

# Parameters influencing health variables in a sample of 949 German teachers

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## Abstract

**Purpose** Studies including investigations by our group indicate a significantly strained health of school teachers. Only little is known about the influence of single parameters that may act as predictors of teachers' ill health.

**Methods** By using stepwise regression, in a sample of  $N = 949$  school teachers, we analyzed the correlation between personal and professional parameters on the one side and measures such as GHQ, MBI, and ERI on the other.

**Results** We found a significant correlation of work place-related factors with parameters of ill health. Compared to all other factors considered, verbal insults by pupils had the strongest impact. Positive feedback by parents and pupils or support by colleagues and school heads had a significant protective influence.

**Conclusions** Our data demonstrate that interpersonal factors appear to play a prominent role with respect to both strain and protection of teachers' health.

**Keywords** Teacher · Health · Occupation · Stress · Burnout · Violence

## Introduction

Although, among retired teachers in Germany, the previously very high rates of premature retirement due to ill health (around 50% in the 1990s) declined during the last years (30% in 2005, 24% in 2006), these rates are still significantly above those in other public employees (17% in 2006) (Statistisches Bundesamt 2008). Studies have shown that, among teachers, premature retirement due to ill health is mainly caused by mental health problems (Weber et al. 2002, 2004). In previous studies, we have examined the prevalence of psychiatric and psychosomatic symptoms of school teachers still in employment. Applying the SCL 90R in a sample of >400 high school teachers (Gymnasiallehrer), we found significant mental symptoms in 30.8% (i.e. >60 points on the GSI scale of the SCL90R). In the same sample, using an inventory describing job-related behaviour patterns (AVEM: Occupational stress and coping inventory) (Schaarschmidt and Fischer 1997) (for the English version see Schaarschmidt and Fischer 2001) we found that 50.2% belonged to the two health risk types [i.e. type A = tense type, or type B = burnout type according to Schaarschmidt (Bauer et al. 2006)].

When the Maslach burnout inventory (MBI) (Maslach et al. 1996) was used in a separate sample of  $N = 949$  teachers coming from different school types, we again found high rates of burnout symptoms such as emotional exhaustion, depersonalization and low personal accomplishment (Unterbrink et al. 2007). In this latter sample, we also determined the effort–reward ratio with the ERI inventory. We found that >21% of the teachers were above the critical cut-off of 1 (Unterbrink et al. 2007). Previous studies have shown that high effort and low reward according to the ERI measure is a robust indicator of ill health (Kudielka et al. 2004; Siegrist 1996). In fact, 30% of this latter sample

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indicated significant mental health problems (Bauer et al. 2007b) as indicated by scores of more than 4 in the GHQ (Bauer et al. 2007a; Goldberg and Williams 1988; Schmitz et al. 1999).

The main goal of this study was to analyze how several independent parameters (see below) influence perceived job stress (ERI), job strain (MBI), as well as mental health (GHQ) in a sample of 949 teachers. Thus, we aimed at analyzing work place-related and personal parameters that may predict ill health. As independent variables, we took into account work place-related criteria such as part time versus full time teaching load, school type, and class size, social support by colleges and/or school heads, and adverse events or positive feedback by pupils and/or parents. As further independent variables we considered personal criteria such as age, gender, living in a steady relationship or not, and having children or not. As dependent variables, we used the GHQ, MBI as well as the ERI scales, measuring teacher ill health.

## Materials and methods

This is a cross-sectional study. It was part of a project entitled “Health Promotion for Teachers” (“Lange Lehren”) initiated and supervised by the “Bundesanstalt für Arbeitsschutz und Arbeitsmedizin,” an agency of the German Federal Ministry of Labour.

We contacted and gave the respective inventories to all teachers of two school types (Hauptschule and Gymnasium) in a defined area (three school districts in southwest Germany). The study sample consisted of 949 teachers (426 from Gymnasium comparable to high schools, 523 from Hauptschule, a secondary school type that, upon completion, does not qualify for access to university) who had returned filled-out questionnaires. The sample represented 38.2% of a total of 2,484 teachers to whom the questionnaires had been sent. The mean age was 48.9 years, 64.0% were female. According to data of the supervisory school authority (Regierungspräsidium Freiburg) this sample of 949 teachers, regarding age and gender, turned out to be representative with respect to the above-mentioned basic teachers population ( $N = 2,484$ ). Since return rates, in Hauptschule and Gymnasium, were nearly identical, our sample may be regarded also representative with respect to teachers working in these two school types (other German school types such as Realschule and Berufsschule were not covered by this study). For further details concerning the study sample see Table 1 in Unterbrink et al. (2007).

### Inventories

As an instrument detecting mental health problems, we used the “General Health Questionnaire (GHQ12)” (Goldberg

and Williams 1988; Schmitz et al. 1999). Additional instruments applied as more specific measures of health at the workplace were the Maslach burnout inventory (MBI) (Büssing and Perrar 1992) and the “effort–reward imbalance” inventory (ERI) (Siegrist 1996). In addition, our questionnaire comprised a number of items related to the personal and professional situation of the teachers. Question covered different aspects of the personal and professional situation. The latter included supportive and adverse events that teachers may experience in their schools. Previously, we provided a rather detailed description of the above-mentioned inventories (Bauer et al. 2007a; Unterbrink et al. 2007), therefore, we restrict the following explanations to a minimum. The GHQ-12 (Goldberg and Williams 1988), used here in its German version (Schmitz et al. 1999), is a screening instrument for mental health problems and has been used in a number of WHO studies, in particular, in the primary care sector (Schmitz et al. 2001). Higher values on the GHQ scale correspond to a higher degree of ill health. The MBI was developed by Maslach and Jackson (1984) as a measure for the burnout syndrome. In its German version MBI-D (Büssing and Perrar 1992), it consists of four metric subscales, three of them taken from the American version (Maslach et al. 1996): (1) “emotional exhaustion”, (2) “personal accomplishment”, and (3) “depersonalization” (the latter expressing a cynical stance towards the client one is working for). The MBI-D (German version) includes (4) an additional scale “involvement” (describing excessive dedication). While higher scores in emotional exhaustion, depersonalization and involvement signify a higher degree of burnout, in the case of personal accomplishment higher scores stand for less burnout. Finally, we applied the effort–reward imbalance questionnaire (ERI) to assess stressful “high-cost/low-gain” experiences (Siegrist 1996). The ERI consists of two main scales, the effort and the reward scale. The values for effort divided by those for reward result in a quotient i.e. the ERI ratio. This ratio turned out to be an important factor in ill health at the workplace (Kudielka et al. 2004; Siegrist 1996). The higher the ERI ratio scores the worse is the relationship of effort and reward.

### Statistical methods

The main goal of this study was to analyze how several independent parameters (mentioned below) influence both perceived job stress (ERI), strain (MBI) as well as mental health (GHQ). The independent parameters included personal variables (such as age, gender etc.), living circumstances (e.g., living alone, being divorced or living in partnership), and professional conditions (such as school type, adverse events, perceived social support, see vertical in Table 1). In all three inventories (MBI, ERI, and GHQ),

**Table 1** Results of the regression analyses with MBI, GHQ and ERI as dependent variables

Predictors	MBI-exhaustion	MBI- pers accomplish.	MBI-depersonalisat.	MBI-involvement	GHQ-12	ERI
	17.4% β-std	23.3% β-std	21.4% β-std	3.5% β-std	8.5% β-std	17.4% β-std
<i>I Professional factors</i>						
School type (1 = Gymnasium, 2 = Hauptschule <sup>a</sup> )	+0.08					
Working part time		-0.12				-0.08
Verbal insults by pupils	<b>+0.18<sup>b</sup></b>	<b>-0.22</b>	<b>+0.23</b>	<b>+0.13</b>	<b>+0.21</b>	<b>+0.13</b>
Threat of violence by pupils			+0.07			
Deliberate damage by pupils						
Positive feedback of pupils	-0.08	+0.19	-0.11			
Complaints by parents	+ <sup>c</sup>	-0.16	+0.08	+0.11		+0.07
Accusations by parents						
Verbal insults by parents			+0.07			
Positive feedback of parents	-0.13	+0.18	-0.18		-0.08	-0.08
Feeling/experience of support by colleagues in stressful situations	-0.10					-0.08
Feeling/experience of support by school heads in stressful situations						
Feeling/experience of being abandoned by colleagues in stressful situations						
Feeling/experience of being abandoned by school heads in stressful situations	+		+0.08		+	+0.11
Average number of pupils ≥28	+					+0.10
<i>II Personal factors</i>						
Age	+		-0.09			+0.12
Gender (1 = male, 2 = female)		+0.11	-0.17			
Living in a steady relationship						
Experience of a separation during the last year	-0.08					
Own children						
Living with children	-0.13	+0.15			+	

β-std the standardized regression coefficient beta of the regression equation. The standardization allows to compare the degree of influence of the single predictor

<sup>a</sup> If not noted in another way all dichotomic variables were rated with Yes = 1 or No = 0

<sup>b</sup> Numbers in bold letters mark highest β-std. value of the single regression model

<sup>c</sup> The symbols “+” or “-” stand for inclusion in the regression model without significance ( $P \geq 05$ ). “+” symbolizing an amplifying “-” a reducing influence on the outcome variable

the scales are metric. However, since there is no cut-off in the MBI, logistic regression could not be applied for our analysis. Instead, we conducted multiple linear regressions using SPSS (14.0). However, we faced the fact that the distribution of the MBI, ERI, and GHQ values, due to the left side bounded scales, showed a slight degree of positive skewness. Because this remained in still tolerable dimensions, we abstained from making any transformation. Most of the values of the predictors were dichotomised (“dummy”) variables, which can be included in a linear regression model the same way as metric variables (see Backhaus et al. 2006).

On basis of the large number of included predictors, we decided to use a backward regression: At the beginning of the arithmetic all predictors are included and then, step by step, the one with the lowest contribution to the model is eliminated. This is conducted as long as the model continues to improve until that moment, when further eliminations do not generate a better model. At this point, only the relevant parameters survive. We calculated the same models also with the opposite operation, i.e. the forward method (starting with the parameter with the best correlation, and then including step by step the following, next relevant parameters). In a third approach, we applied the “enter method” (restricted to only one step, including all parameters together). We mainly relied on the backward regression method. The results did not differ substantially from those obtained by the two other methods.

Finally, we determined how far our model fits to explain the outcome variables. For this purpose, we applied the possibility to assess the goodness-of-fit of the multiple regression models by calculating the “coefficient of determination”  $R^2$  in SPSS. With respect to the response variable, this value indicates how much of the total variance can be explained by the regression model. Because this  $R^2$  is calculated based on data of the actual sample, it tends to overestimate the explained variance for the basic population. Therefore, we used  $R^2$ -corr, which is reduced by a correction factor (see Backhaus et al. 2006).

## Results

We investigated the correlation of both personal characteristics and factors related to working conditions on the four MBI scales, the GHQ, and on the ERI. We applied multiple regression analysis with the backward method as detailed in the methods section. The data are shown in Table 1. For three of the four MBI scales, as well as for the ERI, the goodness-of-fit of the relative regression equations (as a measure for the part of variance explained by the included parameters) amounted to values between 17.4% and 23.3%. In the case of the “involvement” scale of the MBI, only 3.5

and 8.5% in the case of the GHQ could be explained. The parameter that was significantly associated with all six outcome scales was “verbal insults by pupils”. In addition, this parameter, in all six cases, turned out to be the most predictive one towards deterioration, compared with all other parameters. “Complaints by parents” had a similar negative effect, influencing five of the six outcome scales. Conversely, the parameter „positive feedback of pupils” significantly predicted three of the four MBI scales towards amelioration. In addition, “positive feedback of parents” influenced these three MBI scales, in addition to exerting a positive effect on the ERI and GHQ scales. Thus, parameters describing adverse events such as insults or complaints and those describing positive feedback shaped up as the most predictive ones with respect to the overall impact on the MBI, GHQ, and ERI scales. As a further remarkable observation, the values of the ERI scale were significantly correlated to parameters indicating the experience of social support or a lack of such support.

We analyzed whether the predictors remain the same if gender and age is taken into account. For this purpose, we repeated the regression analysis separately for both sexes (tables A1 and A2, see annex) as well as for different age decades (tables A3–A6, see annex). With respect to gender, it was remarkable that, in the case of male teachers, the goodness-of-fit was higher for all six above-mentioned predicted scales (four MBI scales, ERI, GHQ). Thus, in the case of male teachers, the above-mentioned predictors had an even higher impact on the outcome scales, if compared to females. Especially, verbal insults by pupils had predicted all six outcome scales in male teachers, compared to females. Another interesting gender difference was that, with respect to the ERI, lack of support by the school heads was the best predictor in the case of male teachers, whereas in female teachers the ERI was best predicted by lack of support by colleagues. While having children predicted less emotional exhaustion (MBI) for both sexes, it led to less depersonalization (MBI) only in men, and to more accomplishment (MBI) only in women.

If the data were analyzed along the four age groups (<35, 35–44, 45–54, >54 years), the following interesting observations could be made: negative effects of verbal insults by pupils, although existing also there, were lowest in the youngest age group (<35 years). In all other age groups, such verbal insults were correlated with at least four of the six scales. In at least one of these scales, verbal insults by pupils even were the strongest predictor. For the youngest age group, both positive feedback by pupils and accusations by parents were strong predictors and even the strongest for two scales (positive feedback by pupils for MBI-self accomplishment and -depersonalization, accusations by parents for MBI-exhaustion and GHQ). While, in the three older age groups, positive feedback by pupils

repeatedly appeared as a predictor, accusations by parents did never. In the age group above 54 years, female sex appeared to be a predictor for better health, at least as expressed by our outcome parameters. A peculiarity of the most advanced age group was that teaching in a *Hauptschule* (compared to *Gymnasium*) turned out to be a predictor for bad health in five of the six scales. Another observation was that, as already mentioned, there was a protective influence of having own children, however, this influence appeared not earlier but in the age groups of 45 years and more.

## Discussion

Among a number of various variables, hostility directed against teachers by pupils and, to somewhat a lesser extent, by parents turned out to display the strongest correlation with several outcome parameters and thus appeared to be a major predictor of teacher ill health. A second major finding was the protective role of positive feedback, both by pupils and by parents. Other factors including age, gender, school type, class size, although displaying influence on single parameters appeared to be of less overall importance, compared to hostility and positive feedback. This impression, however, may be somewhat misleading, because our data are based on stepwise regression. With this method, we compared the relative influence of different potential predictors. It is important to note that this does not exclude that parameters that, upon stepwise regression, appear to be of minor significance, still show a considerable correlation. Another important aspect relates to the fact that the predictors described in our study explain only part of the variance (Table 1). However, since health must be regarded as a very complex phenomenon that always depends on many influences, goodness-of-fit percentages between 17.4 and 23.3% for the three main MBI scales, 17.4% for the ERI scale, and 8.5% for the GHQ (the latter being the most general measure) are not too bad.

The main focus of this paper was not to describe the extent of health disturbances in a teacher population [this has been done in several of our previous studies (Bauer et al. 2007a; Unterbrink et al. 2007)], but to shed light on the interrelations between a number of work place-related and personal parameters on the one side, and selected health parameters on the other. We would like to emphasize that our study, describing correlations, cannot address the question of what is cause and effect. However, we assume that parameters describing supportive or adverse events, at least to a certain extent, must be regarded as factors influencing teachers' health. Coming from a traditional point of view on health at the workplace, it may be surprising those interpersonal phenomena such as lack of support or hostility, and, vice versa, support or positive feedback, appear to

exert a comparable influence as “classical” parameters such as age, gender, or work load. One may have to learn from these data, that, in the school teacher profession, disturbed interpersonal relations with both pupils and parents are an important, previously underestimated source of stress and strain. Several studies report both a considerable amount of adverse experiences with pupils, to which teachers are exposed (Schubarth et al. 1999; Schwind et al. 1997; Sterblin 2007; Varbelow 2003) and destructive behaviour of pupils as a major stress factor for teachers (Bauer et al. 2006; Burke et al. 1996; Schaarschmidt 2004). In a German study by Schwind et al. (1997), frequent verbal insults (several times a week or more) were indicated by 13.3% of the teacher sample. In the same study, 13.1% indicated that they had experienced physical violence at least once a year. In another German study, 13.9% of a teacher sample reported that, within the last three years, they had been threatened with physical violence by pupils (Varbelow 2003). Interestingly, another study showed that, across different schools, between 26.1 and 31% of German pupils indicated that teachers are exposed to verbal aggression “several times a month” or more (Schubarth et al. 1999). All these reports are in line with previously published own data showing that, only within one year, 42.6% of teachers were exposed to verbal hostility, 4.4% threatened by physical violence, and 1.4% affected by actual physical violence (Bauer et al. 2007a). Although a remarkable degree of adverse events caused by pupils and directed against teachers is well documented, our study, to our knowledge, is the first one indicating a tight statistical correlation between experiences of hostility on the one side and relevant parameters of teachers' health on the other.

It must be emphasized that parameters such as age, gender, school type and work load, although they appeared to exert less influence in our study, are anything else but unimportant. However, data from the literature are inconsistent. Regarding age or length of service of teachers, some studies indicated a positive correlation to burnout parameters (Maslach and Jackson 1984; Lechner et al. 1995; Gamsjäger and Sauer 1996), while others did not (Bauer et al. 2006; Barth 1997). An actual correlation between age and increased burnout risk might be hidden by a selection effect caused by the fact that a considerable percentage of teachers with ill health undergo premature retirement (Statistisches Bundesamt 2008; Weber et al. 2002, 2004). With respect to the influence of gender on the burnout risk, reports are contradictory. Higher burnout rates for female teachers have been found if the AVEM inventory was used (Bauer et al. 2006; Schaarschmidt 2004). In contrast, higher burnout rates have been described for males, if the MBI was the instrument that was applied (Burke et al. 1996). This contradiction could be an only seeming one due to the fact that the AVEM scales do not include depersonalization. A consistent finding is



that male teachers, compared to females, exhibit higher degrees of depersonalization (Gamsjäger and Sauer 1996; Lechner et al. 1995; Schmitz 2001; Unterbrink et al. 2007). Finally, we found, that serving as a teacher in “Hauptschulen” increases the risk of emotional exhaustion, thus confirming similar previous findings (Bauer et al. 2007a; Hedderich 1997; Lechner et al. 1995; Unterbrink et al. 2007).

Social support, both in the professional and in the private sphere has been described as a protective factor for stress-related disorders and burnout. Our data indicate that the experience of support by either colleagues or school heads has a protective role with respect to the ERI and to the depersonalization and exhaustion scale of the MBI. Also living in a steady relationship appeared to be protective, at least with respect to the exhaustion scale of the MBI. These observations are in line with a broad scientific literature demonstrating that social support at the work place affects health parameters of employees (Burke and Greenglass 1993; Duquette et al. 1993; Golembiewski et al. 1986; Ksienzyk-Kreuziger 2007; Maslach and Jackson 1984; Pierce and Molloy 1990; Schaarschmidt and Fischer 2001). Also the role of social support originating from the private sphere has been described before (Bauer et al. 2006; Buschmann and Gamsjäger 1999; Gamsjäger and Sauer 1996; Kretschmer 2004; Tyler and Ellison 1994). Of note, our data provide evidence that, in the case of school teachers, receiving direct positive feedback by pupils or by parents appears to exert a stronger protective influence than what is traditionally designated as social support.

General conclusions must be drawn with cautions, although the sample on which our study is based on, is fairly representative with respect to age, gender and distribution among the two school types. According to data provided by the supervisory school authority (Regierungspräsidium Freiburg), the teachers who returned the inventories were representative with respect to the above-mentioned parameters. Our return rate of 38.2% may appear as low; however, it is similar to return rates reported by comparable investigations. Reported return rates in similar studies dealing with teachers' health are between 34 and 63% (Bauer et al. 2007a). However, studies with higher return rates than in our present study dealt with smaller numbers of teachers. Since our sample size did not allow personal addressing, we faced a lower return rate, which may have created a bias. According to Körner (2003) and Schmid (2003), the more heavily burdened teachers tend not to return the questionnaires. As a consequence, our sample would reflect a selection of somewhat less burdened teachers. However, since in our sample parameters such as gender, age, and school type were representative, we assume that this possible bias is limited. Further limitations of the representativeness of our study result from the fact that only two school types were included, and finally, that the survey, instead of

a metropolitan environment, was done in and around a medium sized city. In spite of the above-mentioned limitations, we feel that our data give a realistic description of the professional situation of teachers.

In conclusion, our data show that, among many factors, interpersonal experiences of teachers both with pupils and with parents are strongly correlated with parameters of teachers' health. Since problematic pupil behaviour in many western countries reflects a societal situation that cannot be changed in the short run, teachers should get the chance to develop better competences to deal with these difficulties. In the future, these competences should be taught during the education of teachers. Protecting teachers' health now, beside other measures, should focus on the improvement of the teachers' ability to deal with adverse pupil behaviour and to configure a constructive interpersonal relationship in the classroom. However, this capability of teachers should not be confined to their relationship with pupils alone, but also include the capability to improve the relationship with parents and with colleagues. Recently, we developed a manual for an intervention designed to help teachers to improve the quality of interpersonal relationships at their workplace (Bauer 2007; Bauer et al. 2007a).

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