ARE TEACHERS STRESSED AND SATISFIED?
THE ANALYSIS OF COMPLEX INTERACTION EFFECTS USING TWO-STAGE
LEAST SQUARES REGRESSION ANALYSIS.

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ABSTRACT

Recent studies have indicated that many teachers simultaneously report the experience of work-related stress and reasonably high levels of satisfaction with teaching. This apparently paradoxical relationship between teacher stress and satisfaction is analysed by considering teacher perceived workload and the frequency and intensity of stressful experiences as variables operating in association with perceived stress and satisfaction to produce complex causal relationships.

Data on perceived teacher stress and satisfaction collected from 182 Hunter Region secondary classroom teachers were used to test a non-recursive causal model involving teacher work-related stress and satisfaction. Two-stage least squares regression analyses was used to test for the existence of bi-directional relationships between these variables. When the purpose of research is explanation, this limited information technique is shown to be a useful guide to aid understanding of complex interaction effects between such variables as stress, workload and satisfaction.

INTRODUCTION

Teacher satisfaction has been conceptualised as the perceived value placed on the intrinsic rewards (for example, satisfaction derived from successful instruction or from social contact) and the extrinsic rewards (for example, that associated with salary levels or leave entitlements) arising out of teaching (Fraser, 1983, p.24). On the other hand, teacher stress can be considered as a state of `negative affect' which arises when the demands of teaching exceed the teacher's coping capacity (Kyriacou, 1989, p.27). Teacher work-related stress has been associated with such factors as poorly motivated and undisciplined students, poor working conditions, time pressure, low status and conflict within the workplace (Kyriacou, 1989, p.31).

The Relationship between Stress and Satisfaction

The working life of the classroom teacher incorporates a diverse array of factors which have been identified as potential sources of stress and satisfaction (Smith & Bourke, 1992). The indication from research is that satisfaction and stress arise from different but related aspects of the work environment (e.g. Smith & Bourke, 1992; Farrugia, 1986; Mykletun, 1985). Kyriacou (1987, p.148) notes in an international review of literature on teacher stress that the negative correlation found between levels of stress and satisfaction is generally moderate in size. This suggests that while the majority of teachers find their work stressful to some degree, many of them also find their work rewarding and even pleasurable.

Mykletun (1985), in an examination of work stress and satisfaction amongst Scandinavian comprehensive school teachers, investigated this proposition in detail. Over 80 per cent of the 73 respondents in this study reported negative emotional states such as anger and irritation (96 per cent), helplessness, difficulty in relaxation and fear of failure, all of which are known to be associated with stress (Mykletun, 1985, pp.62-64). However, the teachers also reported the experience of work-related pleasure and satisfaction (97 per cent), and at higher levels of intensity and frequency than those reported for the negative feeling states.

In analysing these relationships Mykletun made the important distinction between the intensity (or strength) of feeling states and their frequency of occurrence. In terms of intensity, the correlation between the experience of high intensity of work-related pleasure and the intensity of negative emotions, such as anger, helplessness and failure, was found to be positive and significant ($r=0.30$ approximately). In terms of frequency, the indications were that teachers who experienced high levels of work-related pleasure also reported high frequencies in feelings of helplessness, but the lowest frequencies of problems in relaxing from work ($r=-0.27$).

These findings demonstrate that the relationship between stress and

satisfaction is complex. While some teachers report the simultaneous
experience of stress and pleasurable work-related experiences, other
teachers who report difficulty in relaxing from work appear to relate
stress and satisfaction in a negative way. One possible explanation is
that individual teachers have different types of stress responses depending
on the duration and intensity of their exposure to stressors in the
workplace. Grosser (1985, pp.5-8) describes the General Adaptation
Syndrome, a theory arising from the work of the stress researcher Hans
Selye. According to this theory, exposure to a stressor can produce three
different `stages' of psychological and physiological reaction. The
initial reaction is that of `alarm' as a response to threat arising from
stressors in the workplace. With longer exposure to the stressor the
second stage of adaptation, `the stage of resistance' will be reached with
an associated levelling out in the intensity of the response. However, if
the stressor is severe and/or the exposure prolonged, the `stage of
exhaustion' may be reached with an associated drop in resistance to the
stressor. Fatigue, anxiety, tenseness and irritability are characteristic
of teachers at this stage of the reaction.

The stress response is complicated because not all individuals react to a
stressor in the same way. There are a range of `conditioning factors' and
interacting variables which could account for this fact. Variation in the
duration of exposure to stressful experiences, previous stressful
experiences, the general health status, the effectiveness of personal
coping mechanisms, perceived and actual work demands, motivational factors
and home life could explain individual variations in the response to a
particular stressor.

The current paper examines observed variations in the relationship between
perceived levels of stress and satisfaction in relation to the teacher's
ability to make adaptive responses to stress. Two-Stage Least Squares
Regression analysis (2SLS) was used as a means of analysis. The frequency
and intensity of stressful experiences and perceived levels of work demand
were considered as potential factors influencing this relationship.

                    THE VARIABLES USED IN THE ANALYSIS

Data relating to perceived levels of stress, workload and satisfaction were
collected from 182 secondary classroom teachers in six Hunter Region
secondary schools during Term 2 1989. Teachers indicated their work-
related experiences of stress, satisfaction and workload on self-report
questionnaires comprising 118 items in total. Responses to these items
were coded on a four point likert scale ranging from 1, indicating low
levels of stress, workload and satisfaction, to 4, indicating high levels
of stress, workload and satisfaction. Table 1 reports summary statistics
for these variables.

The original analysis (Smith, 1990) factorised these data into four

dimensions of perceived stress, three dimensions of satisfaction and four dimensions of workload. However, in order to simplify the network of causal relationships revealed in the original analysis, the current exploratory analysis incorporates these dimensions into three composite measures representing overall experiences of stress, satisfaction and workload.

Two factors relating to school-wide administrative responsibilities, the satisfaction with administration and senior staff and the workload arising from school-wide administrative responsibilities, were found to produce confounding influences on their respective composite variables. This problem was overcome by considering only those teachers from the original sample of 199 teachers who taught in excess of 9 hours (approximately 14 forty-minute periods) in a week. This condition omitted 17 school-based administrators and casual teachers on minimal loads from the analysis, focussing attention on the conditions faced by classroom teachers and precluding the particular conditions faced by teachers with high administrative loads. The analyses reported here were completed on 182 teachers.

TABLE 1.MEANS, STANDARD DEVIATIONS AND CORRELATIONS:
        TEACHER STRESS, SATISFACTION AND WORKLOAD (N=182)

VARIABLES	STRESS	SATISFACTION	WORKLOAD
MEAN	2.32	2.20	2.46
S.D.	0.48	0.48	0.55
Correlations			
STRESS	.	-.45	.60
SATISFACTION	.	.	-.29

The general concept of stress used in this paper incorporates stress arising from students and physical conditions, stress arising from lack of rewards and recognition, stress arising from time pressure, and stress arising from inter-personal and role related conflicts. The overall level of stress was 2.3 (S.D.=0.48) which indicates teachers, on average, experience moderate degrees of stress. The general concept of satisfaction used in this paper incorporates the satisfaction associated with the teacher's workload and conditions and the satisfaction arising from the teacher's relationships with students. Overall teacher satisfaction had a mean of 2.2 (S.D.=0.48) indicating that on average teachers experienced `a little' satisfaction. Teacher workload consisted of the workload associated with the demands of face-to-face teaching, resource preparation and assessment. Overall workload had a mean of 2.5 (S.D.=0.55) which indicates that teachers in general find their class-based duties midway

between `slightly' and `quite demanding'.

Background Variables

Background variables considered in the study included teacher demographic
characteristics, teacher timetable allocation and school. Teacher
background variables included sex and the number of years of teaching
experience. Teacher timetable allocation variables included the year
distribution of the periods taught, periods per week spent with
academically streamed classes, periods per week spent with composite
classes, and the teacher's main teaching subject.

Year Distribution was a composite variable computed by weighting the number
of periods spent with each year level by a factor representing the
correlation between the respective year groups and teacher stress. As
such, this variable represents the effect of teaching allocations
containing greater numbers of periods spent with more stressful year
groups. Years 7 and 12 were more stressful while Year 11 was less
stressful than other year levels.
Teaching Subject Area was computed in a similar way to represent the effect
of teaching in more stressful subject areas. The more stressful subjects
were English, History, Languages and the Social Sciences. The less
stressful subjects were Mathematics and Science. The use of variables such
as Year Distribution and Subject Area provides a means of controlling for
the effect of these variables in the regression analyses without involving
large numbers of dummy variables with their potentially confounding
influences on the model (Smith, 1990, 79-85). Descriptive statistics are
displayed for the background variables in Table 2.

TABLE 2.DESCRIPTIVE STATISTICS: BACKGROUND VARIABLES a (N=182)

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INDEPENDENT VARIABLES	MEAN	S.D.
SEX (M=1, F=2)	1.40	0.51
YEARS OF TEACHING	16.41	7.12
YEAR DISTRIBUTION	4.54	3.87
COMPOSITE PERIODS b	1.08	1.64
STREAMED PERIODS	12.27	9.53
SUBJECT AREA	0.02	0.13
SCHOOL SIZE	59.71	10.09

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a.   These variables were converted into Z-Scores for use throughout the
     regression analyses.
b.   Only 41 of the teachers in the sample taught any composite classes.

DEVELOPING A MODEL FOR ANALYSIS

The initial model was of a typical recursive type (see Figure 1, appended to this paper).   The pattern of causation in this model is hierarchical: teacher background, school background and timetable allocation variables have a potential influences on all subsequent variables, teacher workload has the potential to influence teacher satisfaction and teacher stress, and in turn, teacher satisfaction has a potential influence over teacher stress. Teacher stress is consequent to all other variables and can not influence them in any way. This model was analysed using OLS regression to create estimates for comparison purposes.

Within such a model the pattern of causation is central to this analysis and it must be specified on the basis of theory, past research and commonsense arguments. The results for such an analysis are displayed in Table 3 and in Figure 2 (appended).

These findings indicate that perceived levels of workload are significantly higher amongst female teachers (beta=0.16), for teachers with greater numbers of academically streamed classes (beta=0.15), and for teachers in the subject areas of English, History and the Social Sciences (beta=0.29). Teacher satisfaction was shown to diminish for teachers with higher perceived workloads (beta=-0.26) and for those teaching greater numbers of academically streamed classes (beta=-14). The outcome variable, Teacher Stress, is shown to be higher for teachers with greater numbers of composite classes (beta=0.24), for teachers in larger schools (beta=0.12), for those teachers with higher levels of perceived workload (beta=0.52), and for those experiencing lower levels of satisfaction (beta=-.29).

The results relating to stress and satisfaction were consistent with those established in earlier research; work satisfaction has a moderate, negative correlation with teacher stress (Smith & Bourke, 1992).

TABLE 3.PATH COEFFICIENTS FROM OLS REGRESSION OUTCOME VARIABLE:
        TEACHER STRESS abc (N=182, Multiple R=0.70)

INDEPENDENT VARIABLES	TEACHER WORKLOAD	TEACHER SATISF.	TEACHER STRESS
SEX	16	.	.
YEARS OF TEACHING	.	.	.
YEAR DISTRIBUTION	.	.	.
COMPOSITE PERIODS	.	.	24
STREAMED PERIODS	15	-14	.
SUBJECT AREA d	29	.	.
SCHOOL SIZE	.	.	12

WORKLOAD	na	-26	52
SATISFACTION	na	na	-29

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a.   All coefficients multiplied by 100.
b.   Only paths significant at 0.05 confidence level are shown.
c.   "na" indicates path not applicable due to the hypothesised causal
     order. A dot indicates a path not significant at the 0.05 level.
d.   The positive coefficient indicates that teachers of Humanities and
     Social Science subjects perceived their workloads to be higher than
     Mathematics and Science teachers.

An Alternative Form of the Model

The findings of Mykletun (1985) suggest that the relationship between
stress and satisfaction may not be consistent but moderated by a third
variable producing an interaction effect of the type discussed by Jaccard,
Turrisi & Wan (1990). This could occur as a result of the moderating
influence on the stress/satisfaction relationship produced by teacher
perceived workload. When the level of perceived workload is minimal it is
posited that satisfaction mitigates stress, but when perceived workload is
high the experience of satisfaction does little to moderate stress.

Product term analysis was used to test for the significance of this effect
(Jaccard et al, 1990, p.20-22). The product term between workload and
satisfaction did not result in a significant increase in the varianve
explained (increase in R-Squared=0.003) indicating that Workload did not
moderate the relationship between Stress and Satisfaction.
A Non-recursive Form of the Model

Having eliminated this possible source of interaction, the decision was
made to examine a non-recursive form of the model. Recursive models
require a hierarchical ordering of variables thus precluding any reciprocal
relationship between the endogenous variables. Berry (1985) cautions that
this assumption is often unrealistic when dealing with many social science
contexts and that the decision to use a recursive model should not be taken
lightly or for convenience.

In the context of the current study, if teachers' feelings of satisfaction
serve to mitigate their perceptions of stress in the work place but, at the
same time, their experience of stress diminishes their feelings of
satisfaction, the model is no longer recursive. It is also feasible to
consider a bi-directional relationships between perceived workload and
stress. This relationship posits that higher levels of perceived workload,
adding to the experience of quantitative and qualitative over-demand, add
to the experience of stress. On the other hand, stress is known to draw on
the coping resources of teachers, eventually leading to fatigue, excess
time pressure, alienation and intolerance, and consequently making work
seem more of an encumbrance. In such a situation OLS regression would
produce inaccurate estimates which would be both biased and inconsistent.

For the purpose of this analysis, the relationship between Workload and
Satisfaction is considered to be uni-directional. The anticipation of
success associated with teaching could affect teachers' perceptions of
workload, and consequently in turn influence their Satisfaction. However,
Satisfaction is not considered to directly influence perceptions of
Workload. The construct used in the study to represent satisfaction
concerned the satisfaction with relationships with students and
satisfaction with rewards and conditions of work and was thus not directly
related to the experience of work demand. However, the model allows for
Satisfaction to influence perceived workload indirectly through the
experience of stress. For example, if satisfaction with rewards and
conditions is low, teachers may feel a lack recognition for the value of
their work. Such a response has been shown to increase stress (Smith &
Bourke, 1992) which will in turn tend to perceptions of increased Workload.

TWO-STAGE LEAST SQUARES ANALYSIS

Two-stage least squares (2SLS) regression is a limited information
technique suitable for analysing non-recursive models. After testing to
ensure identification of the structural equations using the most helpful
matrix transformation algorithm described by Berry (1985, pp.39-53), a two-
stage regression process was used to estimate the parameters of the
structural equations. The previous work of Smith (1990) was used to aid in
the identification process by indicating the exogenous variables
appropriate for use in each regression model.

First-Stage Regression Analysis

In the first-stage regression analysis, endogenous variables in the model
are regressed on all exogenous variables in the model. The predicted
values for the endogenous variables were saved for use in the second stage
of the regression. The instrumental variables have two important
characteristics which make the second-stage regression possible (Berry,
1985, p.66). Firstly, they are the most similar variables to the original
exogenous which can be created using OLS regression. Secondly, if the
assumption that the exogenous variables are unrelated to the error term is
true, the instrumental variables must be unrelated to the error term.

The correlations between the instrumental variables and the respective
observed variables were r=0.65 for both Stress and Satisfaction, and r=0.73
between the Workload variable. Z-Scores were computed for all variables
used in the regression analysis to avoid the problem of attenuation of beta
estimates for the exogenous variables in the second-stage regression
(Berry, 1985, p.68).

Second-Stage Regression Analysis

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During the second-stage of the regression analysis the instrumental
variables are included in the structural equations in place of any
exogenous variable acting as an explanatory factor in the equation. This
produces 2SLS estimates of the original equations. The results of this
process are displayed in Table 4 and in Figure 3 (appended). The values
for standardised partial slope coefficients (beta coefficients) obtained
through 2SLS have been referred to as beta cap (beta^) values in
recognition that they are estimates of the true structural coefficients.

TABLE 4.2SLS PATH COEFFICIENTS FOR THE NON-RECURSIVE MODEL
       (beta^ values) (N=182) abc

	ENSUING VARIABLES d		
FOREGOING VARIABLES	TEACHER WORKLOAD	TEACHER SATISF.	TEACHER STRESS
	(R=0.67)	(R=0.40)	(R=0.66)

SEX	16	.	.
YEARS OF TEACHING	.	15	11
YEAR DISTRIBUTION	.	.	.
COMPOSITE PERIODS	-23	.	22
STREAMED PERIODS	.	.	.
SUBJECT AREA	.	.	.
SCHOOL SIZE	.	-15	12

WORKLOAD	na	-27 (-29)e	47 (60)e
SATISFACTION	na	na	-32 (-45)e
STRESS	71 (60)e	-35 (-45)e	na

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a.   All coefficients multiplied by 100.
b.   Only paths indicated as significant at 0.05 confidence level based on
     the second-stage regression are shown.
c.   "na" indicates path not applicable due to the hypothesised causal
     order. A dot indicates a path not significant at 0.05 level.
d.   Stress, Satisfaction and Workload act as both foregoing and ensuing
     variables e.g. In the following situations:-
     Satisfaction --> Stress, stress is the ensuing variable,
     Stress --> Satisfaction, stress is the foregoing variable.
e.   Significant bi-serial correlation between the observed variables.
The causal relationships in this model are considerably different to those
displayed by the OLS model. Firstly, the relationships amongst the
background variables and the endogenous variables have altered. Teacher
workload is now shown to be reduced by teaching more composite periods
(beta^=0.15) consistent with the fact that the composite classes involved
in the study were most often in the practical areas requiring less

preparation and marking. Teacher satisfaction was higher amongst more
experienced teachers (beta^=0.15) and lower amongst teachers in larger
schools (beta^=-0.15). Teacher stress was higher for the more experienced
teachers (beta^=0.11), for teachers of the apparently less rewarding
composite classes (beta^=0.22), and for those teaching in larger schools
(beta^=0.12). The changes to the background variables found to be
significant in the 2SLS model can be explained by the inclusion of the
instrumental variables into the structural equations. The relationship
between Workload and Satisfaction (beta^=-0.27) has changed only marginally
from that obtained using OLS regression (beta=-0.26).

Bi-Directional Relationships Within the Model

The interrelationships between the endogenous variables in this model are
worthy of special consideration. Bi-directional relationships exist
between Stress and Satisfaction, and between Stress and Workload.

Stress and Satisfaction. The concomitance between Stress and Satisfaction
is represented diagrammatically in Figure 4 (appended). The structural
equations with Stress and Satisfaction in turn as dependent variables
produce different coefficients. Providing this is not simply the result of
error in estimation (as discussed below), a bi-directional relationship is
suggested. In the first instance the experience of satisfaction is seen to
mitigate the teacher's feelings of stress (beta^1=-0.32). That is, a unit
increase in Satisfaction will result in a 0.32 unit decrease in Stress. In
the converse relationship, the experience of stress diminishes the
teacher's level of satisfaction (beta^2=-0.35). A reduction of 0.35 of a
Satisfaction unit follows a unit increase in stress. However, if the
inter-relationship between Stress and Satisfaction forms a loop, an
increase of one unit in satisfaction will cause a 0.32 reduction in stress,
and in turn, 0.35 of this is feedback to Satisfaction and so on until
products are small enough to be inconsequential (when the loop may be said
to have settled down).

Davis (1985, p.66-67) suggests that if the ultimate causal order can be set
(that is, Stress is truly consequent to Satisfaction), loop theory can be
used to estimate the final effect of the interaction between the variables.

EQUATION 1. COMPUTATION OF THE LOOP EFFECT

        XiXj = beta^1 / 1-(beta^1 x beta^2)
             = -0.32/1-(0.32 x 0.35)
             = -0.36
    Where XiXj is the net effect of satisfaction on stress once the loop
    has settled down.

The net effect of a unit change in Satisfaction according to this formula
is XiXj=-0.36. As a guide to the accuracy of this estimate, this figure
was compared to bi-serial correlation between Stress and Satisfaction of

r=-0.45 and the OLS estimate of beta=-0.29. (Note that any error present
in the beta^ estimates would be compounded in the computation of net
effect).

If the hypothesised causal order were to be reversed, the net effect of a
unit change in Stress on teacher satisfaction outcomes computes to a higher
figure of XjXi=0.40. Rather than causing confusion, this discrepancy
serves to emphasise the necessity to correctly hypothesise the `ultimate
causal order' in the specification of the non-recursive model.

Stress and Workload. Computations relating to the hypothesised influence
of Workload on teacher stress, where the interrelated paths are less
similar (beta^=0.47 for Workload/Stress and beta^=0.71 for Stress/Workload)
yields a net effect of 0.69. This figure may be compared to the bi-serial
correlation of r=0.60 and to the OLS estimate of beta=0.52 to gain some
insight into the appropriateness of this estimate.

According to loop theory, when a model is misspecified by treating a loop
as a one-way interaction, the estimate of the total direct effect will
remain the same but the causal relationship between the variables is not
acknowledged (Davis, 1985, p.67). The non-recursive model offers a
mechanism for understanding the complexity of the interaction of Stress,
Satisfaction and Workload. However, as described in the next section,
difficulty in obtaining accurate estimates must cast doubt on the adequacy
of this technique.

TEACHERS WHO ARE STRESSED AND TEACHERS WHO ARE SATISFIED

Having suggested the basic usefulness of 2SLS regression, the thrust of the
analysis returned to the nature of the interaction between Stress and
Satisfaction. After examination of teacher responses to the questionnaire,
a decision was made to classify teachers according to the intensity of
their feelings along the lines suggested by the findings of Mykletun
(1985). Teachers were classified as having high, moderate or low stress
and high, moderate or low satisfaction. The grouping of teachers into this
somewhat arbitrary classification proved to be useful in examining the
conditions faced by teachers in the workplace (see Table 5).

TABLE 5.NUMBERS OF TEACHERS CLASSIFIED ON STRESS AND
        SATISFACTION (N=182)
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STRESS	LOW SATISF'N	MODERATE SATISF'N	HIGH SATISF'N
LOW STRESS	10 ls	26 ls	26 ls

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MODERATE STRESS        20 ar          22 ss          19 ss

HIGH STRESS            35 ar          14 ss          10 ss
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ls   Teachers experiencing low stress (n=62)
ss   Teachers experiencing Stress and Satisfaction (n=65)
ar   Teachers at risk from Stress and low Satisfaction (n=55)
When the teachers were categorised as having high, moderate and low Stress
and Satisfaction, the relationship between the stress and satisfaction
variables was significant at the 0.05 level of confidence using the Chi
square statistic. `Stressed teachers' were considered as those reporting
moderate to high levels of stress. `Satisfied teachers' were those
reporting moderate to high levels of satisfaction.   The teachers were
further classified into three groups - low stress teachers, stressed and
satisfied teachers and teachers at risk, the latter having at least
moderate levels of stress and low satisfaction. Summary statistics for
these groupings are provided in Table 6.

TABLE 6.SUB-CLASSIFICATION OF TEACHERS: TEACHER STRESS AND TEACHER
        SATISFACTION (MEANS & STANDARD DEVIATIONS, N=182)

	LOW STRESS TEACHERS	STRESSED & SATISFIED TEACHERS	AT RISK TEACHERS
VARIABLES	(n=62)	(n=65)	(n=55)
STRESS	1.83 (.24)	2.50 (.28)	2.72 (.37)
SATISFACTN	2.37 (.40)	2.40 (.34)	1.67 (.27)
WORKLOAD	2.10 (.47)	2.60 (.52)	2.75 (.37)

Low Stress Teachers and the Alarm Response

Sixty-two teachers reported experiencing low levels of stress. Although
ten teachers in this classification reported low levels of Satisfaction as
well as of Stress, they were considered to be at low risk of suffering
adversely from their experiences (except perhaps from `rusting out on the
job'). It is hypothesised that because these teachers encountered few
stressors in the workplace that an unexpected encounter with stress would
trigger a brief period of intense reaction consistent with the `alarm
response'. The data for these teachers was fitted to the non-recursive
model as displayed in Table 7 and Figure 5 (appended).

Teachers falling in the low stress category associate what little stress
they suffer quite strongly with the demands of their work. Since the two
paths are of equal size (beta^=.49) and so similar to the bi-serial

correlation there is little to be gained by considering this as a two way interaction effect. Even though these teachers suffer only periodic encounters with the stressors associated with excessive demands, the resultant negative feelings are intense and consistent with that of an alarm reaction.

Teacher satisfaction amongst these teachers is higher for females (beta^=0.22) and for the more experienced teachers (beta^=0.25). Perceived workload diminishes Satisfaction (beta^=-0.32) as it did in the general model. The path from Satisfaction to Stress (beta^=-0.21) is considerably smaller than that from Stress and Satisfaction (beta^=-0.44) suggesting that when stress is experienced it quite strongly influences teachers feelings of satisfaction.

TABLE 7.2SLS PATH COEFFICIENTS - LOW STRESS TEACHERS
     (beta^ values) (N=62) abc

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	ENSUING VARIABLES d		
FOREGOING VARIABLES	TEACHER WORKLOAD	TEACHER SATISF.	TEACHER STRESS
	(R=0.44)	(R=0.44)	(R=0.59)

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SEX	.	.	25
YEARS OF TEACHING	.	.	22
YEAR DISTRIBUTION	.	.	.
COMPOSITE PERIODS	.	.	.
STREAMED PERIODS	.	.	.
SUBJECT AREA	.	.	.
SCHOOL SIZE	.	.	.

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WORKLOAD	na	-32 (-17)e	49 (48)e
SATISFACTION	na	na	-21 (-46)e
STRESS	49 (48)e	-46 (-46)e	na

——

a.   All coefficients multiplied by 100.
b.   Only paths indicated as significant at the 0.05 confidence level
    based on the second-stage regression are shown.
c.   "na" indicates path not applicable due to the hypothesised causal
    order. A dot indicates a path not significant at 0.05 level.
d   Stress, Satisfaction and Workload act as both foregoing and ensuing
    variables, as before.
e.   Significant bi-serial correlation between the observed variables.

The coping energy of the less stressed teachers, buoyed in many cases by

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their satisfaction with work, seems to support them during the period of
the alarm response and allows them to return to their enviable state of
relatively low stress.   Although the frequency of stressful experiences
amongst these teachers may be high at times, the duration of stressful
experiences is probably. It is also proposed that the intensity of feeling
associated with unexpected stressors is none-the-less high amongst these
teachers who are generally little stressed.

Teachers Who are Stressed and Satisfied

Sixty-five teachers fell into the category of being `stressed and
satisfied'. This category included 10 teachers who were paradoxically both
`highly stressed' and `highly satisfied'. Table 8 sets out the results of
the 2SLS analysis for this group, illustrated in Figure 6 (appended).

It was hypothesised that teachers who report both Stress and Satisfaction
suffer from longer term sources of frustrations in the workplace as well as
shorter term annoyances. These teachers have the capacity to use their
essentially intrinsic sources of satisfaction as a means of coping with
stress in a way consistent with the `stage of resistance'. The more
satisfied teachers in this category have a greater potential to cope and
are therefore more likely to be able to reduce their experience of stress.

TABLE 8.2SLS PATH COEFFICIENTS - STRESSED AND SATISFIED
        TEACHERS (beta^ values) (n=65) abc
_____

| | ENSUING VARIABLES d | | |
FOREGOING VARIABLES	TEACHER WORKLOAD (R=0.74)	TEACHER SATISF. (R=0.26)	TEACHER STRESS (R=0.49)
SEX	23	.	.
YEARS OF TEACHING	.	.	23
YEAR DISTRIBUTION	.	.	.
COMPOSITE PERIODS	-49	.	-23
STREAMED PERIODS	.	.	.
SUBJECT AREA	.	.	.
SCHOOL SIZE	.	.	.
WORKLOAD	na	.	36 (34)e
SATISFACTION	na	na	-34 (.)
STRESS	72 (34)e	.	na

_____

a.   All coefficients multiplied by 100.

b.   Only paths indicated as significant at 0.05 confidence level based on
      the second-stage regression are shown.
c.   "na" indicates path not applicable due to the hypothesised causal
      order. A dot indicates a path or correlation not significant at the
      0.05 level.
d.   Stress, Satisfaction and Workload act as both foregoing and ensuing
      variables, as before.
e.   Significant bi-serial correlation between the observed variables.

Amongst these teachers perception of Workload is influenced by Sex
(beta^=0.23), by the number of composite periods taught (beta^=-0.49) and
most strongly by their experience of Stress (beta^=.72). Satisfaction is
increased by the number of composite periods taught (beta^=0.27) but not by
Stress or Workload. There is a one way interrelationship between
Satisfaction and Stress (beta^=-0.34) consistent with the hypothesised
relationship. It seems that these teachers may draw their satisfaction
from sources not fully described within the context of this model.

Teachers at Risk

A third group of 55 teachers, those reporting the experience of moderate to
high levels of stress and low satisfaction, were considered to be `at risk'
of suffering adversely from stress. Included within this classification
were 35 teachers (almost 20% of the sample) who reported high Stress and
low Satisfaction levels - the most at risk teachers. The results of this
analysis are shown in Table 9 and Figure 7 (appended).

The teachers classified `at risk' are of special concern because of their
experience of moderate to high levels of stress and their reduced ability
to draw on sources of satisfaction to improve their circumstances. These
teachers may be considered as approaching the threshold of exhaustion with
little in the way of personal coping resources to help themselves.

TABLE 9.2SLS PATH COEFFICIENTS - TEACHERS AT RISK
        (beta^ values) (n=65) abc
_____

                          ENSUING VARIABLES d
FOREGOING   TEACHER   TEACHER   TEACHER
VARIABLES   WORKLOAD   SATISF.   STRESS

                        (R=0.47)   (R=0.25)   (R=0.51)
_____

SEX   .   .   .
YEARS OF TEACHING   .   .   .
YEAR DISTRIBUTION   .   .   .
COMPOSITE PERIODS   -30   .   .
STREAMED PERIODS   .   .   .

```
SUBJECT AREA           .            .             .
SCHOOL SIZE            .            .             .
_____
WORKLOAD              na            .             .
SATISFACTION          na            na            .
STRESS                45 (32)e      -51 (-28)e    na

_____
```

a.   All coefficients multiplied by 100.
b.   Only paths indicated as significant at 0.05 confidence level based on
     the second-stage regression are shown.
c.   "na" indicates a path not applicable due to the hypothesised causal
     order. A dot indicates a path not significant at the 0.05 level.
d.   Stress, Satisfaction and Workload act as both foregoing and ensuing
     variables, as before.
e.   Significant bi-serial correlation between the observed variables.

Stress appears to be the operative factor, diminishing what Satisfaction
these teachers experience (beta^=-0.51) and intensifying the experience of
over-demand (beta^=0.45). It appears that truly stressed teachers do not
associate their circumstances with contextual aspects fo their school life.

CAVEATS APPLYING TO THE 2SLS REGRESSION ANALYSIS

Berry & Feldman (1985, p.36-37) indicate the problems associated with using
instrumental variables. If accurate instrumental variables cannot be
generated in the first-stage regression (that is, instrumental variables
very similar to the observed variables and not related to the dependent
variable except through their correlation with the observed variable),
error is built into the second-stage regression which may produce 2SLS
estimates that are no more useful than the OLS estimates. As the
correlations between the observed values and the instrumental variables
decreases, the source of error in OLS estimates will be progressively
replaced by an equally confounding source of error applying to the 2SLS
estimates.

Furthermore, since the instrumental variables are linear combinations of
the exogenous variables in the model, there is a risk of multicollinearity
becoming a problem in the second-stage structural equations. The
intercorrelation between the instrumental variables was computed to assess
the importance of this problem (see Table 10). The two values of concern
to the model under analysis, that between Stress and Satisfaction which
applies to the structural equation for Workload (r=-0.45) and that between
Satisfaction and Workload applying to the structural equation for Stress
(r=-0.36) were significantly correlated at the 0.05 level and could
generate problems associated with multicollinearity. However, there was no
evidence from the standard errors of the beta estimates made available in
the second-stage regression or from `bouncing beta' estimates in the
regression runs that suggested this was the case. The term 'bouncing beta'

is used to describe wild fluctuations in the value of the path coefficient
(sometimes including the change of sign) for a given independent variable
depending on the presence of other 'independent' variables in the
regression equation.

TABLE 10. CORRELATIONS BETWEEN INSTRUMENTAL VARIABLES
          TEACHER STRESS, SATISFACTION AND WORKLOAD
          (N=182 IN ALL CASES)

_____

VARIABLES	STRESS*	SATISFACTION*	WORKLOAD*
STRESS*	.	-.45	.55 na
SATISFACTION*	.	.	-.36

_____

*   Predicted values generated in first-stage regression runs.
na Not applicable to the model under analysis.

The options available, other than dropping variables from the analysis, to
overcome multicollinearity in 2SLS regression are limited (Berry, 1985,
p.71). Consequently, the possible existence of multicollinearity must be
recognised, especially in the regression analyses of sub-classifications of
stressed teachers where the number of cases is smaller, as a potentially
troublesome source of error in the 2SLS estimates.

A procedural problem also exists in trying to assess the error terms in
2SLS because the standard errors and R-Squared values produced in the
second-stage regressions using separate regression runs for the first and
second stages are incorrect. 2SLS requiring two runs (such as SPSSx)
produces error terms in the second-stage regression which are not those
applying to the observed values but those applying to the instrumental
variables produced in the first-stage regression (Berry, 1985, p.69).

This problem can be overcome by using statistical packages which can
perform both steps in a single run thus allow the first-stage error terms
to be saved in a form suitable for use in the second-stage analysis.
Programs of this type (such as SAS or those employing full-information
techniques) were not available to the researchers at the time of the
analysis.   The intention is to pursue the problem of measurement error in
full at a later date. In the current analysis, the estimates of the beta
coefficients may be biased but they should be consistent (Berry, 1985,
p.65). The enlarged error terms inherent in the current analysis remain
problematic.

CONCLUSIONS

The use of the non-recursive model using 2SLS regression produced results which were broadly consistent with expected relationships. In terms of theoretical consideration, supported by the approximations of net effects provided the bi-serial correlations between the observed variables and the OLS estimates, 2SLS regression provided approxinate estimates which were of use in this analysis. While concerns with error limit the predictive power of 2SLS regression, these estimates provided some benefits in terms of explanation of the complex causal relationships between Stress, Satisfaction and Workload.

The analyses provided evidence that many teachers are in fact both stressed and satisfied with their work. It has also been suggested that these teachers fall into a sub-category of teachers distinct from those teachers who experience low levels of stress and a third category of those who are most `at risk' because of relatively high stress and low satisfaction.  The hypothesis that teachers within the three stress categories are at different stages of the stress response is supported by the findings to a sufficient degree to warrant further analysis.  The results relating to `low stress' teachers are consistent with the alarm response, the reactions of `stressed and satisfied' teachers is consistent with the general nature of the stage of resistance, and the stage of exhaustion describes the situation faced by the `at risk' teachers in the study.

The classification suggested must allow for the relocation of teachers within groups and between groups. Teachers may move from one category to another according to changes in their personal circumstances and coping ability which alter their work-related experiences. If teachers do move between categories over time, the personal and other factors related to a change of category, especially one involving a teacher becoming 'at risk', require investigation as a matter of some priority.

Conversely, it also remains to be investigated whether the location of a teacher in one of the different categories identified in this paper, or in other categorisations of teachers that could be developed, would be more a function of relatively stable personality characteristics than existing as stages in the teacher's coping with stress. Expectations of a 'reasonable' workload, sources of satisfaction, sources of and susceptibility to stress all vary between teachers. However, it is possible that many individual teachers remain in the one category throughout their teaching careers. A longitudinal study of a large sample of teachers, examining changes in their perceptions of workload, satisfaction and stress over time, together with concurrent information about their personal circumstances and personality profiles, would be necessary to address this question.

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