

Stress and strain in teaching: A structural equation approach

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Background. School teaching seems to be particularly stressful. The stress model of Lazarus and colleagues and its adaptation to educational settings by Kyriacou and Sutcliffe is the basis for an analysis of antecedents and consequences of teacher stress.

Aims. The first aim was to test the theoretical model of teacher stress on a large sample using structural equation statistics (study I). The results should then be cross-validated and the model enlarged by additional operationalisations (study II).

Samples. Heterogeneous samples of German school teachers (study I: $N = 356$, study II: $N = 201$).

Methods. In study I, standardised questionnaires measuring workload and mobbing as stressors, physical symptoms as stress reactions, and social support and self-efficacy as moderating variables. In addition to these concepts, coping strategies, burnout and absenteeism were assessed in study II.

Results. The structural equation modelling in study I revealed that the predications of the stress model hold true: Workload and mobbing lead to stress reactions, whereas principal support reduces the perception of workload and mobbing. Global support and self-efficacy moderate the relationships between the variables. These results were confirmed in study II and the model was enlarged by burnout and coping strategies. With all concepts, 12% of the variance of absenteeism can be explained.

Conclusions. Limitations of the studies, using cross-sectional data and self-reported measures are discussed. Practical implications for improving the situation are provided.

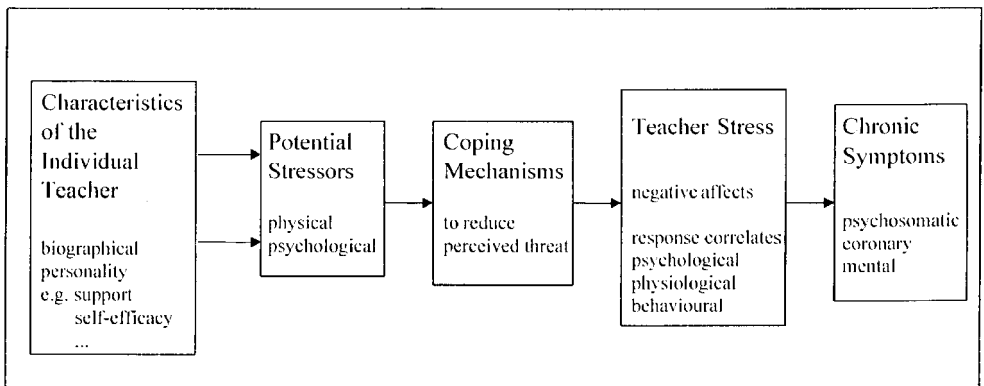
A large number of studies show that teachers are exposed to workloads which result particularly in stress and strain. At least one third of the teachers can be seen as suffering under extreme stress and/or burnout (e.g., Boyle, Borg, Falzon, & Baglioni, 1995; Capel, 1991; Friesen, Prokop, & Sarros, 1988; Friesen & Sarros, 1989). Therefore it is of great interest to get a deeper knowledge of antecedents and consequences of teachers' stress.

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Probably the most frequently used background model in stress research is the stress model of Richard Lazarus and co-workers (cf. Lazarus & Launier, 1978; Lazarus & Folkman, 1984). The advantage of this model is that it takes into account the general aspects any stress definition should consider, i.e., 'how teachers' own *perceptions* of their circumstances play a major role in explaining their emotional experience' (Kyriacou, 1998, p. 4, our italics). There are, of course, other approaches to define stress from a more organisational perspective or bio-psychological models. But even scholars favouring these theories refer to the basic assumption of Lazarus' stress model, namely that subjective perception and appraisal mediate between environmental demands and individuals' stress responses (cf. Hinton & Rotheiler, 1998). Kyriacou and Sutcliffe (1978a) adopted the theoretical conceptualisation of Lazarus to predict school teachers' stress reactions. Figure 1 presents a simplified version of the model.

According to the model, potential stressors are seen as antecedents of teacher stress.

Figure 1. A model of teacher stress (cf. Kyriacou & Sutcliffe, 1978a, p. 3)



The effects of these stressors are mediated by coping mechanisms. Kyriacou and Sutcliffe (1978a) make an explicit distinction between stressors which are mainly physical (e.g., many pupils in the classes) and those which are essentially psychological (e.g., poor relationships with colleagues). Coping attempts can help to deal with stressful situations, that is, to reduce the perceived threat of those situations. If coping mechanisms are inappropriate, stress occurs. Teacher stress is seen mainly as a negative affect with diverse psychological (e.g., job dissatisfaction), physiological (e.g., high blood pressure), and behavioural (e.g., absenteeism) correlates. In the long run these negative stress effects lead to physiological and biochemical changes accompanied by psychosomatic and even chronic symptoms like coronary heart diseases. Finally, characteristics of the individual teacher are assumed to influence the process. Beneath the core biographical characteristics there are quite a few factors, as for example self-efficacy beliefs or the perception of social support.

The model of Kyriacou and Sutcliffe (1978a) contains some additional variables, such as appraisal, or potential non-occupational stressors. These concepts are ignored

here because appraisal is extremely hard to operationalise and non-occupational stressors are not in the focus of the present work.

In this study, two heterogeneous and sufficiently big samples will be surveyed to test the model. On the side of stressors, i.e., as independent variables, workload (as a more physical stressor in the sense of Kyriacou & Sutcliffe) and mobbing will be considered. Mobbing refers to 'psychological terror . . . in working life {which} involves hostile and unethical communication which is directed in a systematic way by one or a few individuals mainly towards one individual . . .' (Leymann, 1996, p. 168) and is seen here as a more psychological stressor. Physical symptoms are the main dependent variable. Social support and self-efficacy are analysed as individual characteristics. Furthermore, in the second study burnout is introduced as an additional dependent variable. Coping strategies are integrated as a mediator.

Up to now, different studies have dealt with connections between some of the variables mentioned above. Relationships between social support and stress in the teaching profession (cf. Burke & Greenglass, 1993; Greenglass, Fiksenbaum, & Burke, 1994; Burke, Greenglass, & Schwarzer, 1996; Pierce & Molloy, 1990) were frequently examined. Other studies focused on teachers' competence expectations and their influence on stress (cf. Bhagat & Allie, 1989; Punch & Tuettemann, 1990). More complex and theoretically based variable networks have seldom been analysed. In addition, one rarely finds studies examining the connections between the concepts with the help of structural equation modelling (SEM). SEM has the advantage of pointing out causal relationships, even in cross-sectional designs. Secondly, it is possible to calculate the error-free relationships between concepts, because in latent structure models SEM considers the reliability of the measures.

Exceptions are the studies of Brenner, Sörbom, and Wallius (1985), Starnaman and Miller (1992), and Boyle *et al.* (1995). Brenner and his co-workers also adopted Lazarus' stress model and attempted to test invariance in the stress-strain relationship over time. In a longitudinal study they asked Swedish teachers to fill in questionnaires concerning coping strategies and social support, workload, mental health, physical well-being, and the quality of their sleep (measures and index computing are provided in Tellenback, Brenner, & Löfgren, 1983). Data were collected twice, at the beginning and at the end of a period of six months. Co-variations between variables were analysed using LISREL. Brenner *et al.* found relationships between stress and strain. Relationships between stress and coping strategies and stress and social support, respectively, were weak. The study of Brenner *et al.* has to face one major criticism: only 63 teachers filled in all items and were used in the analyses. This is a rather small *N* for structural equation purposes.

The aim of Starnaman and Miller (1992) was explicitly to develop and test causal relationships of stress in teaching. They questioned 182 American teachers about burnout using the Maslach Burnout Inventory (Maslach & Jackson, 1981), principal support with revised items from Caplan, Cobb, French, van Harrison, and Pinneau (1980), workload, role ambiguity, and role conflict. The latter three concepts were assessed using a survey instrument of Pettegrew and Wolf (1982). Workload occurred as a major source of stress, here emotional exhaustion. Role conflict and role ambiguity were good predictors of burnout, too. Principal support led to less role conflict and role ambiguity. Contrary to expectations a positive relation between principal support and

depersonalisation emerged, i.e., teachers who felt well supported by their principals had more negative attitudes about the students than teachers who perceived lower levels of support. Starnaman and Miller explained this by assuming that principals, in their attempt to be supportive, offer 'war stories' about students which might lead to negative attitudes in the long run. This explanation can be discussed, but the more serious problem goes back to the procedure Starnaman and Miller used: without any theoretical foundations they changed paths in their model in order to optimise model fit. Unfortunately, statistical details about chi-square values and so on are not provided. Moreover, Starnaman and Miller's aim was not reached: even at the end of their modification procedures the model did not fit ($\chi^2 = 143, 4$, d.f. = 19, $p < .01$, AGFI = .747).

Boyle and co-workers (1995) interviewed two samples of altogether 710 teachers from the islands Malta and Gozo. Their 20-item sources-of-teacher-stress-inventory was derived from the work of Kyriacou and Sutcliffe (1978b). The questionnaire contained items concerning workload, student misbehaviour, time and resource difficulties, and poor colleague relations. In the first sample the factor structure of the items was examined via exploratory factor analyses. In the second sample the structure was cross-validated via confirmatory factor analyses. Finally, on the basis of the total sample, a latent structure model was developed. Student misbehaviour and workload accounted for most of the variance of a general 'stress' factor. However, concepts, which were operationalised and which would be of special interest in the present context, e.g., job satisfaction, were not integrated in the model. Boyle *et al.* did not claim to establish causal relationships but their latent structure model could serve for future studies of the causes of teacher stress.

Because of the limitations of the literature, the present studies have the following aims:

1. To test the theoretical model of teacher stress (cf. Figure 1) on a large sample using complex structural equation modelling (study I). Although SEM cannot deliver a final proof of causality, the scope of using this approach is to get a first insight into the order of relationships between the concepts.

2. To cross-validate the results and to enlarge the operationalisations (study II).

Study I

Method

Sample and procedure

A total of 356 female ($N = 208$) and male ($N = 148$) teachers participated (mean age 46 years, standard deviation: 8 years, Min: 25, Max: 62), the mean professional experience is 19 years (standard deviation: 9 years, Min: 0, Max: 39). The sample is representative regarding age, sex and the distribution of age and sex within the school types (primary school, secondary school, high school, and special schools). The questionnaires were administered in the context of a larger research project about intercultural education in German schools (cf. Wagner, van Dick, Petzel, Auernheimer, & Sommer, 2000). The response rate was 34%.

Instruments

Only scales which are of interest in the present study are listed here. All items, their statistical characteristics and some of the other measures used in the project, can be found in van Dick (1999), van Dick, Wagner, and Petzel (1999), van Dick, Wagner, Petzel, Lenke, and Sommer (1999). All items had to be answered on 6-point scales.

Physical symptoms, the central dependent variable, were measured with an 8-item scale. The subjects rated (endpoints 'never' and 'very frequently') how often they suffered from physical symptoms like heart troubles, pain in the shoulders, headaches, stomach aches, or feelings of weakness.

Workload: Thirteen stressors (e.g., too many students, student misbehaviour, problems with foreign students, problems with parents, frequent criticism by the public about the teaching occupation, hectic work climate, etc.) were listed, regarding different problematic fields in school teaching. Teachers were asked to assess how stressful (endpoints on a 6-point scale: 'not at all stressful' and 'very stressful') the problems were.

Mobbing is a more recent concept describing certain kinds of terrorising at the workplace by colleagues and/or principals (cf. Leymann, 1996). It was measured here with four items derived from the Leymann Inventory of Psychological Terrorisation (LIPT, Leymann, 1993). Two items refer to mobbing by principals ('the principal treats me as if I were invisible', 'I am often unjustly criticised by the principal'), and two items assessed mobbing by colleagues ('colleagues often spread rumours about me', 'I am often excluded from social activities, like parties or informal meetings'). The teachers indicated their agreement or disagreement with each item (endpoints, 'totally agree' and 'totally disagree').

Social support was operationalised with 20 items altogether. There were items about practical and emotional support, respectively, each from the sources principal, colleagues, friends/partners, and students (examples: 'I often receive practical support from my principals', 'there are a lot of colleagues I have a really close relationship with', 'in my private life I have people I can talk to about the problems in school', 'I receive practical support from my students in the daily work'). The items were counterbalanced regarding positive and negative formulations and the teachers had to assess how they would agree or disagree to each (endpoints 'totally agree' and 'totally disagree').

The *self-efficacy* measure consisted of 14 items, referring to external locus-of-control (e.g., 'my life and work are determined by other people'), internal locus-of-control, ('it depends on me whether I can be satisfied with my lessons'), and self-efficacy in the more narrow sense (e.g., 'when problems arise I always see ways of coping'). The items were counterbalanced regarding positive and negative formulations and the teachers had to indicate their agreement with each statement (endpoints 'totally agree' and 'totally disagree').

Analyses

Data were analysed in two steps. First, the items of each scale were analysed using exploratory factor analyses (principal components analysis with varimax-rotation) and consistency analyses (Cronbach's alpha). In the second step, structural equation models were calculated in order to examine the relations between the variables (maximum-likelihood method of EQS¹).

Results

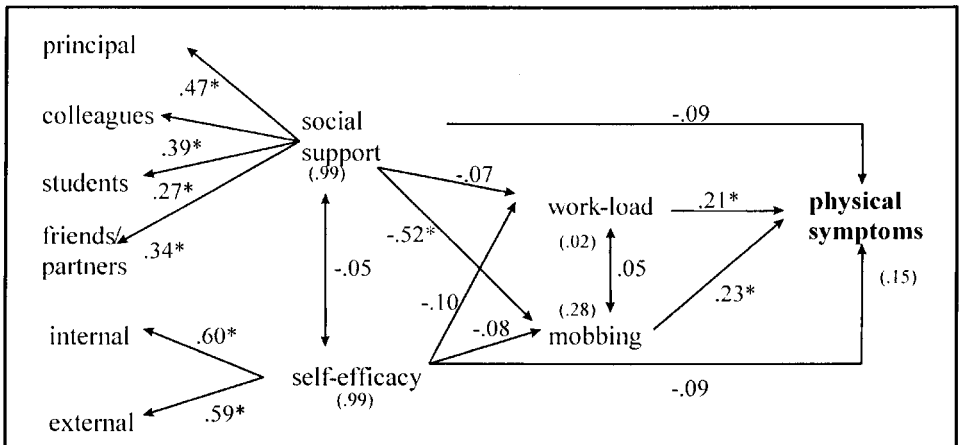
Exploratory factor analyses and consistency analyses

Physical symptoms: The analysis showed a clear unidimensional structure; internal consistency was good with an Cronbach's alpha of .81. *Workload:* Factor structure was unidimensional. After eliminating one item ('preparing the lessons and doing afterwork') because of low item-total-correlation, the scale had an alpha of .76. Factor analysis for the four items of *mobbing* showed an unidimensional solution (alpha = .63). According to delivered factor and consistency analyses for the *Social support* items both an unidimensional ('global social support', all 20 items, alpha = .86) and a four-factorial solution (principal support, 5 items, alpha = .91, support from the colleagues, 6 items, alpha = .85, support from friends/partners, 5 items, alpha = .73, students support, 4 items, alpha = .74) seem appropriate. *Self-efficacy:* Factor analyses replicated the theoretical dimensions with minor limitations. Two subscales were computed, one measuring internal locus-of-control (alpha = .74), the other external beliefs (alpha = .65). Also an unidimensional structure seemed to be a good solution, leading to a general 'self-efficacy' scale, with an alpha of .77.

Structural equation modelling

Structural equation analyses were calculated from covariance matrices on the basis of scale means. In the first model tested, social support and self-efficacy were supposed to function as independent variables. Workload and mobbing were considered as mediating stressors which cause strain in form of physical symptoms. A full factorial model, as presented in Figure 2, including workload, mobbing, physical symptoms, the

Figure 2. Full factorial model on the basis of scale means with social support and self-efficacy as predictors (R^2 in brackets)

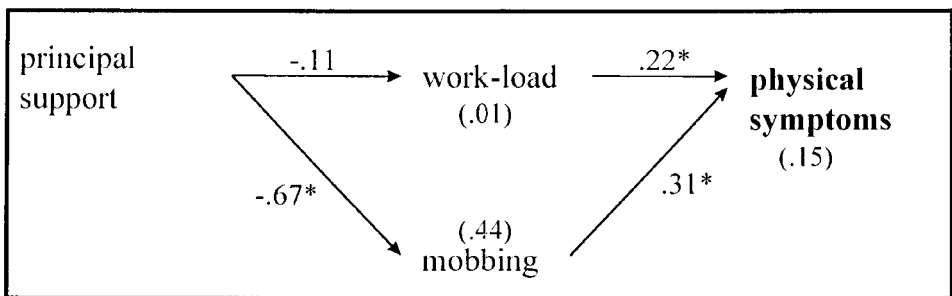


four specific and the global measures of social support, and self-efficacy (two subscales and global scale), was tested with poor fit to the data ($N = 356$, $\chi^2 = 295$, d.f. = 32, $p < .0001$; CFI = .96; RMSEA = .16, $\chi^2/\text{d.f.} = 9.2$). Looking at the modification

indices and the paths, self-efficacy in general and the two specific measures (internal and external beliefs) showed no significant relationship to the other concepts. Therefore self-efficacy measures were excluded from the model and regarded as a moderator in further steps of the analysis. The global measure of social support had no direct effect on any other variable, but the Lagrange-multiplier test showed that there were meaningful relationships between principal support and workload, and between principal support and mobbing. These two paths remained in the model; the global measure of support and the other specific measures were excluded.

In Figure 3, an optimised model is presented. The model fit is good ($N = 356$; $\chi^2 = 1,49$, d.f. = 2, $p = .475$, CFI = 1.00, RMSEA = 0.00; $\chi^2/\text{d.f.} = 0,8$). As postulated in the theoretical model (cf. Figure 1), workload and mobbing are stressors which lead to higher amounts of physical symptoms. Principal support lowers the perception of workload and mobbing.

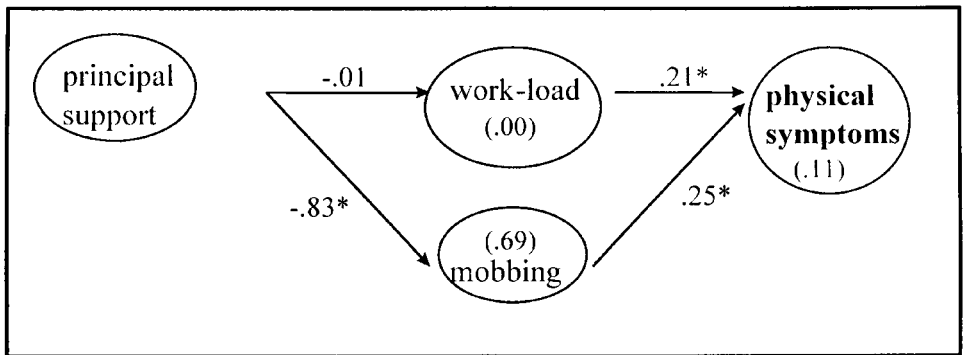
Figure 3. Optimised model on the basis of scale means (R^2 in brackets)



The strong relationship between principal support and mobbing puts into question whether the two concepts are really distinctive. A detailed analysis (cf. van Dick, 1999) with exploratory and confirmatory factor analyses showed that there are clear factor loadings of four of the five support items on the appropriate factor and clear loadings of the four mobbing items on a mobbing factor (there is one exception: the support-item 'the principal trusts me' has a higher loading of $-.67$ on the mobbing factor than on the support factor of $.21$. An analysis of the scale without this item leads to identical results).

The model presented in Figure 3 was also tested on the basis of latent structures, i.e., with all concepts as latent variables. This kind of latent structure analysis is highly restrictive because of the large number of indicators (28 in this case) and therefore a model-misfit is likely. The advantage of analysing latent structure models is that measurement errors can be considered and this makes the results more reliable. As can be seen in Figure 4 the relationships between variables are as in Figure 3. The relationship between principal support and mobbing becomes even stronger, the path between principal support and workload decreases. The model does not fit very well ($\chi^2 = 744,9$, d.f. = 363, $p < .01$, CFI = $.866$, RMSEA = 0.06; $\chi^2/\text{d.f.} = 2,1$), but the $\chi^2/\text{d.f.}$ -ratio and the RMSEA are satisfactory and support the assumption that the results of the scale-mean based models tested above are reliable.

Figure 4. Optimised model on the basis of latent variables (because of clarity only the latent variables are presented; R^2 in brackets)



Finally, the moderating roles of social support and self-efficacy were tested. The sample was divided on the basis of median splits into subgroups of high versus low support and high versus low self-efficacy. Figure 5 shows the results for the groups of high and low social support.

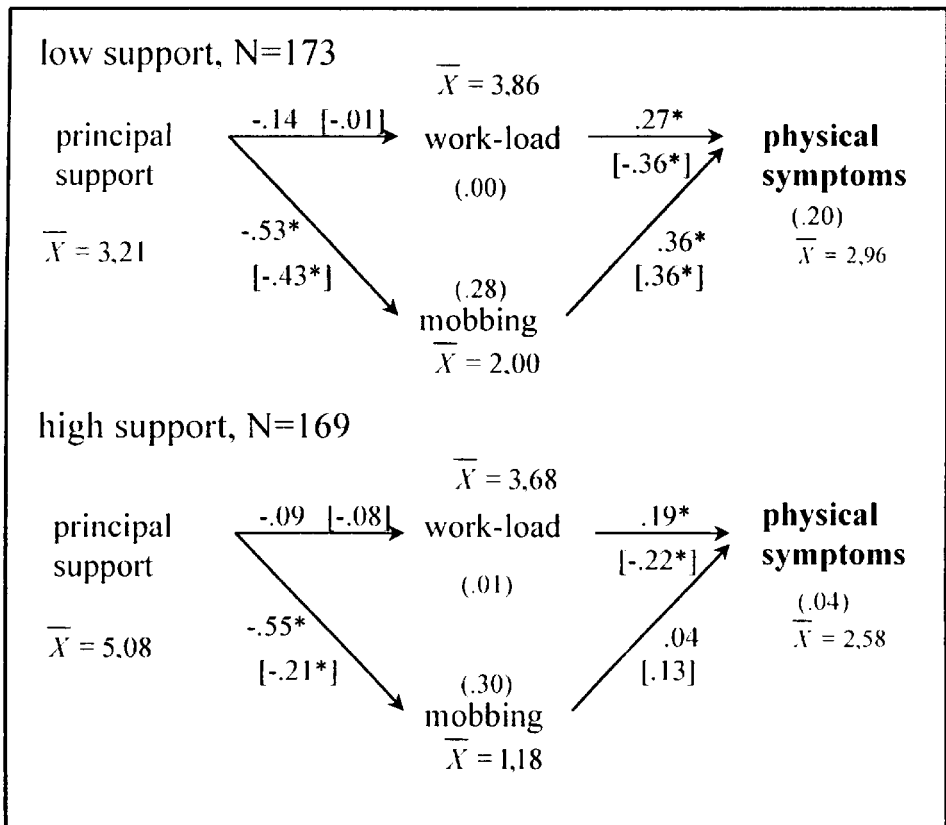
The model fits well in both subgroups. In the group with low support ($N = 173$; $\chi^2 = 2,62$, d.f. = 2, $p = .27$; CFI = .993; RMSEA = .04; χ^2 /d.f. = 1,3) the relationships between stressors and physical symptoms are somewhat stronger than in the group with high support ($N = 169$; $\chi^2 = 4,66$, d.f. = 2, $p = .10$; CFI = .960; RMSEA = .09; χ^2 /d.f. = 2,3).

A multiple-group analysis shows that the model is valid in both groups and that the two groups do not differ significantly from each other ($\chi^2 = 7,28$, d.f. = 4, $p = .12$; CFI = 0.98; χ^2 /d.f. = 1,8). In a second multiple-group analysis, however, in which all paths were fixed between the two groups via CONSTRAINTS, a difference between the two models ($\chi^2 = 25,26$, d.f. = 8, $p = .001$; CFI = 0.893; χ^2 /d.f. = 3,2) emerged in the path between principal support and mobbing ($\chi^2 = 13,79$, $p < .0001$). At a first glance this effect seems implausible: however, when considering the unstandardised path-coefficients, the stronger relation between principal support and mobbing in the low support subgroup compared to the high support group becomes clear. The moderating effect of support is also indicated in the lower mean in physical symptoms and the lower account of variance in the high support group.

Figure 6 shows the results of the structural analyses in the two subgroups constructed on the basis of median split in global self-efficacy. In both groups the models were fitted well to the data, in the low self-efficacy subgroup ($N = 167$; $\chi^2 = 2,72$, d.f. = 2, $p = .26$; CFI = .995; RMSEA = .05; χ^2 /d.f. = 1,4) the relations between stressors and strain were stronger than in the high self-efficacy group ($N = 175$; $\chi^2 = 4,45$, d.f. = 2, $p = .11$; CFI = .973; RMSEA = .08; χ^2 /d.f. = 2,2).

A multiple-group analysis showed no differences between the groups of low and high self-efficacy ($\chi^2 = 7,17$, d.f. = 4, $p = .13$; CFI = 0.986; χ^2 /d.f. = 1,8). A second multiple-group analysis testing path differences (CONSTRAINTS), however, delivered a significant difference ($\chi^2 = 19,21$, d.f. = 8, $p = .014$; CFI = 0.951; χ^2 /d.f. = 2,4),

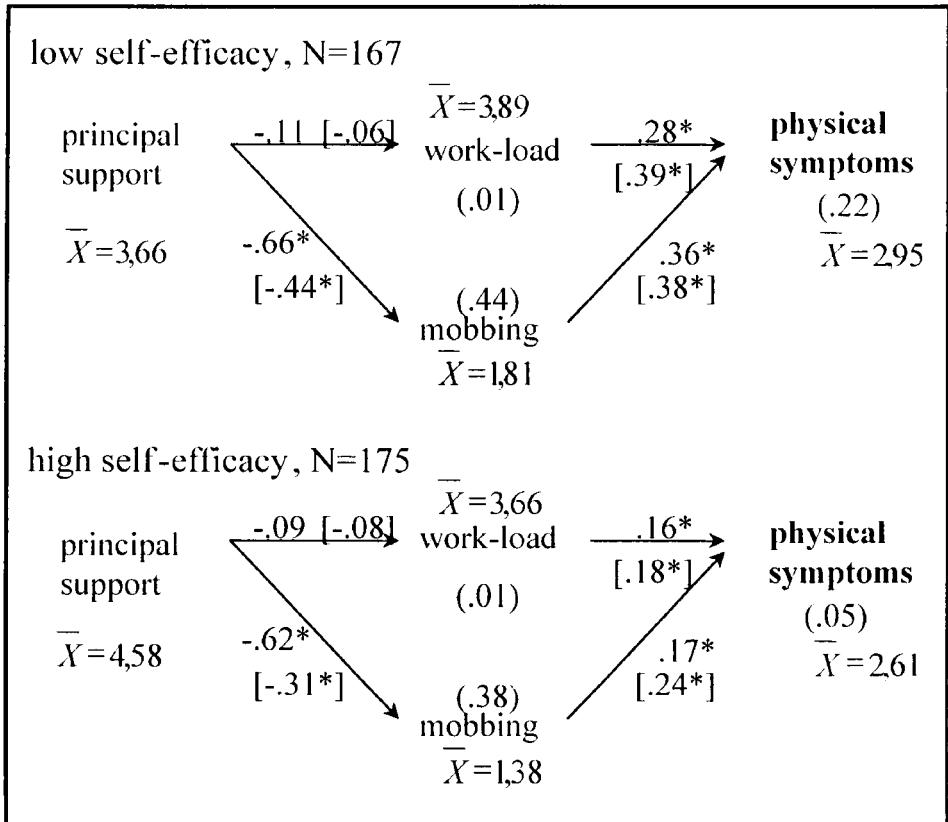
Figure 5. Structural equation models in subgroups with low and high social support (R^2 in round brackets, unstandardised regression-coefficients in square brackets)



indicating a stronger connection between principal support and mobbing in the low self-efficacy group ($\chi^2 = 7,35$, $p < .01$). The difference between the subsamples becomes more clear when looking at the unstandardised parameters.

Two further analyses were computed in order to check whether sex or age of participants have an impact on the relationships between variables. The literature documents studies which find differences for demographic indicators (e.g., Schwab & Iwanicki, 1982) as well as studies which fail to find such differences (e.g., Pierce & Molloy, 1990). In our data, subgroup analyses showed that the models did not differ between male and female teachers, even when all paths were fixed via CONSTRAINTS ($\chi^2 = 9,18$, d.f. = 8, $p = .33$; CFI = 0.995; χ^2 /d.f. = 1,1). The same held true for two subgroups of younger (here less than 46 years, which is the median age of the sample and German teachers in general, too) versus older (than 46 years) teachers (with CONSTRAINTS: $\chi^2 = 8,79$, d.f. = 8, $p = .36$; CFI = 0.997; χ^2 /d.f. = 1,1). Therefore, effects of the demographic characteristics sex and age do not seem to be very important, at least in the present sample.

Figure 6. Structural equation models in subgroups with low and high self-efficacy (R^2 in round brackets, unstandardised regression-coefficients in square brackets)



Study II

Study II extended the perspective of study I. Burnout was included in the dependent variables to broaden the negative outcomes of work stress. In addition, absenteeism was added to bring in a concept which is closer to actual behaviour. The concept of coping was added to the predictors or moderators, respectively.

Following Kyriacou and Sutcliffe (1978a), *burnout* was used as a concept to operationalise one important aspect of teacher stress, namely the experience of negative affect. According to the three-dimensional structure of the burnout syndrome as proposed by Maslach and Jackson (1981), this negative affect refers to depersonalisation of students, feelings of reduced personal accomplishment, and emotional exhaustion. Employee *absenteeism* is an acknowledged problem in any organisation that uses fixed work schedules. This holds especially true for the school system in which students and teachers are totally determined through time schedules. Lazarus and Folkman (1984, p. 141) define *coping* as 'constantly changing cognitive and behavioural

efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of a person'. Correspondingly, coping strategies are defined here as every non-automated teacher behaviour directed at stressful events in the school.

Method

Sample and procedure

The sample consisted of 201 female ($N = 110$) and male ($N = 91$) teachers. They stem from all German school types and from seven different federal states. The mean age was 45 years (standard deviation: 7 years, Min: 24, Max: 61), the mean professional experience was 17 years (standard deviation: 8 years, Min: 0, Max: 36). Twenty-nine per cent were in part-time occupations, 80% married or living in continuous partnerships, 73% had at least one child. The response rate was 60%.

Instrument

The items used in this study were identical with those in study I for the following measures: workload, physical symptoms, social support, and self-efficacy. The mobbing scale was enlarged by seven additional items assessing mobbing both by principals and colleagues. Two new measures were added to the questionnaire: *Coping strategies* were operationalised with 33 items describing efficient and less efficient coping strategies. Examples are 'I try to stay calm', 'I ask colleagues for help', 'I get angry', 'I try to avoid the problem', 'I try to relax at home'. The teachers had to agree or disagree on 6-point scales (endpoints 'totally agree' and 'totally disagree'). For the analyses all items were recoded, so that higher values indicate the use of more adaptive coping strategies. *Burnout* was measured with a 22-item scale of teacher burnout which is a German version (Barth, 1985) of the Maslach Burnout Inventory (Maslach & Jackson, 1981). Again, the teachers were supposed to answer on a 6-point scale (endpoints 'totally agree' and 'totally disagree'). Finally, the teachers were asked: 'How many days have you been absent from school because of illness in the last term?', to have a (relatively simple) measure of absenteeism.

Results

Structure and internal consistency of the measures

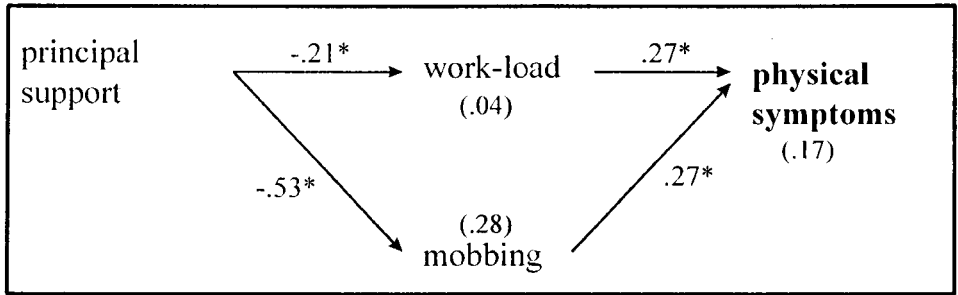
The measures that were used in the first study were also internally consistent in this study (workload: $\alpha = .79$; physical symptoms: $\alpha = .81$; self-efficacy: $\alpha = .72$; principal support: $\alpha = .87$). The enlarged mobbing scale is of a better consistency (here $\alpha = .82$) than the one in study I. When eliminating items because of low item-test-correlations, the scale of coping strategies showed sufficient internal consistency (14 items, $\alpha = .75$; exploratory factor analyses showed a unidimensional solution). The alpha for the burnout scale with 16 items was .85.

Structural equation modelling

The first goal of this study was the cross-validation of the results from study I. Therefore, the same model was tested as in study I with identical measures, except for

the mobbing scale, which was enlarged with seven items. The model fits very well ($\chi^2 = 2,93$, d.f. = 2, $p = .23$, CFI = 0.99, RMSEA = 0.05, $\chi^2/\text{d.f.} = 1.5$). The results are shown in Figure 7. The relationships between the variables are the same as in study I: workload and mobbing lead to physical symptoms; principal support can reduce both the perception of workload and mobbing.

Figure 7. Structural equation model in study II (R^2 in brackets)

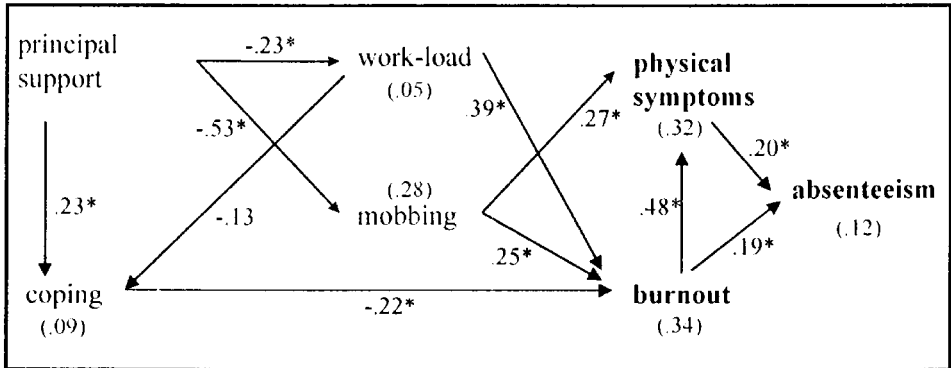


A multiple-group analysis, to test the correspondence between the two studies revealed that there is a lot of similarity between the two samples ($\chi^2 = 5,5$, d.f. = 4, $p = .24$, CFI = 0.996, $\chi^2/\text{d.f.} = 1,4$). A second multiple-group analysis with all paths fixed via CONSTRAINTS showed one significant difference, namely in the relationship between principal support and mobbing ($\chi^2 = 12,1$, $p < .01$), the connection is stronger in study I (-.67) than in study II (-.53). Because of this difference the models are not exactly equivalent ($\chi^2 = 21,1$, d.f. = 8, $p < .01$, CFI = 0.97, $\chi^2/\text{d.f.} = 2,6$), but considering the CFI or the $\chi^2/\text{d.f.}$ -ratio, the correspondence between the two samples seems sufficient to speak of a successful attempt of cross-validation.

Broadening the model

In the last step, it is intended to broaden the model with the additional concepts, coping strategies and burnout in order to follow Kyriacou and Sutcliffe (1978a, cf. Figure 1). In addition, absenteeism was integrated as an indicator closer to actual behaviour. The absenteeism measure showed sufficient variance: mean 2.96 days, standard deviation 4.4, Min: 0 days, Max: 30 days. The final model, as presented in Figure 8, is of good fit ($\chi^2 = 14,28$, d.f. = 10, $p = .16$, CFI = 0.98, RMSEA = 0.05, $\chi^2/\text{d.f.} = 1,5$).

The following relationships appear in the model: as in study I and as predicted by the general stress model, workload and mobbing lead to burnout. Burnout acts as a mediator between these stressors and physical symptoms, i.e., teachers who feel exhausted develop physical symptoms in the long run. Adaptive coping strategies can reduce burnout and the use of appropriate coping is enhanced by principal support. Principal support also reduces workload and mobbing, as in the more simplified models tested before. With these relationships and the overall model fit the theoretical model (cf. Figure 1) seems to have been proven sufficiently. Finally, absenteeism can be explained ($R^2 = .12$) through physical symptoms and burnout.

Figure 8. Enlarged model, study II (R^2 in brackets)

Conclusions

Stress (workload and mobbing), strain (physical symptoms and burnout), and some moderating variables (self-efficacy, social support, and coping strategies) in the teaching occupation were measured successfully. The scales were of sufficient homogeneity and reliability. In study I a model was developed and tested. The general stress model of Lazarus and his colleagues and its adaptation for teaching via Kyriacou and Sutcliffe (1978a) served as a foundation and seemed to be a fruitful ground for stress and strain research in teaching. The model proposed that stressors lead to strain in the long run. Precisely this could be demonstrated in study I: workload and mobbing lead to more physical symptoms, an operationalisation of the general stress reaction. Moreover, the general stress model suggested positive influences of personality and environment factors in form of resources to cope with stressful situations. Here, two of these potential resources were operationalised, namely self-efficacy and social support. Especially principal support turned out to be an important factor for reducing stress at work. Additionally, global social support served as a moderator: for teachers with low feelings of support there was a much stronger relationship between stress and strain than for teachers with higher support. The same was true for the moderating role of self-efficacy, when high self-efficacy leads to weaker connections between stress and strain. There were no indications of substantial impacts of demographic characteristics: attempts to check for moderating influences of sex or age failed.

The main goal of study II, the cross-validation of the results of study I, was successful: the model could be replicated; the structure between the concepts was the same in both samples. The next step in study II was to broaden the model with additional concepts. One important improvement was to add coping strategies as a central variable of the general stress model. It was found that coping strategies served as a mediator between workload and burnout: teachers with more adaptive coping strategies showed a lower degree of burnout than teachers with coping strategies based on ignoring or avoiding problematic situations. On the other hand, coping itself was positively determined by principal support, i.e., teachers who felt secure of support from their principal made more attempts to cope actively with stressors than teachers

who were supervised by less supportive principals. Burnout, the other new concept in study II, served as a mediator between stressors (both workload and mobbing) and physical symptoms: the more the teachers suffered from stress the more they showed symptoms of burnout, like reduced personal accomplishment and emotional exhaustion. On top of that they developed more physical symptoms in the long run. Burke and his co-workers (1996) found support for this causal influence of burnout on physical symptoms in a longitudinal study. Both suffering from burnout and physical symptoms, respectively, lead to more days of absenteeism in school.

The successful attempt of cross-validation is especially important because of the much better response rate in study II (60%). The comparatively low response rate of 34% in study I could probably be explained by the different topics of the two studies. In study I, the questionnaires were introduced as part of a research project on intercultural education. This might have caused a certain mistrust in the teachers. Some oral comments of teachers during the administration of questionnaires (e.g., 'We have no problems with hostility against foreign students in our school, we don't need this research') indicated that some teachers might have been suspicious of being examined for having racist attitudes. The second study was on aspects of the teaching occupation explicitly named in title and introduction of the questionnaires. This difference in topics of the studies might be responsible for higher compliance rates in study II. The advantage of study I is that respondents are representative of the population, the advantage of study II is the lower selectivity.

Results of both studies taken together first support the assumptions of the general stress model. Exposure to stress (workload, mobbing) can lead to more strain (physical symptoms and burnout) among schoolteachers. Second, the negative impact of stress on strain can be buffered through factors like beliefs of self-efficacy, perceptions of support, and use of appropriate coping strategies.

What are the practical implications of these results? On the one hand the situation could be improved if the individual teacher were trained better to deal with the stressful aspects of teaching: there are programmes developed especially for enhancing teachers' self-efficacy (cf. Brockmeyer & Edelstein, 1997) and their application has shown encouraging results (Schmitz, 1998). In a similar manner, also directed to the individual teacher, training to improve coping strategies could be helpful (e.g., Hall, Wooster, & Woodhouse, 1989; Tyler, 1998). On the other hand, it also seems useful to improve interactions between colleagues to enhance collegial support (cf. Fimian, 1986) and to reduce mobbing (cf. Kasper, 1998). Finally, the positive influence of principal support has political impact: if the school principal has a key function in mediating between teachers' needs and demands of the educational system which often are unavoidably stressful, he or she should be well prepared to fit this role. At least in Germany, reality seems far from this: school principals are mostly regular teachers who have a high teaching load themselves. They are usually not trained as principals or only as far as it concerns additional administrative duties (cf. Wissinger, 1996).

Finally, two limitations of the present work have to be mentioned. First, strictly speaking, the applied cross-sectional design cannot deliver any proof of causality. To attain this, longitudinal studies are necessary. However, longitudinal designs in the school context are extremely hard to carry through. There are only very few attempts to survey teachers over a longer period of time. Mostly because of an extreme sensibility

for anonymity, even in some existing longitudinal studies teachers could not be identified over waves, which led to quasi-longitudinal statements (see for an example the study of Nagy & Nagy, 1992). When using cross-sectional survey studies, the analysis of data with structural equation modelling seems to be a first step to get at least an idea of causality. This is especially true when the analyses are theory driven and can be cross-validated, like in the work on hand.

The second limitation refers to the use of self-reported measures for all the concepts. It could be argued that teachers have their own theories of causality when answering questions of stress and strain and that their responses are influenced by a tendency to give consistent answers. However, the subjective measures are related with objective indicators in the present studies (e.g., the subjective perception of having too many students in the classroom correlates with the objective number of students, cf. van Dick, 1999, p. 129) and in other research on school teachers' stress (cf. Sugisawa, Nakijima, Kikkawa, & Sugisawa, 1996) so that we can assume at least some validity for the self-reported measures. In addition, as different researchers have stated, self-reported measures are not only more economical than other types of data collection (e.g., peer-ratings, objective data, physiological measures) but they are also closer to the individuals' reality: in this sense it is more the *perception* and *meaning* of the situation that causes stress and strain and less the situations' objective characteristics (cf. Landeck, 1981). Nevertheless, this kind of research should be supported and confirmed by studies using other ways of data collection. Some bio-psychological approaches using physiological measures supported our results to a large extent (cf. Hinton & Rotheiler, 1998).

NOTES

1 We used Maximum Likelihood Method because it is relatively stable against violation of normality in large samples (Bentler, 1992). Because the normal distribution was violated here for most of the scales (cf. van Dick, 1999) we also calculated a model with the method ROBUST using raw data for analyses: results are identical for both methods.

2 CFI, RMSEA, and chi-square/df-ratios are used to describe models' goodness of fit. The CFI (comparative fit index, see for exact formula Bentler, 1992) is less susceptible for difficulties associated with sample size effects as some other fit indices. In general, models with CFI > .90 are adequate. The RMSEA represents the average of the residuals of the fitted covariance matrix and should have a value below .10. Finally a ratio of chi-square divided by the model's degrees of freedom (chi-square/df) with a value of at least five, better two or three, is adequate. See Medsker, Williams, and Holahan (1994) for a summary and discussion of these and other methods of evaluating goodness of fit of structural equation modelling.

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