

**ORGANIZATIONAL
RISK FACTORS FOR
JOB STRESS**

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Methodological Issues in Occupational-Stress Research: Research in One Occupational Group and Wider Applications

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The purpose of this chapter is to address a number of important methodologic issues that are relevant to occupational-stress researchers. The issues addressed have arisen in the context of an ongoing research program involving cross-sectional and longitudinal studies of stress in teachers; the issues, however, apply to occupational research in general. The first issue involves measurement strategies required in operationalizing the stress process. The focal concern of this section of the chapter is the reduction of confounding in measures of the work environment. The second issue encompasses the question of whether to sample new or veteran workers. In some circumstances there are advantages to research designs in which new workers are sampled. The third issue applies to types of job stressors. The discussion of the three issues coalesce in a section describing a study of confounding in measures of various occupational stressors encountered by new teachers. Finally, some of the wider implications of reducing confounding are discussed.

A supplementary issue bearing on a great deal of the occupational-stress literature, including the literature on teachers, has been the largely cross-sectional nature of study designs. From the standpoint of developing causal models of the effects of working conditions, cross-sectional designs are very weak. The chapter speaks to the necessity of longitudinal designs in occupational-stress research.

Operationalizing the Stress Process

A problem in much of the literature on teachers has been the absence of a satisfactory conceptualization of the stress process. Many investigators have

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conceptualized stress as an overly inclusive construct embracing both the working conditions that are suspected of provoking psychological distress and the distress those conditions are thought to provoke (DeFrank & Stroup, 1989; Dunham, 1984; Farber, 1984; Fimian & Santoro, 1983; Galloway, Panckhurst, Boswell, & Green, 1984; Gold, 1985; Kyriacou & Sutcliffe, 1978, 1979; Maslach & Jackson, 1981; Needle, Griffen, & Svendsen, 1981; Seiler & Pearson, 1984). A commonly used stress questionnaire having an item structure that reflects this blurring of independent and dependent variables comes from Kyriacou and Sutcliffe (1978, 1979): "As a teacher, how great a source of stress are these factors? Inadequate disciplinary policy of school; Pupils' poor attitudes to work" (pp. 159–160). Another problem with the items is that they provide no information on the extent or duration of the exposures.

In a different sense burnout scales (Fimian, 1983; Gold, 1984, 1985; Iwanicki & Schwab, 1981; Johnson, Gold, & Knepper, 1984; Malanowski & Wood, 1984; Maslach & Jackson, 1981, 1984; Meier, 1984; Zabel & Zabel, 1982) also confound presumed cause and effect (see Schonfeld, 1990a, 1992a, 1992b, in press). Burnout scales are typically used with helping professionals. Burnout involves the attribution to one's job of a syndrome centered on feelings of psychological exhaustion, a poor sense of personal accomplishment, and the depersonalizing of the individuals whom the professional is supposed to serve. Schonfeld (in press) adduced evidence from the published literature to indicate that burnout lacks construct validity. He showed that burnout measures cover much the same ground as well-validated depressive symptom scales and that there is evidence to suggest that depression and burnout are operationally redundant.

A related problem is that cross-sectional correlations of (a) stress scales with measures of distress and (b) burnout scales with measures of job conditions are likely to be overestimates because stress and burnout measures—albeit to different degrees—include items that refer to both difficulties at work and the distress engendered by those difficulties (a problem relating to lagged correlations is discussed later). Teacher-stress measures (e.g., Fimian & Santoro, 1983), vulnerable to similar overestimation errors, ask respondents to indicate how bothered or annoyed they are by various school and classroom conditions.

Stressor-Rating Scales

Some measures of occupational (and nonoccupational) stress in other samples of working people require respondents to indicate if a condition occurred and to rate its impact, positively or negatively, on a Likert-type scale (e.g., Bhagat, McQuaid, Lindholm, & Segovis, 1985; Brief, Burke, George, Robinson, & Webster, 1988). Occupational-stress scales are created by summing the negative ratings on various work-related conditions. These scales, however, are open to confounding with preexisting distress. Respondents are also vulnerable to attribution errors (Cohen, Karmarck, & Mermelstein, 1983). Procedures that have respondents identify conditions by their stressful consequences are better

suitable for pilot or exploratory research than for research on the etiologic significance of stress (Schonfeld, 1992a).

Negative Affectivity

The problem of confounding is also underlined in the personality literature. Watson and Clark (1984) adduced evidence for the view that negative affectivity (NA) is a major dimension of personality. NA is a stable disposition toward a dysphoric mood that permeates much of the individual's attitudes and behavior. Long-term psychological distress may be reasonably characterized as NA. For example, NA is highly related to measures of depressive symptoms (e.g., Brief et al., 1988). NA is likely to color an individual's evaluation of perceived stress (Watson & Pennebaker, 1989). Brief et al. (1988) found that NA is confounded with typical measures of work and nonwork stress and distorts the zero-order relation between stress and distress. Work-environment scales comprising "How stressed are you?" types of items or summated stressor-rating scales such as the ones described above (e.g., Bhagat et al., 1985; Brief et al., 1988) tap NA and thus are likely to overestimate cross-sectional correlations with measures of current distress.

Reducing Confounding

Kasl (1978, 1987) suggested that one way to minimize circularity in measuring occupational stress is to banish the stress concept. In place of measuring occupational stress, an investigator would do better to obtain independently measures of the hypothesized adverse environmental exposures (i.e., the stressors) and current psychological distress (e.g., depressive symptoms). The advantage of this conceptualization of the stress process is that the independent and dependent variables are kept distinct. From a public-health standpoint, it is important to be able to alter identifiable exposures that may affect the well-being of workers (Kasl, 1987). When stress measures become too subjective or if the independent and dependent variables are blurred, the targets of remedial actions become less identifiable.

An independent measure of psychological distress. In two studies, one of veteran teachers (Schonfeld, 1990a, 1990b) and the other of newly appointed teachers (Schonfeld 1992a, 1992b), stressors and outcomes were measured independently. Psychological morbidity, an important outcome variable, was measured with the Center for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977), a depressive symptom scale that makes no reference to working conditions. The CES-D has two other advantages. First, normative landmark scores are well-known from general-population surveys (Schonfeld, 1990b). Second, it can be used for the purpose of psychiatric case finding (see Schonfeld, 1992a).

Neutral self-reports. Adverse working conditions, the stressors, were measured with neutrally worded self-report items. Consistent with Kasl's (1983) critique of existing self-report stress instruments, a strategy was employed in which the items used to assess school-related conditions were worded with a minimum of reference to the distress they have been hypothesized to cause (e.g., "You encountered students involved in a fight . . . not at all, once per month, once per week, 2-4 times per week, daily"). In addition, items were written to minimize the amount of inference making required by the teacher incumbents (e.g., "You were assaulted by a student or an intruder? No, Yes"). Later in this chapter, we evaluate the potential for confounding with preexisting psychological distress, the neutrally worded self-reports on school conditions that newly appointed teachers encounter.

Objective data. One source of objective, external measures of working conditions is the *Dictionary of Occupational Titles (DOT)*; U.S. Department of Labor, 1965). The *DOT* provides average values on work characteristics across job titles. Measures such as the *DOT*, however, are better suited for between- than for within-occupations research. Other types of objective measures may be sought for within-occupations designs. In one of the within-teachers studies, data obtained from the reports of teachers who work in New York City public schools will eventually be linked to officially collected records of assaults, larcenies, and sex offenses against teachers. One of us reported elsewhere (Schonfeld, 1992b), however, that such so-called objective measures have deficiencies including lack of candor on the part of administrators reporting on violence against teachers (also see Dillon, 1994).

Partitioning the sample. A complementary strategy that can reduce confounding between measures of stress and distress, in longitudinal research, is to limit samples to individuals who, initially, are relatively undistressed. Depue and Monroe (1986) advanced the view that individuals who are high and low in psychological symptoms represent different populations and should therefore be examined separately in research linking risk factors to later distress. In an investigation of social support in women making the transition from college to work, Schonfeld (1991) limited a number of his longitudinal analyses to women whose symptom scores at the beginning of the study suggested that they were initially free of high levels of distress. He found that social companionship was more strongly (and inversely) related to later symptoms when women who initially were highly symptomatic were excluded from the sample than when no exclusionary criteria were imposed. This finding was not merely an artifact of reduced variance in the covariate owing to the exclusionary criteria. Three other social support measures—tangible, appraisal, and self-esteem support scales—were unrelated to future symptoms whether highly symptomatic women were excluded from the analyses.

By also examining subsamples of individuals who, initially, are relatively more highly distressed, two other important research questions can be addressed. First, investigators can study the extent to which later job conditions aggravate or reduce preexisting distress. Of particular interest is the issue of

identifying work environments that lead to a diminution of initial distress. Schonfeld (1992b) advanced the view that work environments that offer teachers a sense of control as well as physical safety will result in new lower levels of distress compared with preemployment baseline levels. More research on this issue, however, needs to be conducted.

Second, investigators, using longitudinal designs, can more generally study the relation of high levels of psychological distress or NA to health-related sequelae (cf. Vassend, 1989) and other outcomes. Research on NA has largely been cross sectional. Longitudinal designs could be used to examine the effects of preexisting psychological distress, either directly or in interaction with adverse job conditions, on later physical and mental health. Other outcomes worthy of study include the propensity to encounter, or overreport, adversity at the workplace.

Psychological distress should be treated as a variable to be studied in its own right, rather than as a mere nuisance variable that needs to be controlled before other, more interesting questions can be examined. What we do not want to lose sight of is the issue of how working conditions are related to temporal changes in psychological distress and a host of other aspects of health.

Studies of New and Veteran Workers

The general occupational-stress literature has relied heavily on veteran-worker samples. Longitudinal research on veteran workers is especially important when the effects of job conditions on incumbents are insidious and apparent only after many years of exposure. Selection into occupational categories is not likely to be a problem. In the context of slow, long-term effects of exposures and in the absence of self-selection by subclinical disease and other risk factors, longitudinal research on veteran-worker samples is particularly suited to the field of chronic-disease epidemiology.

Studies of veteran workers can be problematic when findings are susceptible to selection-based explanations. Compared with research on physical health, selection is a relatively more important problem in research linking working conditions to mental health because preemployment records of conditions such as depressive symptoms are less available than medical records with, say, preemployment blood pressures. Investigators often have little or no knowledge of the functioning of veteran workers before they obtained their jobs, making it difficult to determine if mental health problems in particular occupational groups resulted from exposures to adverse working conditions or if less healthy individuals selected themselves into occupational roles with ostensibly the most adverse exposures. Research with newly employed workers allows for a test of the selection hypothesis.

A related advantage of following new workers is the opportunity afforded for controlling confounding in measures of the work environment and psychological distress, provided new workers are evaluated before they assume their jobs and several times after. In his research on newly appointed teachers, Schonfeld (1992a, 1992b) used preemployment measures of depressive symp-

toms as a baseline against which to measure change in functioning. One component of the preemployment depressive symptoms measure is likely to be trait depression or NA (Watson & Clark, 1984), depending on the perspective (psychosocial epidemiologic or personality) of the investigator.

Importance of Preemployment Baseline Data

Longitudinal studies of new workers may be problematic without preemployment baseline measures. If, among new workers, the effects of the work-related exposures on distress occur relatively immediately after entry into the work role (an immediate-exposure effects model), longitudinal designs that begin after workers assume their new work roles are incapable of disentangling relations among work-environment factors and distress (this notion is also discussed below in the context of causal modeling). In an immediate-exposure effects model, a Time 1 correlation between the measures of the work environment and psychological distress may truly reflect a causal pathway from environment to distress; however, without preemployment baseline distress data, the Time 1 relation cannot be deciphered satisfactorily.

Moreover, within the framework of such a model, a partial regression coefficient assessing the relation of the Time 1 work environment to Time 2 psychological morbidity may underestimate the corrosive effects of poor working conditions when Time 1 symptoms are controlled. In the regression equation, controlling for Time 1 symptoms amounts to controlling for the unfolding causal process. In this model, elevations in Time 2 symptoms are the result of a process that developed at Time 1. For individuals who remain stably employed but encounter poor working conditions as soon as they commence work, Time 2 symptoms are high because (a) the symptom elevations originate at Time 1 with the relatively immediate impact of adverse features of the work environment, and (b) the bad environment is unremitting, maintaining the symptoms over time. Making sense of the process occurring at Time 1 is critical.

An example of an occupational group in which immediate work-environment effects are evident is teachers. Using preemployment symptom data, Schonfeld (1992b) adduced evidence that among new teachers the effects of adverse job conditions occur relatively soon after the teacher assumes her new work role. New female teachers who obtained jobs in the "best" and "worst" schools did not differ in preemployment depressive symptoms but did differ markedly in symptoms during the first months on the job. If much of the action of the work environment on distress occurs at Time 1 and endures through the worker's tenure on the job, without preemployment baseline data it may be difficult to discern effects even with two or more waves of data collection through the duration of employment. Teachers in well- and poorly run schools may differ from one another at Time 1 and Time 2; however, without the leverage afforded by Time 0 preemployment morbidity data, there will be little opportunity to rule out selection-based explanations of the differences in symptoms (through either self-selection or selection by administrative gatekeepers). More important, in the absence of Time 0 group differences in morbidity, large

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Time 1 morbidity differences are more plausibly linked to Time 1 differences in working conditions.

Nursing (Parkes, 1982), social work (Satyamurti, 1981), and corrections (Cullen, Link, Wolfe, & Frank, 1985) are examples of other fields in which within-occupation stress research has been conducted. They are also apt contexts in which to conduct prospective research on new entrants into those fields. Prospective research would be aided by the inclusion of a preemployment data collection period if there is reason to suspect that working conditions exert immediate effects on incumbents. Parkes's (1982) work on nurses is exemplary because she (a) examined the same student nurses rotating through both medical and surgical units and (b) obtained prerotation baseline measures of psychological symptoms in addition to measures obtained during each of the two rotations. She found that work in medical wards was linked to marked increases in depressive symptoms and job dissatisfaction.

A disadvantage of the first author's (Schonfeld, 1990a, 1990b) study of veteran New York City teachers is that the sample was likely to overrepresent individuals who made successful adaptations to their jobs, despite the teachers' relatively high levels of depressive symptoms. The average experience of these teachers was 13 years. The teachers necessarily excluded from the sample because of attrition in the school system were likely to be the major casualties of job stress (cf. Kasl, 1983). These are the teachers who left the profession before the investigator recruited his sample. Thus, the study probably underestimated teacher distress. In response to the problems inherent in research with veteran workers, a later study (Schonfeld, 1991, 1992a, 1992b) followed newly appointed teachers and obtained key preemployment symptom data as well as data on expected job satisfaction.

Episodic and Ongoing Stressors

Some general life-stress investigators (e.g., Brown & Harris, 1978; Pearlin, Lieberman, Menaghan, & Mullan, 1981) underline the distinction between episodic and ongoing stressors; that distinction, however, is often absent in the occupational-stress literature. Stressful events are unscheduled, episodic, and undesirable (Dohrenwend, Krasnoff, Askenasy, & Dohrenwend, 1982; Pearlin et al., 1981). In Pearlin's terminology (Pearlin et al., 1981; Pearlin & Schooler, 1978), strains refer to enduring, threat-arousing problems (also see Brown & Harris, 1978).

To fully sample the array of stressful conditions teachers encounter, Schonfeld (1992a, 1992b) measured both events and strains, including a range of areas that are more or less problematic for teachers. For example, a fight erupting between students or an insult from a colleague would constitute a stressful event. An ongoing threat of involuntary transfer or excessive noise in the ambient environment would constitute a strain. In view of the above discussion of confounding in stress scales, we present findings bearing on the relation of work-related event and strain items to preemployment psychological symptoms and morale.

A Study of Confounding

As part of an ongoing longitudinal study of stress in newly appointed teachers, subject recruitment was conducted at several colleges with a history of staffing local school districts. Recruitment took place during the late winter and the spring in upper-level, senior-year education classes (1987 to 1990) that were identified by faculty and administrative informants as likely to include graduating seniors who would go on to obtain teaching jobs in the September following their graduation. The September following June and August graduations is ordinarily the month during which new teachers begin work. The college classes in which recruitment took place were classes students typically attend en route to obtaining teacher certification.

The teachers came from largely middle-class homes (average social class of origin as measured on the Hollingshead, 1974, scale was 2.7), 30% were married, and 77% were White. The mean age of the teachers was 27 years, which is consistent with national and local trends regarding the aging of the undergraduate population (Schonfeld & Ruan, 1991). To maximize stable differences in exposures to a variety of working conditions, the sample was limited to 198 women who were full-time teachers in the fall, remained full-time teachers in the same schools in the spring, and contributed the preemployment data described below. Past reports on this data set (Schonfeld, 1992a, 1992b) were limited to cohorts graduating before 1990 and to combined samples of full-time and part-time female teachers, including those who changed schools.

Participants completed questionnaires in the summer (preemployment period or Time 0), fall (Time 1), and spring (Time 2). At Times 0, 1, and 2 depressive symptoms ($\alpha \geq .91$ Time 0 to Time 2) were measured with the 20-item CES-D (Radloff, 1977; Weissman et al., 1977). At Time 0 expected job satisfaction was assessed with one Likert-type item ("Overall, how satisfied do you expect to be in the job you are about to get?") specially modified from the Quality of Employment Surveys (QES; Quinn & Staines, 1979). By contrast, at Times 1 and 2 a job-satisfaction scale was constructed from three Likert-type QES items (α s = .78 and .74 at Time 1 and Time 2, respectively).

Three measures of teachers' working conditions consisted of neutrally worded self-report items administered at Time 1. The Teacher Event Inventory assessed the extent to which teachers encountered episodically occurring stressors (Schonfeld, 1990a, 1990b, 1992a, in press; Schonfeld & Ruan, 1991). The response alternatives for the event items were (0) *not at all*, (1) *once per month*, (2) *once per week*, (3) *2-4 times per week*, and (4) *daily*. The Teacher Strain Inventory assessed the extent to which teachers encountered ongoing difficulties (Schonfeld, 1990a, 1990b, 1992a, in press; Schonfeld & Ruan, 1991). The response alternatives for the strain items were (0) *not at all*, (1) *to a minimal extent*, (2) *to a small extent*, (3) *to a moderate extent*, and (4) *to a great extent*. To reduce the likelihood of response set, the event and strain items included positive conditions. The alpha coefficients for the event and strain scales created from these items were both .80. The Crime Inventory consisted of a series of yes-no items that assess whether teachers have been the victim of an assault or robbery in or near their school (Schonfeld, 1990a). In addition,

assaults against teacher colleagues were also ascertained. A crime scale was created by counting the number of different types of crimes of which the respondent (or, in the case of one item, a colleague) was a victim.

Confounding in the Items

Among the full-time female teachers, we examined the relation of the Time 1 event, crime, and strain items to the preemployment (Time 0) CES-D. Three of the 22 event items attained conventional levels of significance (see Table 1 for a sample of the items). One of the eight crime items (excluding one item with no variance) was significantly related to prior depressive symptoms. Seven of the 32 strain items were significantly related to prior symptoms. Although the significant strain-related correlations tended to be small, averaging .17 (corrected for the direction of the coefficient), these tallies indicate that it was more difficult to develop unconfounded strain items than items that assess the occurrence of events and crimes.

The relation of the Time 1 event, crime, and strain items to the Time 0 expected job satisfaction measure was also examined. Two of the 22 event items were significantly related to Time 0 expected satisfaction. In contrast to the relations between the strain items and the Time-0 CES-D, 3 of the 32 strain items were related to Time 0 expected satisfaction. No crime item was related to expected satisfaction.

The findings show that it is practically impossible to obtain self-report measures of the work environment that are perfectly uncorrelated with prior depressive symptoms or prior expectations about work. The findings, however, indicate that work-environment measures that tap discrete events such as episodes of vandalism and the occurrence of crimes are somewhat less likely to be correlated with preemployment depressive symptoms than are measures of ongoing working conditions (strains).

Reprise of the Problem of Confounding

An explanation of the relation of the work-environment items to prior distress calls for a closer look at the event and strain items. The response alternatives for the strain items were *not at all*, *to a small extent*, *to a minimal extent*, *to a moderate extent*, and *to a great extent*. The response alternatives for the event items were *not at all*, *once per month*, *once per week*, *2-4 times per week*, and *daily*. Compared with the strain items, the event items were more closely anchored to estimable frequencies. Although prior mental state could have colored the respondents' estimates of event frequencies, the strain items, with their more subjective extent alternatives, were more affected.

One would expect the response to the crime items to be the least confounded with prior depressive symptoms because self-knowledge of one's status as a crime victim is relatively unambiguous. It is of note that one of the crime items (property damage) was weakly, but significantly, related to prior depressive symptoms. Although it is possible that individuals who experienced

Table 1. The Item-Level Relation Between School Environment Measures and Preexisting Depressive Symptoms: Systematic Sample of Half the Items

Items	Correlation with preemployment depressive symptoms
Event items	
A student threatened you with personal injury	-.11
You were confronted by an insolent student	-.05
Materials or books you selected were disapproved by a supervisor	-.03
An episode of vandalism occurred in your class	.05
Several students failed to complete their classwork	.06
A student expressed appreciation for your teaching	.08
Several students failed to complete their homework	.02
A student used vulgar language in class	.07
A fellow teacher insulted you	.17*
You broke up a fight	-.16*
Crime items	
Were you assaulted by a student or an intruder?	-.07
Was anything of yours stolen in school?	-.11
Were you harassed on your way to or going from school?	.07
Were you assaulted in the neighborhood of your school?	.03
Your class activities must be planned on an individual basis	.01
Your class activities are closely controlled by supervisors	-.15*
You are safe to walk alone in the neighborhood surrounding your school	-.05
You are in jeopardy of being <i>involuntarily</i> transferred to another school or building	.20**
The noise level in the school is excessive	-.03
Underprepared students attend your class(es)	.03
Your fellow teachers are friendly	-.08
It is unsafe to be alone in the school building	.08
In general, school personnel enforce sanctions against rule breakers	-.14*
Administrators routinely give teachers too much information	.09
Your paperwork is excessive	-.03
Administrators give you information discourteously	.19**
Several fellow teachers tend to be lazy	.11
You teach low ability students	-.01
Administrators criticize you unfairly	-.05

Note. The response alternatives for the event items were 0 = *not at all*; 1 = *once per month*; 2 = *once per week*; 3 = *2-4 times per week*; 5 = *daily*. The response alternatives for the crime items were 0 = *no* and 1 = *yes*. The response alternatives for the strain items were 0 = *not at all*; 1 = *to a minimal extent*; 2 = *to a small extent*; 3 = *to a moderate extent*; 4 = *to a great extent*.

p* < .05. *p* < .01.

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property damage were somehow more likely to have been singled out for victimization because of their mental state, this hypothesis is unlikely in view of the absence of significant correlations between the Time 0 CES-D and other crime items. It is implausible that prior mental state plays a role in making teachers vulnerable to one type of crime but not to others. The relation of the property-damage item to prior symptoms probably reflected a Type I error.

Another Self-Report Measure

Although it is not the purpose of this chapter to review all types of self-report instruments that have been designed to assess working conditions, it is important, within the context of a discussion of confounding, to mention one of the more prominent instruments, Hackman and Oldham's (1975) Job Diagnostic Survey (JDS). Levin and Stokes (1989) found that "NA was significantly and inversely correlated with six of the seven [dimensions of] job characteristics" that were obtained from the JDS (p. 756). Levin and Stokes (1989) suggested that, compared with individuals lower in NA, high-NA individuals cognize their work environments differently. The authors speculated that high-NA workers more often selectively attend to negative aspects of their jobs, distort in negative ways their perceptions of their jobs, and store in memory negative aspects of their jobs.

Other findings are consistent with those of Levin and Stokes (1989). Brousseau (1978) found that temporal change in a personality dimension labeled *freedom from depression* was more closely related to JDS scales than were other personality dimensions. Schnake and Dumler (1985), in a factor analytic study, found JDS scales to be subtly biased by affective state.

To attempt to reduce confounding with affective state, stress researchers may consider administering to workers neutrally worded self-report items, although such a strategy may be more amenable to within- than between-occupations designs. In view of the notion that a depressed affective state can bias cognitions negatively, the self-report items should be developed to minimize the amount of inference making required of incumbents who are asked to characterize their work environments. Slightly more inference making is required of JDS items because the JDS was designed to assess relatively broad dimensions of the work environment across a wide variety of occupations (Hackman & Oldham, 1975). Because of the teacher study's within-occupation design, neutrally worded items could be tailored specifically to assess working conditions teachers encounter. An approach we recommend is that focused (e.g., Teacher Event Inventory and a comparable social worker inventory) and broad-band scales (e.g., the JDS) be used within the same study to investigate the effects of within-occupation stressors and to allow comparisons across occupations (e.g., teachers vs. social workers).

Data Analytic Considerations

It might be argued that the problem of constructing highly distinct measures of the work environment and distress should not be a high priority. After all,

the beauty of regression procedures is that they can estimate the impact of one risk factor on psychological morbidity outcomes, controlling for the influence of other risk factors. Consider, however, the situation in which two risk factors (e.g., initial adverse job conditions and preemployment depressive symptoms) influence a later morbidity outcome (e.g., Time 2 depressive symptoms), and the two risk factors are themselves positively correlated. Because each predictor variable carries information about the outcome that is also carried by the other predictor variable, Cohen and Cohen (1983) described this condition as "partial redundancy" and noted that it constituted "by far the most common pattern of relationship in nonexperimental research in the behavioral sciences" (p. 94).

The standardized regression coefficient for X_1 in a two-predictor regression equation is as follows:

$$\beta_1 = [r_{yx_1} - r_{yx_2}r_{x_1x_2}]/[1 - r_{x_1x_2}^2].$$

If each of the bivariate correlations involving X_1 , X_2 , and Y is positive (as is likely with multiple risk factors), the size of the zero-order relation between X_1 and X_2 will affect the partial regression coefficient representing the influence of X_1 on Y .¹ For example, if $r_{yx_1} = .4$, $r_{yx_2} = .4$, and $r_{x_1x_2} = .1$, then $\beta_1 = .36$. By contrast, if $r_{x_1x_2} = .4$, with the other two bivariate correlations held constant, then β_1 would be reduced to .29. Similar results can be shown with the unstandardized regression coefficients.

Often enough, redundancy among predictor variables is difficult to avoid. The view advanced here is that, when possible, redundancy in the predictors should be minimized. We should refrain from using items that ask "How stressed are you by student fighting?" Similarly, we should refrain from using summated stressor scales that depend on participants' ratings of stressor negativity (e.g., Bhagat et al., 1985; Brief et al., 1988). When we covary for prior psychological distress, the stress scale will lose power to predict future psychological distress. The penalty for avoidable redundancy will typically be reduced effect sizes and, concomitantly, lower power. The aim in constructing work-environment measures that were based on neutral self-reports (in contrast to the more traditional "How stressed are you?" measures) was to reduce redundancy in the work-environment and preemployment distress scales.

It is worth reiterating here that redundancy has an opposite effect in the case of cross-sectional correlations between "How stressed are you?" measures of the work environment and summated stressor-rating scales, on one hand, and psychological distress, on the other. As mentioned earlier, cross-sectional correlations (or lagged correlations without a distress covariate) are likely to be overestimates because of the content overlap in the measures. The correlation coefficient is inflated because both predictor and predicted variables reflect psychological distress.

¹The focal concern of this discussion is how commonly found redundancy can weaken effect sizes. Other less common conditions can arise such as one in which r_{yx_1} , and $r_{x_1x_2}$ are positive; however, the product of r_{yx_2} and $r_{x_1x_2}$ is large enough to make the numerator [$r_{yx_1} - r_{yx_2}r_{x_1x_2}$] negative, forcing β_1 to be negative, the sign opposite the sign of the zero-order relation (r_{yx_1}). See Cohen and Cohen (1983) for a discussion of various patterns of association in the regression context.

Another advantage of developing measures that reduce redundancy is that such measures enable investigators to test models of reciprocal causation. Two-stage least squares (Kenny, 1979) and reciprocal LISREL (Jöreskog & Sörbom, 1989) models require instrumental variables. Instrumental variables are factors that explain one causal variable but are relatively independent of another causal variable of interest (Kenny, 1979). For example, in an earlier study (see Figure 1) Time 0 (preemployment) depressive symptoms were significantly related to Time 1 (fall) depressive symptoms but were uncorrelated with the Time 1 school environment measures (Schonfeld & Ruan, 1991). Thus, the Time 0 symptoms measure was used as an instrumental variable in a causal

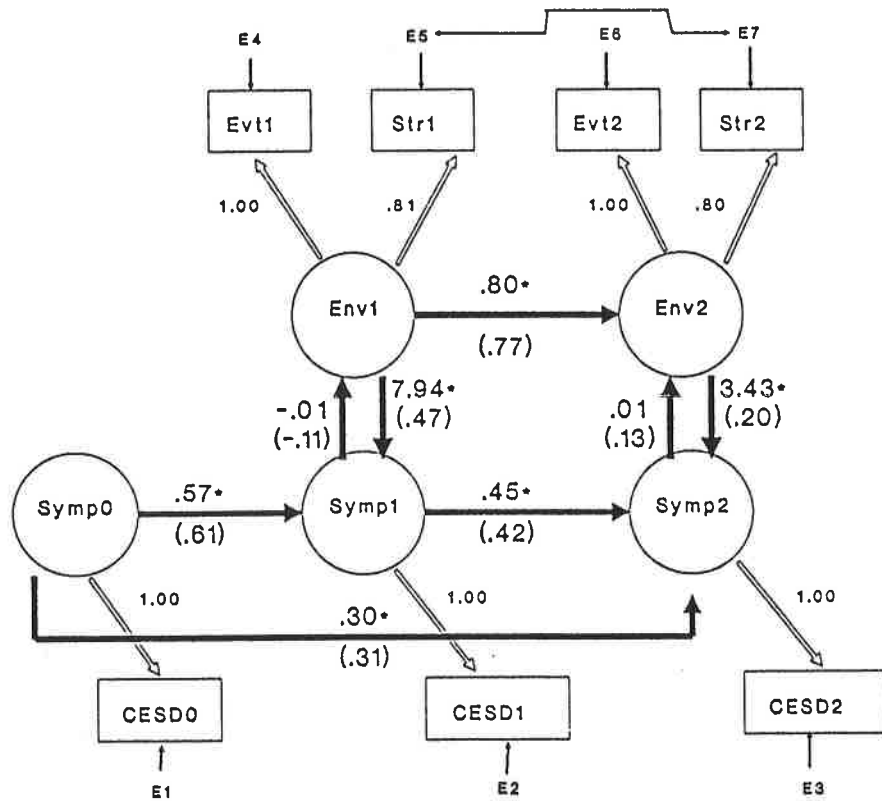


Figure 1. LISREL-generated path diagram depicting reciprocal relations between depressive symptoms and school work environments. Symp0, Symp1, and Symp2 represent depressive symptoms in the summer, fall, and spring, respectively, adjusted for measurement error; CESD0, CESD1, and CESD2 represent raw scores on the Center for Epidemiologic Studies-Depression Scale. Env1 and Env2 represent adversity in the school environment in the fall and spring. Evt1 and Evt2 represent fall and spring scores on the Event Inventory, a measure of episodically occurring job stressors; Str1 and Str2 represent fall and spring scores on the Strain Inventory, a measure of ongoing job stressors. Unstandardized coefficients are presented above each path, and standardized coefficients are presented below each path in parentheses. Asterisks indicate a significant causal path ($p < .001$). From Schonfeld and Ruan, 1991. Reprinted with permission.