ($r = -0.02$–0.11) as well as between risk factors for cardiovascular diseases and psychological health status ($r = -0.09$–0.07).

Correlations of medium strength were only observed between ERI variables and psychological health ($r = -0.25$–0.32).

Looking to the number of complaints, there were only significant bivariate correlations between time-related variables at work (e.g. time for preparation and follow-up of lessons, duration per week for extra-curricular activities: total working hours) and complaints ($r = 0.12$–0.18), whereas these associations were clearly higher and consistent between ERI variables and complaints ($r = -0.25$–0.34).

With the exception of single variables, the strengths of these partial correlations (Table 5) were not significantly different from that of the studied bivariate correlations (Table 4), that means, the same correlations can be established after elimination the confounding (adjustment) variables.

Discussion and conclusions for prevention

High working load may elevate the risk for health problems. Associations between teacher-specific working demands, as well as psychological and physical health components and volume of employment were examined among 630 female teachers.

At first, this study confirms differences in *working conditions* for female part- and full-time employed teachers. Part-time teachers invested on average 2 h more in extra-curricular activities like holding additional positions, further education, projects, or conferences. Full-time teachers reported more time spent with preparation and revision, conferences, supervision and standing in for other teachers than the part-time teachers. Seen from this perspective, part-time teachers even had a proportionally higher average total working time in comparison with full-time teachers, for whom an *average* working time of 42 weekly lessons was assessed which is slightly higher than the standard working time provided for in the labour agreement.

Table 5 Partial correlations of selected work- and health-related variables of the whole sample of female teachers ($n = 630$), controlled by age and school type

Studied variables	GHQ-12 score	SBP	DBP	Fitness index	Body fat mass	BMI	WHR	Physical complaints	Psychological complaints
Working tasks (demands)									
Additional activities									
Number (quantity)	0.06	0.02	0.04	−0.05	−0.04	0.07	−0.02	0.04	−0.06
Duration (hours per week)	−0.00	−0.06	−0.02	0.01	−0.05	0.02	0.03	−0.01	−0.06
Preparation and follow-up of lessons (hours per week)	0.05	−0.08	−0.08	0.01	0.01	−0.00	−0.02	0.11**	0.15***
Extra-curricular activities									
Duration (hours per week)	0.10*	−0.07	−0.07	−0.03	0.00	−0.02	−0.02	0.18***	0.17***
Working conditions									
Class sizes (number of pupils)	0.01	−0.01	−0.02	0.02	−0.05	−0.03	−0.04	0.01	0.02
Class number	−0.05	−0.01	0.02	−0.04	−0.01	0.08	−0.07	−0.05	−0.02
Class level	−0.02	0.05	0.04	−0.01	−0.07	0.04	−0.04	−0.01	−0.00
School lessons (hours per week)	0.05	0.03	0.03	0.01	0.05	0.02	−0.02	0.00	0.06
Total working hours (hours per week)	0.10*	−0.03	−0.02	−0.00	−0.06	0.02	−0.01	0.15***	0.14**
Effort–reward–imbalance									
ERI-effort (range of values: 6–30)	0.30***	−0.02	−0.02	−0.04	0.02	0.09*	−0.03	0.35***	0.33***
ERI-reward (range of values: 11–55)	−0.25***	0.01	0.02	0.06	0.03	−0.09*	0.04	−0.26***	−0.27***
ERI-ratio	0.32***	−0.02	−0.03	−0.08	−0.01	0.10*	−0.02	0.37***	0.36***

Correlation coefficients are considered as follows: school type: 1 = primary school (PS; German: Grundschule), 2 = comprehensive school (CS; German: Mittelschule), 3 = grammar school (GS: high school, German: Gymnasium)

Partial correlations with the control variables age, school type and volume of employment

r = Pearson product-moment correlation coefficient

SBP systolic blood pressure (mmHg); *DBP* diastolic blood pressure (mmHg); *BMI* body mass index (kg/m^2); *WHR* waist hip ratio

Significance (two-tailed): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Bucher (2001) also found that the disparity between the agreed and actual working times of Swiss part-time teachers increases with decreasing employment volume. Therefore, Bucher (2001) suggests considering the volume of employment when researching teachers' health. Krause (2002) concludes that it can be regarded as certain that part-time teachers do (unpaid) extra work. Mummert and Partner (1999), however, evaluated teachers in the German federal state of North Rhine-Westphalia and reported moderate total working hours comparable with other public sector employees. On the other hand, study in Saxony found significantly higher working hours, with an average working time of 55.6 h per week among grammar school (German: Gymnasium) teachers (Scheuch and Haufe 2005). It is generally difficult to accurately assess the actual total working hours per week among teachers, because these data are predominantly based on self-reported estimates (Scheuch et al. 2010; Seibt et al. 2004). Furthermore, it can be assumed that the individual amount of work varies strongly among teachers (Hübner and Werle 1997; Mummert and Partner 1999; Scheuch and Haufe 2005; Seibt et al. 2004, 2007b).

The present study indicates that *on average* the health status is explained by variables that correlate with or reflect favourable health behaviour. Psychological well-being was assessed by the (German) short version of the *General Health Questionnaire* (GHQ-12: Linden et al. 1996) and by the number of psychological complaints.

Based on the GHQ-12-sum ranging from 0 to 12, the sample revealed a mean score of 2.2 ± 2.6 points (median: 1.00). Volume of employment ($r = 0.03$), age ($r = 0.08$) or school type ($r = 0.07$) were not related to the GHQ-12-sum in our sample. Looking at the frequencies of impaired mental health using the cut-off value equal to or above five, 18% of the female teachers showed signs of mental health problems. Using the cut-off value of four and above, Bauer et al. (2007) found 30% of the teachers in their sample (32% for male and 29% for female teachers) showed signs of significant mental health problems. They also identified that the GHQ-12-sum did not differ significantly across gender, age-range or volume of employment. Small but significant differences were observed only for school types, with lower GHQ values observed in grammar schools (Gymnasien) than in secondary modern schools (Hauptschulen, 2.3 vs. 2.7, $p = 0.037$). In comparison, a British study of a general population sample reported impaired mental health among 11% of men and 15% of women using also a

GHQ cut-off of four and above (British Heart Foundation 2006). However, given the fact that this sample included 'healthy' persons, and other studies of mental illness in general health care dealt with patients, these latter data are hardly comparable. Independent of these facts, GHQ values varies between populations and countries (Goldberg et al. 1997). Also, gender, age and educational level are shown to have no significant effect on the validity of the GHQ values (Goldberg et al. 1997). Some studies reported that women show higher rates of depression than men (i. e. Aneshensel 1992) but researchers still do not fully understand the source of this difference.

A GHQ-12-validity study revealed an equally wide range of best estimates for threshold scores ranging from 0/1 to 5/6, but the variation in best thresholds is unaccounted for (Goldberg et al. 1998).

The examined female teachers were *on average* of favourable fitness. Data analyses of the health report of teachers in Saxony show that these teachers were more active in sports, smoked less and reported to drink less alcohol compared with a representative sample of the German population ('Telefonischer Gesundheitssurvey', English: Telephone Health Survey; RKI 2006). Furthermore, for the most part the teachers were very active in their leisure time, which can also be seen as an important health resource.

Because the correlations between work- and health-related variables did not change after the adjustment variables, age and school type were eliminated from the analysis, these do not seem to confound the work- and health-related associations. One could speculate, if these correlations may be explained by specific activities in the teaching profession. The opposite was found for physical complaints ($r = 0.44$), with the number of reported complaints increasing significantly with advancing age.

In the context of employment volume among the female teachers, *health-related variables* played an only minor role, whereas the ERI-ratio was clearly correlated with the volume of employment. No systematic correlations between working conditions and health were observed. Consequently, in accordance with the cited literature findings, the slight differences in health components across employment forms indicate that part-time and full-time employment do not seem to have different effects on health. However, the actual total of working hours of the part-time employees have to be considered, which in single cases was reported to be even more than 80% of a full-time position. This could explain the very small differences in the health status of the sample.

The special importance of the ERI-ratio observed could be due to the fact that the work-related evaluation of effort and reward already includes aspects of subjective complaint perception: rating and coping. With regard to this, factors like coping, motivation, work satisfaction, working style and social support appear to be promising explanation variables in scientific studies of health status. Social components like cooperation with colleagues, parents and head of the schools were not examined closely in this study, but could be relevant resources for the teaching profession and thus should be more strongly considered in the future.

In general, this study cannot determine a fundamental difference in the health status between female part-time and full-time teachers. The favourable state of health of the examined teachers has to be seen in the context of the working conditions, which are characterised by a high percentage of part-time work and which, additionally, have a positive or moderate expression of time-related and school-related variables. In a negative sense high values in these working conditions might reflect a higher relevance for explaining the health of teachers.

Despite the generally positive state of health among the female teachers, health impairments regarding mental health, physical complaints or effort–reward–imbalance were observed in some of the teachers. Considering the importance of the teaching profession for pupils and the society, there is a need for action to shape suitable prevention and intervention programmes for the teachers with health impairments—even if these comprise a minority of the teachers in this sample. Generally, teachers make little use of psycho-therapeutic counselling and preventive occupational–medical examinations (Seibt et al. 2007a, b). This can indicate insufficient provision of services in this field or missing acceptance of existing offers and possibilities. The question is if the counselling and therapy available to all teachers with health problems, especially with psychological impairments, are adequate. Regardless, special attention must be given to teachers with an unfavourable stress–strain-constellation.

The *interpretation* of the results is limited by the cross-sectional study design. The selection effects introduced over time by the migration of selected subjects into an occupation and the endurance of the more resilient healthy worker subgroup in this occupation cannot be observed or estimated with a cross-sectional study design. With cross-sectional data at hand, it is also impossible to determine the causal direction of the effects between the volume of employment and health variables. In this study, no measure of negative affectivity was available and, thus, reporting bias cannot be excluded.

Unfortunately, longitudinal studies of teachers are lacking, and this study only examined a part of the complex interaction between work and health. In depth analyses of private aspects of life and correlations with work (work-life-balance/conflict) would be desirable.

Due to the low number of male teachers in the study population, we found it valid to limit the study sample to

female teachers. However, this makes it more difficult to generalise the results. For example, relevant gender differences of health indicators cannot be examined. With regard to this study, the overall frequency of psychological complaints may decrease with inclusion of the male teachers since psychological impairments (e.g. depression) have been found to occur more often in women than in men in the German population (RKI 2006). The same has been observed for teachers (Hillert et al. 1999; Weber et al. 2003). Furthermore, it has to be considered that the teachers participated *voluntarily* in the occupational health screening, so that self-selection may have had an effect on the results. With a participation rate of more than 70%, however, it seems unlikely that only health-conscious teachers participated in the medical screening. It seems more likely that selection bias would have been caused by the fact that the most impaired teachers had already left their working life ('healthy worker effect'). This could obscure (underestimate) the actual burden of impairments in teachers (Seibt et al. 2004). On the other hand, persons with a good level of health may be more enthusiastic about undergoing diagnostic procedures, possibly causing a higher participation rate among the healthier teachers. Therefore, a correlation between health and a process of (self-) selection cannot be excluded. The participation rate might introduce a serious bias in the analysis of associations if the factors leading to (self-) selection are correlated with both determinants and dependent variables and hence are classical confounders in the analysis of potentially causal relationships. Because of these possible biases, the results should be interpreted with caution and final conclusion about the effects of employment volume on the state of health among female teachers cannot be drawn.

The application of highly standardised instruments in this study to measure work- and health-related factors can be regarded as a comprehensive and innovative approach to analyse associations between these factors. Individual teachers who participated in the study also benefited from this complex approach because they received valuable and comprehensive information about their health status, potential risks to health, as well as resources.

Occupational–scientific findings emphasise that work-related stress among teachers can be a danger to health and can be followed by a higher risk for disability, especially for psychological diseases (Bellingrath et al. 2009). This points out the need for professional occupational–medical and psychological care with the clear aim of work-related stress prevention.

The starting points for prevention are manifold. Improvements to the demands and resources of the occupational situation, as well as in personal coping conditions, but also in the social sphere and society are possible. Especially, individual analyses and the examination of school specific stress constellations are necessary to secure the health and work ability of teachers. The *Dresden Model*, which was created at the *Institute and Clinic of Occupational and Social Medicine of the TU Dresden* (Seibt et al. 2007a) as a primary-preventive instrument offers teachers an occupational–medical health programme with *individual* counselling. Besides preventive measures for the individual in the form of supervision and counselling (behavioural prevention), the *Dresden Model* also includes an 'at-risk' evaluation (condition oriented prevention).

This medical prevention programme is based on the stress–strain-coping model and has a salutogenetic basis. The occupational–medical care takes place with a network of competent physicians and psychologists. Conclusions for the development of a prevention programme for teachers in schools are derived from these study results and applied to the design of an adjusted intervention programme with occupational, communicational and organisational structures continually tested and adapted according to their health-promoting effects.

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

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