

# **A structural model of the dimensions of teacher stress**

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A comprehensive survey of teacher stress, job satisfaction and career commitment among 710 full-time primary school teachers was undertaken by Borg, Riding & Falzon (1991) in the Mediterranean islands of Malta and Gozo. A principal components analysis of a 20-item sources of teacher stress inventory had suggested four distinct dimensions which were labelled: Pupil Misbehaviour, Time/Resource Difficulties, Professional Recognition Needs, and Poor Relationships, respectively. To check on the validity of the Borg *et al.* factor solution, the group of 710 teachers was randomly split into two separate samples. Exploratory factor analysis was carried out on the data from Sample 1 ( $N=335$ ), while Sample 2 ( $N=375$ ) provided the cross-validation data for a LISREL confirmatory factor analysis. Results supported the proposed dimensionality of the sources of teacher stress (measurement model), along with evidence of an additional teacher stress factor (Workload). Consequently, structural modelling of the 'causal relationships' between the various latent variables and self-reported stress was undertaken on the combined samples ( $N=710$ ). Although both non-recursive and recursive models incorporating Poor Colleague Relations as a mediating variable were tested for their goodness-of-fit, a simple regression model provided the most parsimonious fit to the empirical data, wherein Workload and Student Misbehaviour accounted for most of the variance in predicting teaching stress.

The problem of teacher stress has received increasing recognition over recent years (e.g.,

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Abouserie, in press; Borg, 1990; Borg & Falzon, 1989, 1990, 1993; Borg, Riding & Falzon, 1991; Brenner, Sörbom & Wallius, 1985; Capel, 1987; Cooper & Payne, 1991; Farrugia, 1986; Fimian, 1988; Fletcher & Payne, 1982; Fontana & Abouserie, 1993; Kyriacou, 1987; Kyriacou & Sutcliffe, 1978*a*, 1978*b*, 1980; Perlberg & Keinan, 1986; Smilansky, 1984; Smith & Bourke, 1992; Starnaman & Miller, 1992; Tellenback, Brenner & Löfgren, 1983; Turk, Meeks & Turk, 1982; Wearing, 1989; Woodhouse, Hall & Wooster, 1985). Although some investigators have played down the importance of such occupational stress (e.g., Milstein & Farkas, 1988), the fact is that teacher stress is such a serious problem that it often requires therapeutic intervention (Cox, Boot, Cox & Harrison, 1988; Hall, Woodhouse & Wooster, 1986).

Several surveys of the sources of teacher stress have revealed that up to a third of teachers regard teaching as highly stressful (Borg & Falzon, 1989; Broiles, 1982; Kyriacou & Sutcliffe, 1979*a*, 1979*b*; Solman & Feld, 1989; Spooner, 1984). Although there are obvious differences in sociodemographic variables such as age, experience, gender, and teacher rank, evidence suggests that stress has a discernible impact on most teachers (Borg *et al.*, 1991; Brown & Ralph, 1992; Laughlin, 1984; Pierce & Molloy, 1990*a*; Punch & Tuetteman, 1990). Yet, despite apparently high levels of stress, the majority of teachers (at least 60–70 per cent) regard teaching overall as rewarding and satisfying (e.g., Borg & Falzon, 1989; Kyriacou & Sutcliffe, 1979*a*). As expected, the relationship between teacher stress and job satisfaction is such that the level of stress is negatively associated with job satisfaction (cf. Laughlin, 1984; Litt & Turk, 1985; Otto, 1982).

Stress is typically defined in terms of (1) the external environmental stimulus characteristics; (2) individuals' emotional states; or (3) an interaction variable emphasising the relationship between individuals and their environments (Cox, 1978). Hinkle (1974) referred to the first approach as the engineering model, wherein stress results from environmentally exerted pressures. The second interpretation involving emotional states is known as the physiological model, in view of stress-induced physiological responses within the individual (DeFrank & Stroup, 1989), although many of the concomitant intraindividual changes are partly psychological and affective in nature (cf. Boyle & Katz, 1991). The interactional/transactional perspective conceptualises stress as the product of a complex transaction between individual needs/resources and environmental demands and constraints (Handy, 1986). Kyriacou & Sutcliffe (1978*b*) concluded, however, that the engineering model provides an insufficient account of the intrapersonal perceptual and affective processes involved in stress reactions. According to them (p. 2), 'Teacher stress may be defined as a response of negative affect (such as anger or depression) by a teacher usually accompanied by potentially pathogenic physiological and biochemical changes (such as increased heart rate or release of adrenocorticotrophic hormones into the bloodstream) resulting from aspects of the teacher's job and mediated by the perception that the demands made upon the teacher constitute a threat to his self-esteem or well-being and by coping mechanisms activated to reduce the perceived threat'. As they pointed out, intrapersonal characteristics (such as enduring personality traits) may interact with an individual's perceptions of stressful stimuli, so that stress reactions will vary differentially among individuals, even when the objective external conditions are the same.

When individuals are exposed to stressful stimuli, personality dispositions play a mediating role in the onset of stress reactions (Boyle, 1983; Evans, 1986; Grossarth-Maticek, Eysenck & Boyle, 1994; Krohne, 1990; Ormel & Wohlfarth, 1991). Clearly, there are

considerable individual differences in susceptibility to stress. As compared with extraverts, introverted individuals tend to perceive negative affect at lower stimulus intensities (Eysenck, 1991), implicating cognitive appraisal as a mediating variable (cf. Lazarus, 1990). Given the role of cognitive appraisal, it is evident that stress reactions are not solely the result of external sources but are determined to a large extent by individuals' perceptions and interpretations of such stimuli, as well as their coping mechanisms. According to Strelau (1988), reactivity to such stimuli varies with strength of excitation (SE) of the nervous system as measured, for example, in the Pavlovian Temperament Survey (Boyle, Strelau & Angleitner, 1992). High sensitivity and reactivity to stressful stimuli is directly related to low SE and introversion, and vice versa. Individuals with discernible neurotic tendencies tend to be more susceptible to stress reactions and to recover only slowly (Eysenck, 1991; Schmitz, 1992).

Kyriacou & Sutcliffe (1978*b*) pointed out that potential stressors may be primarily physical in nature, psychological, or a combination of both. Evidently, all these mechanisms may act synergistically in the onset of a stress reaction (Grossarth-Meticek *et al.*, 1994; Ormel & Wohlfarth, 1990). The key aspect is that individuals perceive a threat to their self-esteem or security (Roe & Gray, 1991), and that their coping mechanisms are unable to mediate adequately the increase in negative hedonic tone. Finally, Kyriacou & Sutcliffe (p. 5) concluded that 'the potentially pathogenic nature of the physiological and biochemical changes that accompany teacher stress may not only lead to psychosomatic symptoms (e.g., peptic ulcers) but to even more chronic symptoms such as coronary heart disease and mental ill health ...' Clearly, the problem of teacher stress is a serious one, and it is evidently important to view such stress from a multivariate perspective (cf. Tellenback *et al.*, 1983). Stress has been associated with reduced immune functioning and resultant infectious diseases, peptic ulcers, hypertension and coronary disease (Lobel & Dunkel-Schetter, 1990). In addition, obesity and diabetes, as well as faulty lipoprotein metabolism, and atherosclerosis have been associated with stress (Brindley & Rolland, 1989).

Brenner & Bartell (1984) built on the conceptual model of teacher stress proposed by Kyriacou & Sutcliffe (1978*b*). They maintained that teacher stress results from the combined effects of the teacher and school characteristics, potential stressors in the school environment, actual stressors, overall perceived work-related stressors, stress reactions/symptoms and health status, personality characteristics and coping mechanisms, as well as non-work related (life-events) stressors. Yet, although Brenner & Bartell conducted a LISREL analysis of the Kyriacou & Sutcliffe conceptual model of teacher stress, they failed to verify the proposed structural relationships. Other models of teacher stress, including the cognitive appraisal model of Lazarus & Folkman (1984), have also been criticised for not paying sufficient attention to affective components (cf. Brown & Ralph, 1992; Worrall & May, 1989).

In attempts to identify the major dimensions of teacher stress, a number of exploratory factor analytic studies have been undertaken (e.g., Borg *et al.*, 1991; Clark, 1980; Dewe, 1986; Kyriacou & Sutcliffe, 1978*a*; Laughlin, 1984; Manthei & Solman, 1988; Okebukola & Jegede, 1989; Payne & Furnham, 1987). At least four major dimensions of teacher stress have emerged from these various empirical studies. However, these studies have often misapplied the 'Little Jiffy' method of factor analysis, which involves the estimation of a principal components solution together with orthogonal (varimax) rotation, and number of factors determined by means of the Kaiser-Guttman eigenvalues greater than unity criterion

(see Boyle, 1988, pp. 742–745, for a discussion of factor analytic limitations). The first component, labelled Pupil Misbehaviour, loads significantly on aspects of teaching such as noisy pupils, difficult class, maintaining class discipline, pupils' impolite behaviour or cheekiness, large class size, pupils' poor attitudes to work, having to supervise too many children because of teacher absence, and so on. A second component (Time/Resource Difficulties) exhibits substantial loadings on lack of sufficient time for individual instruction, a vague insufficiently detailed syllabus, shortage of equipment and poor facilities, large class size, administrative work, liaison with parents, and so on. A third dimension (Professional Recognition Needs) involves the perception of a poor career structure with few promotional opportunities, inadequate salary, and lack of recognition for good teaching, while a fourth component (Poor Colleague Relations) concerns the attitudes of one's peers, pressure from the headteacher and other education officers, and pressure from parents.

The purpose of the present study is to check on the validity of the proposed dimensional structure of latent variables pertaining to teacher stress, using different samples to undertake separate exploratory and confirmatory factor analyses. Application of this 'two-handed' exploratory and confirmatory factor analytic approach should provide strong evidence as to the reliability of the dimensions contributing to teacher stress (cf. Cudeck & Browne, 1983). However, to facilitate more meaningful research into teacher stress, concise models of the sources of teacher stress need to be derived in line with the suggestions of Brenner & Bartell (1984), Brenner *et al.* (1985), and Tellenback *et al.* (1983), taking into account the role of intrapersonal characteristics including personality attributes, cognitive appraisal as a mediating variable, and coping mechanisms. With a more limited objective, the present paper proposes models of the direct sources of teacher stress, and statistically tests their goodness-of-fit, using a structural equation modelling (SEM) approach.

## Method

### *Samples and procedure*

All 81 state primary schools in the Maltese islands of Malta and Gozo were sent the 20-item sources of teacher stress questionnaire. Demographic characteristics of the sample of primary school teachers were provided in Borg *et al.* (1991). Altogether, 1074 teachers had prime responsibility for teaching a particular class, and of these, no fewer than 844 usable questionnaires were returned (representing a high participation rate of 78.6 per cent). Some 134 of the completed questionnaires had been returned by part-time and casual teachers. However, considering that temporary teachers might be expected to give somewhat atypical responses, only those questionnaires returned by full-time teachers ( $N=710$ ) were retained for the present analyses. The resulting group comprised 497 female and 213 male teachers. All questionnaires were completed anonymously, and participation in the study was entirely voluntary.

Given the importance of cross-validation of findings, the total group of primary school teachers was randomly split into two separate subsamples partly in accord with the rationale proposed by Cudeck & Browne (1983). Sample 1 ( $N=335$ ) provided the data for an exploratory factor analysis (EFA), while Sample 2 ( $N=375$ ) enabled an entirely separate confirmatory factor analysis (CFA) to be undertaken. Consequently, the data from Sample 1 provided empirically derived hypotheses as to the number and nature of factors of teacher

stress. Sample 2 enabled a test of the goodness-of-fit of the hypothesised measurement model obtained from Sample 1. The total sample ( $N=710$ ) was then used to examine the structural relationships among the sources of teacher stress (latent variables) and the single-item stress outcome measure.

### *Instrument*

The 20-item sources of teacher stress inventory (see Appendix) were derived largely from the 51 sources of stress reported in Kyriacou & Sutcliffe (1978a), and covered various aspects of the teacher's work environment. On the basis of a pilot study of the form, language and content of the questionnaire, items were modified where appropriate for use in the Maltese primary school context, and some new items were written to measure specific aspects of Maltese schooling such as streaming and examinations (see Borg *et al.*, 1991). The instrument had high face validity and all items were scored directly, thereby avoiding the potential problems associated with reverse-worded items (cf. Boyle, 1979). Each item was rated in terms of teachers' responses to the question 'As a teacher, how great a source of stress are these factors to you?' All responses were scored on a five-point Likert-type ordinal scale, with response options ranging from 'No stress', 'Mild stress', 'Moderate stress', 'Much stress', to 'Extreme stress' (with corresponding scores being 0, 1, 2, 3, and 4, respectively).

The overall self-rating of stress (provided separately as part of the general and demographic information as requested at the beginning of the inventory) served as a pseudo-latent variable, being measured by a single variable. The specific question asked, 'In general, how stressful do you find being a teacher?', was scored on the following five-point scale (from zero through to 4, respectively): 'Not at all stressful', 'Mildly stressful', 'Moderately stressful', 'Very stressful', and 'Extremely stressful'. Perusal of the mean scores and associated standard deviations for each item, as well as for the pseudo-latent stress variable, revealed no discernible floor or ceiling effects (cf. Fernandez, Nygren & Thorn, 1991).

## **Results and discussion**

### *Measurement model of teacher stress: exploratory factor analysis (EFA)*

With 335 subjects in Sample 1, there were approximately 18 subjects per variable which more than satisfied the generally accepted minimum requirement of 10 subjects per variable for conducting a valid EFA. Previously, Borg *et al.* (1991) had extracted four principal components, with a varimax rotation on the complete sample of 710 teachers. In the present study, the intercorrelation matrix for all 20 teacher stress inventory items served as the starting point for an SPSS iterative maximum-likelihood factor analysis with an oblique (direct oblimin) rotation, yielding a five-factor simple-structure solution. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.865, while the Bartlett test of sphericity was 2183.396 ( $p<.000001$ ), indicating that the data were suitable for factor analysis.

The original four factors as suggested by Borg *et al.*, as well as an additional factor representing Workload, were obtained (Cooper & Kelly, 1993, had previously provided evidence that both workload and poor colleague relations contribute to occupational

stress in schools). The difference between the maximum-likelihood chi-square for the four-factor and five-factor solutions was significant ( $\chi^2=91.97$ ; d.f.=16;  $p<.05$ ). Both the Kaiser-Guttman (K-G) eigenvalues greater than unity rule and the scree test (Cattell, 1978) confirmed that five factors should be extracted. The K-G criterion underestimates the appropriate number of factors when there are fewer than about 20 variables in the analysis, and seriously overestimates the number of factors when there are more than 40 to 50 variables (Hakstian, Rogers & Cattell, 1982). With 20 variables in the analysis, the K-G should provide a relatively accurate indication of the number of factors. Consequently, the evidence for at least five separate factors is overwhelming. The five-factor solution gave a  $\pm 10$  hyperplane count of 52 per cent (cf. Gorsuch, 1983), suggesting greater simple structure and conceptual improvement over the earlier four-factor solution. Since the five factors exhibited sizeable intercorrelations (median  $r=.31$ ), the orthogonal four-factor solution necessarily failed to achieve maximum simple structure (cf. McDonald, 1985).

The EFA suggested that four items either had low loadings (less than .30) or had substantial loadings on more than one factor. In order to obtain a simpler solution with factors which had clearer interpretations, these four 'noisy' items were removed and the intercorrelations of the remaining 16 items were again subjected to EFA. The factor pattern solution obtained from this reduced item pool yielded the same five teacher stress factors; however, all factor loadings were greater than .30 and no items had substantial loadings on more than one factor.

The five factors together accounted for approximately 65 per cent of the variance. Factor 1 (*Workload*) accounted for 32.1 per cent of the variance and included items suggesting too much work (including lesson preparation and marking), too much responsibility for pupils, and inadequate rest periods. Factor 2 (11.2 per cent of variance) loaded on items related to *Professional Recognition Needs*, including items pertaining to poor career structure, insufficient salary, and inadequate recognition for teaching competency. Factor 3 (7.7 per cent of the variance) loaded on items concerning *Student Misbehaviour*, noisy difficult pupils, lack of class discipline, pupil impoliteness/poor attitudes, and problems in managing additional children. Factor 4 (7.2 per cent of the variance) loaded on items indicating *Time/Resource Difficulties*. This factor highlighted the problems of inadequate equipment and facilities, ill-defined syllabi, insufficient time available for individual tuition, and large class size. The fifth factor (6.3 per cent of the variance) concerned *Poor Colleague Relations*, loading on items involving pressures from educational authorities, pressures from parents, and attitudes of other teachers.

Exploratory analyses alone tend to result in theory conflation, in contrast to hypothesis-testing CFA and SEM approaches. According to Cuttance & Ecob (1987, p. 243), 'MacCallum (1985) investigated the process of the exploratory fitting of models in simulated data ... for which the true model was known. He found that only about half of the exploratory searches located the true model... . He obtained this limited rate of success for such models in samples of 300 observations ... his success rate in smaller samples ( $N=100$ ) was zero'. Since the accuracy of exploratory analyses is extremely sensitive to sample size, only the corresponding EFA results for the total sample ( $N=710$ ) are presented in Table 1. The resulting factor-pattern correlations are shown in Table 2.

**Table 1.** Oblique five-factor pattern solution ( $N=710$ )

Item No.	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	$h^2$
Q9	<b>.99</b>	-.15	.06	.05	.00	.99
Q4	<b>.34</b>	.17	.03	-.14	.07	.30
Q5	.07	<b>.72</b>	-.01	-.04	-.02	.57
Q2	.12	<b>.63</b>	.02	-.03	.03	.49
Q18	-.04	<b>.49</b>	-.03	-.04	<b>.32</b>	.43
Q11	.17	<b>.48</b>	-.05	.09	.15	.36
Q10	.28	<b>.30</b>	.08	-.21	.08	.43
Q20	-.04	<b>.29</b>	.10	-.16	.22	.26
Q1	.01	-.04	<b>.85</b>	.09	.00	.68
Q8	.09	-.09	<b>-.68</b>	-.07	.00	.52
Q3	.05	.16	<b>.35</b>	-.11	.21	.34
Q6	.19	.16	.20	-.07	-.04	.17
Q15	.08	.06	-.02	<b>-.67</b>	.00	.51
Q16	.06	-.09	.23	<b>-.59</b>	.06	.52
Q14	.04	.12	.05	<b>.63</b>	-.08	.48
Q7	.08	<b>.38</b>	.01	<b>-.38</b>	-.07	.40
Q12	.15	-.02	.08	-.24	.23	.24
Q19	.18	.05	-.05	.06	<b>.63</b>	.48
Q17	-.03	-.03	.10	-.04	<b>.51</b>	.29
Q13	.10	.13	-.01	-.23	<b>.43</b>	.44
Eigenvalue	5.79	2.02	1.26	1.21	1.02	
$\pm 10$ Hyperplane						
Count:	10	8	15	10	11 Tot. $\pm 10=54\%$	
% Variance:	29.0	10.1	6.3	6.0	5.1 Tot. Var.=57%	

Notes: Factor loadings are shown to two decimal places only. Non-trivial loadings are highlighted. The factors represent: 1. Workload; 2. Student Misbehaviour; 3. Professional Recognition Needs; 4. Time/Resource Difficulties; 5. Poor Colleague Relations.

**Table 2.** Factor pattern intercorrelations

Factor No.	1	2	3	4
1				
2	.33			
3	.28	.06		
4	-.38	-.28	-.28	
5	.27	.32	.18	-.32

Note: Correlation coefficients are shown to two decimal places only.

Further exploratory analysis was carried out using a maximum-likelihood estimation procedure within LISREL-7 (Jöreskog & Sörbom, 1989). LISREL provides both whole model as well as individual item tests of significance. In addition, diagnostic information such as the modification index (MI) suggests where additional parameters could be freed to improve the fit of the model. When the measurement model obtained from the EFA was initially fitted to the validation sample, all of the proposed loadings were significant; however, several modification indices were quite large indicating items which tended to have double loadings. Since such double loadings would result in factors with unclear interpretations, these items were sequentially removed. That is, the item with the highest modification index was removed and the model re-estimated. This process resulted in two additional variables being deleted from the final measurement model of teacher stress. The fit statistics obtained from this model suggested that the simple five-factor solution provided a very adequate representation of the data. The  $\chi^2$  obtained was 156.94 with 70 d.f.; the adjusted goodness of fit index (AGFI) was .906; and the root mean square residual (RMR) was .053. The AGFI provides a sample-size free assessment of fit and values greater than .90 suggest adequate fit without over-fitting of the model (Cuttance & Ecob, 1987). The RMR is a measure of the average difference between the input correlation matrix and the matrix reproduced by the estimated model. Very small values mean there is little difference between the observed and predicted correlations. Thus, the original five-factor solution was retained with the factors now exhibiting more clear-cut, unambiguous interpretations.

*Measurement model of teacher stress: confirmatory factor analysis (CFA)*

The five-factor measurement model of the direct sources of teacher stress was then tested for its goodness-of-fit using a maximum-likelihood CFA on the cross-validated holdout sample of 375 subjects (cf. Byrne, 1989). Since 'noisy' variables had been deleted, the CFA was carried out using LISREL-7 on the product-moment intercorrelations for the reduced set of 16 variables. The goodness-of-fit statistics provided evidence that the hypothesised model was stable, suggesting good support for all five factors. The  $\chi^2$  was 171.14 with 70 d.f.; the AGFI was .911; and the RMR was .057. There were a few large modification indices in the matrix of factor loadings suggesting some tendency for variables to crossload. However, it is generally the case that when the hypothesised model is fitted to a second sample, the fit will not be as good with the original sample. Since the overall pattern of the model was confirmed, that is, all individual parameters were significant and in the expected direction, it was decided not to conduct further exploratory factor analysis by removing further items with large modification indices. The standardised LISREL estimates resulting from the CFA are presented in Table 3, while the associated covariances (phi matrix) for the five factors are shown in Table 4.

**Table 3.** Confirmatory factor analysis ( $N=375$ )

	Standardised LISREL Estimates (ML)					
	Factor No.					
Latent Trait	$\xi^1$	$\xi^2$	$\xi^3$	$\xi^4$	$\xi^5$	$R^2$
Workload ( $\xi_1$ )						
Q9	.642					.42
Q4	.642					.40



<i>Student Misbehaviour (<math>\xi_2</math>)</i>		
Q5	.718	.52
Q2	.641	.41
Q18	.604	.37
Q11	.611	.37
Q20	.418	.18
<i>Professional Recognition Needs (<math>\xi_3</math>)</i>		
Q1	.771	.59
Q8	.771	.60
<i>Time/Resource Difficulties (<math>\xi_4</math>)</i>		
Q14	.646	.44
Q15	.646	.40
<i>Poor Colleague Relations (<math>\xi_5</math>)</i>		
Q19	.592	.35
Q17	.474	.22
Q13	.679	.46

Notes: GFI=0.941; AGFI=0.911; RMR=0.057

Community estimates are shown to two decimal places only; factor loadings are shown to three decimal places only.

Perusal of communality estimates indicates that Items 17 and 20 account for the least amount of common factor variance.

All Lambda-X factor loadings are statistically significant ( $p < .01$  or better) using two-tailed tests.

**Table 4.** Covariances between exogenous latent traits (phi matrix)

Latent Trait	$\xi_1$	$\xi_2$	$\xi_3$	$\xi_4$	$\xi_5$
Workload ( $\xi_1$ )					
Student Misbehaviour ( $\xi_2$ )	.515				
Professional Recognition Needs ( $\xi_3$ )	.436	-.001			
Time/Resource Difficulties ( $\xi_4$ )	.792	.411	.396		
Poor Colleague Relations ( $\xi_5$ )	.565	.687	.262	.734	

Notes: Covariances are shown to three decimal places only.

#### *Structural models of the sources of teacher stress*

The relationship of the five 'causal' factors with the single-item self-rating measure of teacher stress were then examined. The proposed structural models of the sources of teacher stress incorporate all of the LISREL submodels (see Bollen, 1989). That is, there are

separate measurement models for the endogenous and exogenous latent variables, a structural equation model relating the exogenous latent variables to the major endogenous variable (Stress), and for two proposed models, structural parameters linking two endogenous variables (Poor Colleague Relations and Stress). The factors included in the present model are all true latent variables, with each factor loading on a number of observed variables, whereas the overall self-rating of teacher stress is a pseudo-latent variable with its Lambda-Y fixed at one and its error term set to zero (see Instrument section above). The present models are estimated on the basis of the 21 x 21 matrix of product-moment intercorrelations (including those for the pseudo-latent Stress variable) for both samples combined ( $N=710$ ). The goodness-of-fit indices obtained using the full sample for the various models are presented in Table 5. Also included for comparative purposes are the fit indices for the models when evaluated on the exploratory and validation samples.

**Table 5.** Comparison of fit indices

<i>Exploratory sample (N=335)</i>							
<u>Model</u>	<u><math>\chi^2</math></u>	<u>d.f.</u>	<u>AGFI</u>	<u>RMR</u>	<u><math>\chi^2</math> Change (d.f.)</u>	<u>FI<sup>a</sup></u>	<u>FI<sup>b</sup></u>
True null	1474	105	.402	.262			
Structural null	619	97	.701	.209	855 (8) <sup>c</sup>	.88	
Non-recursive	180	79	.900	.052	439 (18)	.88	.71
Mediated	203	80	.890	.061	416 (17)	.86	.67
Regression	180	79	.906	.053	439 (18)	.88	.71
<i>Validation sample (N=375)</i>							
<u>Model</u>	<u><math>\chi^2</math></u>	<u>d.f.</u>	<u>AGFI</u>	<u>RMR</u>	<u><math>\chi^2</math> Change (d.f.)</u>	<u>FI<sup>a</sup></u>	<u>FI<sup>b</sup></u>
True null	1501	105	.445	.243			
Structural null	646	97	.728	.193	855 (8)	.57	
Regression	183	79	.911	.057	463 (18)	.88	.72
<i>Total sample (N=710)</i>							
<u>Model</u>	<u><math>\chi^2</math></u>	<u>d.f.</u>	<u>AGFI</u>	<u>RMR</u>	<u><math>\chi^2</math> Change (d.f.)</u>	<u>FI<sup>a</sup></u>	<u>FI<sup>b</sup></u>
True null	2733	105	.430	.250			
Structural null	1167	97	.728	.198	1566 (8)	.59	
Non-recursive	286	80	.911	.065	881 (17)	.90	.75
Regression	286	79	.925	.047	881 (18)	.90	.75

*Notes:* AGFI and RMR estimates are shown to three decimal places only; FI indices are shown to two decimal places only.

<sup>a</sup>Based on true null model.

<sup>b</sup>Based on structural null model.

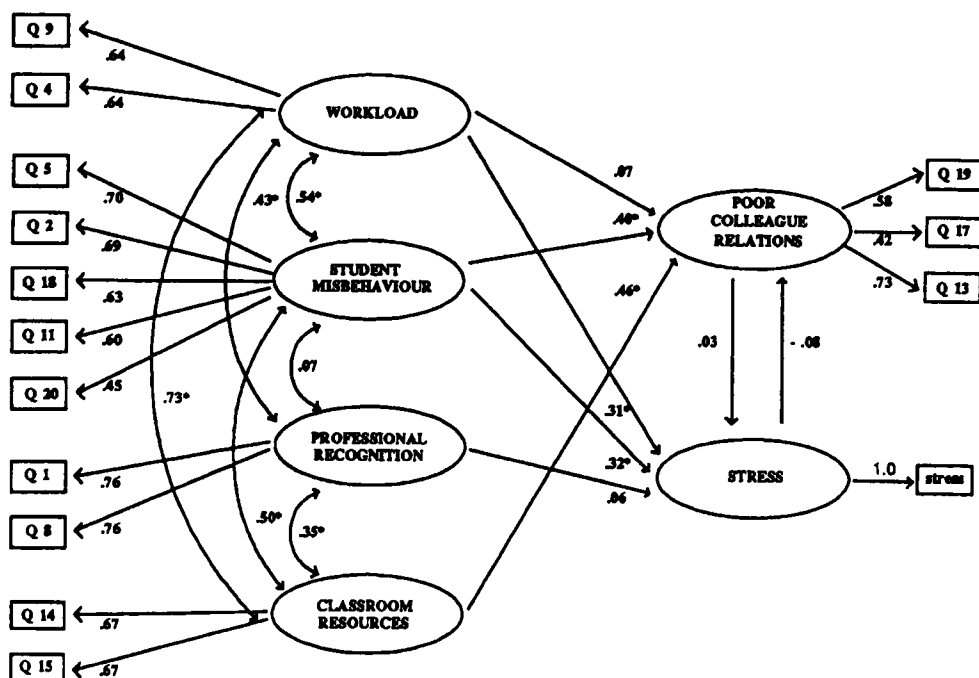
<sup>c</sup>All  $\chi^2$  changes are significant ( $p < .01$  or better).

The sources of teacher stress literature (e.g., Borg *et al.*, 1991; Kyriacou & Sutcliffe, 1978b; Okebukola & Jegede, 1989; Smith & Bourke, 1992; Tellenback *et al.*, 1983) suggest that the primary structure of interest is a non-recursive model in which there is a reciprocal influence between the amount of stress experienced by a teacher and the quality of the relationships a teacher has with colleagues. It is also expected that the amount of student misbehaviour, the level of resources available, the degree of professional recognition received, and the teacher's workload will influence both interpersonal relationships as well as the level of reported stress (cf. Cooper & Kelly, 1993). LISREL 7 (Jöreskog & Sörbom, 1989) was used to estimate the parameters for this model as well as several alternative models (we have incorporated the true null model as well as the structural null model into the model fitting process).

The first line in Table 5 presents the chi-square and degrees of freedom for the *true null model* which tests the hypothesis that there are no significant covariances among any of the variables for the exploratory sample. The AGFI is .402 and the RMR is .262 which, as expected, clearly indicate rejection of this model. However, given that there are several latent variables present in the data, this true null model is actually a 'straw man' (see Sobel & Bohrnstedt, 1985, who suggested that a *structural null model* should be used). Thus, line two of Table 5 provides fit information for a structural null model. This model includes the measurement models for the five latent variables as well as the pseudo-latent outcome variable Stress. However, there are no structural or correlational parameters connecting any of these variables. From the change in chi-square and degrees of freedom, it is clear that the structural null model represents an improvement over the true null model. However, the Bentler (1990) fit indices (FI) suggest that there is room for further improvement in the model. All subsequent nested models are tested against this structural null model.

The model of principal interest in the present study is the *non-recursive model* presented in line three of Table 5, for the total sample. We recognise the cross-sectional nature of the data, but tested a reciprocal model for its theoretical contribution. Had the non-recursive model been supported in the present study, future longitudinal studies would be necessary to validate it. The non-recursive model contains reciprocal direct effects for the variables representing Stress and Poor Colleague Relations. In this model (Figure 1), all of the exogenous variables are significantly correlated ( $p < .01$  or better).<sup>1</sup> The estimated paths from Student Misbehaviour, and Time/Resource Difficulties to Poor Colleague Relations are significant but neither of the paths to Poor Colleague Relations from Workload nor Professional Recognition is significant (for purposes of model identification the path from Professional Recognition to Poor Colleague Relations and the path from Time/Resource Difficulties to Stress were fixed at zero and not estimated). The estimated paths from both Workload, and Student Misbehaviour to Stress are significant. However, none of the remaining exogenous variables operates as significant predictors. Moreover, there are no significant relationships between Poor Colleague Relations and Stress, in either direction of influence. The change in chi-square relative to the change in degrees of freedom suggests that this model represents a significant improvement over the structural null model. However, this model contains several non-significant parameters including the paths estimating the reciprocal effects of Poor Colleague Relations and Stress as well as the effects of Workload on Poor Colleague Relations, and Professional Recognition on Stress. Thus, the hypothesised reciprocal effect between Stress and Poor Colleague Relations is not supported, and on the basis of these results Poor Colleague Relations does not appear to function as a mediating variable.

Figure 1. Non-recursive model



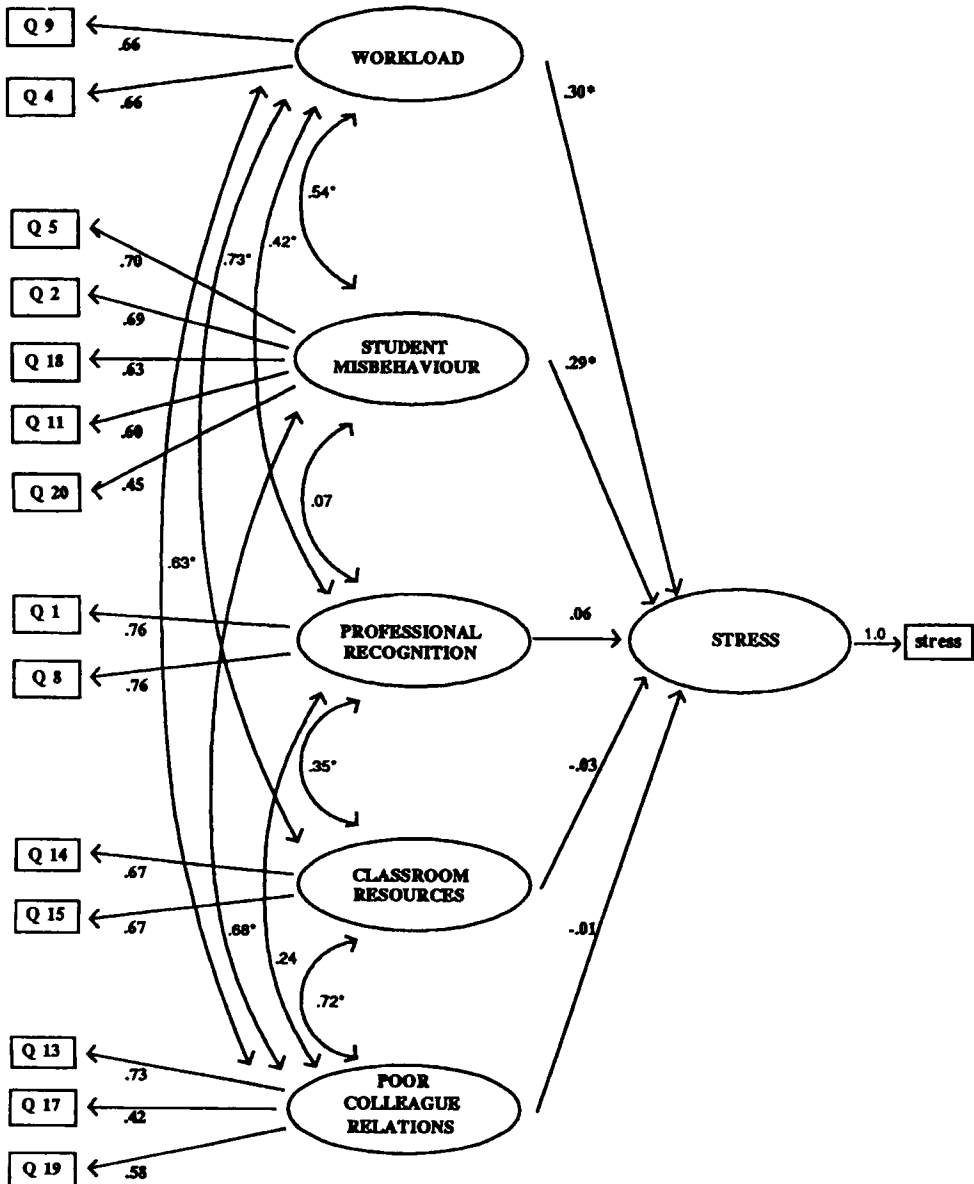
To explore further the relationships among the latent variables, it was decided to examine the significance of the structural parameters for a *mediated model* (not shown). In this model, all parameters linking the four exogenous variables (Student Misbehaviour, Time/Resource Difficulties, Workload, and Professional Recognition) and the two endogenous variables (Poor Colleague Relations and Stress) were estimated. Additionally, the direct effect of Poor Colleague Relations on Stress was estimated. From the results obtained (using the data from the exploratory sample), Poor Colleague Relations does not function as a mediating variable. The standardised regression coefficient (.04) is not significant. Indeed, perusal of the various path coefficients suggests that Poor Colleague Relations itself is a direct function of Workload, Student Misbehaviour, Professional Recognition Needs, and Time/Resource Difficulties. Thus, Poor Colleague Relations appears to co-vary with each of the other latent variables, and is more a result of the operation of these variables, rather than being a direct source of teacher stress, per se.

The fit indicators for this mediated model are presented in line four of Table 5, for the exploratory sample only. As this model provided an inadequate fit to the data, structural parameter estimates were not calculated on the data for the validation and combined samples. Again, as compared with the structural null model, the change in chi-square relative to the change in degrees of freedom indicates a significant increase in fit, although again, the omnibus goodness of fit indices do not suggest an optimal fit, and again, there are several non-significant parameters. As compared with the non-recursive (reciprocal) model, the

AGFI is less adequate (.890 versus .900), and the RMR is not as good (.061 versus .052). Consequently, the mediated model provides a poorer fit to the data than does the non-recursive model.

Since the standardised regression estimates between the two endogenous variables are negligible, a simpler structural model would seem appropriate. Accordingly, the final model presented in Table 5 is essentially a simple *regression model* with Stress being regressed on

Figure 2. Regression model



the five sources of teacher stress factors. This simpler model tests the hypothesis that there are multiple sources of teacher stress and that these sources are correlated. It is more parsimonious than the non-recursive models and, due to the significant correlations between Poor Colleague Relations and the other exogenous variables, it yields better omnibus fit indicators. From Figure 2, it is evident that Workload and Student Misbehaviour are the two major contributors to teacher stress. This model does not reveal any significant relationship between Poor Colleague Relations and Stress. Nor does the model indicate significant relationships between Professional Recognition and Stress, or between Time/Resource Difficulties and Stress. Yet, invoking the principle of parsimony, this model is slightly more acceptable as it provides the same degree of fit as does the more complex non-recursive model.<sup>2</sup> Examination of the standardised residuals confirms that the preponderance of large residuals occurs for those variables loading on separate latent variables. Given that all of the retained structural parameter estimates are significant and that there are no large modification indices for any of the constrained parameters, little further improvement can be obtained by deleting or adding any structural parameters.

### Summary and conclusions

In support of previous studies of teacher stress (e.g., Brenner *et al.*, 1985; Broiles, 1982; Kyriacou & Sutcliffe, 1978a; Laughlin, 1984; Tellenback *et al.*, 1983), the present study attests to the multidimensional nature of the sources of teacher stress construct. In practical terms, if stress management programmes are to be successful in helping teachers cope with the pressures in their work, then such programmes would have to take into account the various factors identified in the present study as contributing to teacher stress. One factor hypothesised to play a mediating role was Poor Colleague Relations, implying that good relationships with one's colleagues is beneficial when a teacher is experiencing stress from other sources (and vice versa). Several investigators (e.g., Dunham, 1980; Fletcher & Payne, 1982; Freeman, 1987; Pierce & Molloy, 1990b) have attested to the importance of social support (from superiors and colleagues and/or from family and friends) as a means of alleviating teacher stress. Others have emphasised the importance of improving the level of social support in schools (e.g., Chakravorty, 1989; Dunham, 1989; Kyriacou, 1981; Otto, 1982). Nevertheless, as shown in the figures above, Poor Colleague Relations not only failed to act as a mediating variable but also failed to emerge as a significant predictor of Stress in its own right. It is instructive that both Workload and Student Misbehaviour were the only latent variables to emerge as significant predictors. Based on this evidence, it is possible that Poor Colleague Relations may be a by-product primarily of Workload and Student Misbehaviour, both of which may be causally antecedent.

Previous studies into the dimensionality of the sources of teacher stress (e.g., Brenner & Bartell, 1984; Brenner *et al.*, 1985; Tellenback *et al.*, 1983) have been carried out with varying degrees of success. However, none of these studies has specifically tested the goodness-of-fit of the presently proposed measurement model. The five-factor model (derived initially from analysis of the exploratory sample of 335 primary teachers) received good support from the confirmatory factor analysis undertaken on the validation sample (comprising 375 teachers). Since the goodness-of-fit indices supported the five-factor measurement model, undertaking the structural modelling analyses on the combined samples was fully justified.

Structural modelling via LISREL supported a simple regression model of the sources of teacher stress. This recursive model provides a satisfactory fit to the empirical data, includes only significant parameters, and is readily interpretable. The possible mediating role of Poor Colleague Relations in producing teacher stress was not significant in the present study. Rather, the present findings suggest that teacher stress is primarily a direct function of Workload and Student Misbehaviour. It is hoped this model will serve as a useful point of departure for future studies into the direct 'causes' of teacher stress.

### Notes

<sup>1</sup>All significant structural model coefficients are shown with an asterisk in all three models.

<sup>2</sup>Although the  $\chi^2/d.f.$  ratio was almost 4, Wheaton (1987) argues against its use as an indicator of fit since it is sample-size dependent. At best, the ratio may provide a measure of efficiency of particular models.

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## Appendix

### Teacher Stress Inventory

As a teacher, how great a source of stress are these factors to you?		0	1	2	3	4
		no stress	mild stress	moderate stress	much stress	extreme stress
1	poor career structure (poor promotion prospects)	none	mild	moderate	much	extreme
2	difficult class	none	mild	moderate	much	extreme
3	lack of recognition for good teaching	none	mild	moderate	much	extreme
4	responsibility for pupils (e.g. exam success)	none	mild	moderate	much	extreme
5	noisy pupils	none	mild	moderate	much	extreme
6	too short rest periods (mid-morning break, mid-day break)	none	mild	moderate	much	extreme
7	pupils' poor attitudes to work	none	mild	moderate	much	extreme
8	inadequate salary	none	mild	moderate	much	extreme
9	too much work to do (e.g. lesson preparation and marking)	none	mild	moderate	much	extreme
10	having a large class (i.e. many pupils)	none	mild	moderate	much	extreme
11	maintaining class discipline	none	mild	moderate	much	extreme
12	administrative work (e.g. filling in forms)	none	mild	moderate	much	extreme
13	pressure from parents	none	mild	moderate	much	extreme
14	ill-defined syllabuses (e.g. not detailed enough)	none	mild	moderate	much	extreme
15	lack of time to spend with individual pupils	none	mild	moderate	much	extreme
16	shortage of equipment and poor facilities	none	mild	moderate	much	extreme
17	attitudes and behaviour of other teachers	none	mild	moderate	much	extreme
18	pupils impolite behaviour or cheek	none	mild	moderate	much	extreme
19	pressure from headteacher and education officers	none	mild	moderate	much	extreme
20	having extra students because of absent teachers	none	mild	moderate	much	extreme

Any final comments? \_\_\_\_\_

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PLEASE CHECK THAT ALL THE QUESTIONS HAVE BEEN ANSWERED.

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.