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Short-Term Effects of Occupational Stressors on Daily Mood and Health Complaints

Rena L. Repetti

This article related daily changes in 2 job conditions, workload and social interaction with co-workers and supervisors, to daily mood and health complaints. Fifty-two air traffic controllers (ATCs) completed measures of subjective well-being and perceived job conditions on 3 consecutive days; objective indicators of daily workload (air traffic volume and visibility at the airport) were also obtained. The results indicate that increases in job stressors are associated with a same-day deterioration in physical and psychological well-being. On days in which workload was perceived to be high, ATCs reported more health complaints and moods that were more negative and less positive. On days in which there was greater air traffic volume (objectively measured), ATCs reported moods that were more negative. On days in which interactions with co-workers and supervisors were described as more distressing, ATCs reported moods that were more negative and less positive.

Key words: occupational stress, mood, health complaints, workload, social interaction, daily stress

Empirical evidence suggests that stress associated with two occupational conditions, workload and the social environment at work, plays a significant role in the development of physical and mental health problems (Repetti, 1993). For example, employee reports of interpersonal conflict or a lack of social support at work have been linked to a variety of indicators of poor health—including increased hospitalization days (Hibbard & Pope, 1985); more episodes of illness, viral infections, and injuries (Rose, Jenkins, & Hurst, 1978); coronary heart disease symptoms and events (Haynes, Eaker, & Feinleib, 1984; Medalie et al., 1973); elevated diastolic blood pressure (Matthews, Cottington, Talbott, Kuller, & Siegel, 1987) and elevated heart rate and systolic blood pressure (Unden, Orth-Gomer, & Elofsson, 1991)—and to various somatic complaints such as stomach problems and headaches (Holahan & Moos, 1982; House & Wells, 1978; Karasek & Theorell, 1990; LaRocco, House, & French, 1980). Impaired social relations at work, particularly nonsupportive relationships, have also been linked to symptoms of psychological distress, such as depression and anxiety (Billings & Moos, 1982; Golding, 1989; Karasek & Theorell, 1990; LaRocco, et al., 1980; Repetti, 1987; Repetti, Matthews, & Waldron, 1989).

Overloads at work also appear to directly increase a worker's risk for adverse physical and mental health outcomes. A high level of perceived workload has been linked to general health complaints, such as headaches and fatigue (Barnett, Davidson, & Marshall, 1991; Karasek & Theorell, 1990; Landsbergis, 1988; Steffy, Jones, & Noe, 1990); to increased excretion of adrenaline and noradrenaline (Lundberg, Granqvist, Hansson, Magnusson, & Wallin, 1989); and to symptoms of psychological distress (Bromet, Dew, Parkinson, & Schulberg, 1988; Estryn-Behar et al., 1990; Karasek & Theorell, 1990; Landsbergis, 1988). In one study, air traffic controllers (ATCs) with high levels of anxiety and those with high levels of depression had greater objectively measured workloads (Rose et al., 1978).

Time Frame

Whether through the use of cross-sectional or longitudinal designs, the question of how stress at work affects health has typically been framed in terms of the long-term health consequences of chronically stressful conditions. An alternative approach focuses on short-term changes in psychological and physical health that are associated with daily variability in job stressors.

Evidence suggests that physiological arousal is one response to short-term increases in workload. Using objective indicators of ATCs' daily workload, Rose and his colleagues (1978) found that systolic blood pressures increased on high workload days. There is also evidence of increased blood pressure and heart rate during the more demanding periods of a paramedic's workday, such as while at the scene of an emergency or at the hospital (Jamner, Shapiro, Goldstein, & Hug, 1991). Some Swedish research suggests that excessive overtime is associated with increased adrenaline excretion and elevated heart rate, both during the day at work and in the evenings at home (Frankenhaeuser, 1981; Lundberg & Palm, 1989). Employed persons may also engage in more unhealthy behaviors that can increase arousal, such as cigarette smoking and coffee drink-

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Correspondence concerning this article should be addressed to Rena L. Repetti, Department of Psychology, Franz Hall, University of California, 405 Hilgard Avenue, Los Angeles, California 90024-1563.

ing, on days in which workload is perceived to be high (Conway, Vickers, Ward, & Rahe, 1981).

Mood appears to fluctuate in accordance with variability in both workload and social interaction at work. Stone (1987) computed average within-subject correlations between daily events and mood (on the basis of data collected over 3 to 4 months) and found that more negative mood and less positive mood were reported on days when a subject experienced "negative emotional interactions" (p. 57) at work. More distressed mood states also have been reported by subjects on days when they perceive a high workload, as well as during the high-demand periods of a single workday (Bolger, DeLongis, Kessler, & Schilling, 1989; Jamner et al., 1991; Stone, 1987).

To summarize, on the basis of the limited available evidence, it appears that increased workload is associated with short-term increases in physiological arousal and distressed mood. Mood seems to also be affected on days marred by negative emotional interactions at work. Better information about short-term responses to job stressors may improve our understanding of the processes underlying the known long-term health consequences of job stress.

The Present Study

In the present study, I examined the association between increases in stress at work and short-term changes in subjective well-being in a sample of ATCs over a 3-day period. Short-term changes are best addressed through a within-subjects design that removes the effects of stable individual differences. This is an especially important control in studies of work place social support because personality characteristics may influence perceptions of support (Connell & D'Augelli, 1990). The analytic strategy used here removed all person-level or between-subjects variance before assessing the association between daily job conditions and well-being. The remaining within-subject variability in daily-report data was examined to address two questions: (a) How do mood reports and health complaints change in response to daily fluctuations in two conditions at work: the quality of social interaction with co-workers and supervisors and the level of workload, and (b) with regard to the effects of workload, does subjective well-being change in response to variations in objective workload, or are the effects limited to perceptions of overload?

By focusing on a circumscribed occupational group, daily variability in two specific job dimensions—social interaction and workload—can be examined while controlling for other job and employee characteristics. ATCs were selected because they were in a high-stress occupation, their workload could vary quite a bit from day to day, and objective measures of ATC workload were available.

Method

Participants and Procedures

All of the ATCs working at a major international airport in the United States ($N = 87$) were invited to participate in the study. Out of the 67 ATCs (77%) who volunteered, 52 (78%) remained in the study long enough to participate in the daily-report phase. The demographic characteristics of those who contributed daily reports were representative of the total population of ATCs working at the airport. That is, the majority were young (average age was 34 years; 79% were under 40 years of age), White (87%), male (77%), and well educated (88% had some college education; 36% had a college-level degree), had above-average incomes (86% earned over $40,000; mean annual salary in 1986 was $50,000–$60,000), and were either married or living with someone in a long-term relationship (73%).

Each participant completed reports on 3 consecutive days. He or she received three daily-report surveys and written instructions a few days before the first daily-report day, which had been selected during an earlier telephone interview. Reminder telephone calls were made on the first evening and, if the ATC wished, on the next two evenings. Participants were instructed to complete a daily-report survey each night before going to bed and to seal it immediately in the envelope provided. Data from the 52 participants were collected over a 6-month period.

Measures of Daily Occupational Stressors

Negative Social Interaction at Work, a 32-item scale included in the daily-report surveys, was adapted from a measure developed in another study (Repetti, 1987). Respondents rated 16 adjectives twice on a scale ranging from *rarely* or *never* (1) to *almost always* (4) to describe how they had felt during interactions (a) with co-workers and (b) with supervisors each day. Nine adjectives described positive social experiences (e.g., feeling respected, appreciated, or cared about), and seven adjectives described unpleasant social experiences (e.g., feeling tense, annoyed, or resentful). Ratings of interactions with co-workers and supervisors were combined in a single score. High scores indicated that more negative and less positive feelings were experienced during social interactions at work that day. As in the previous study, here the scale demonstrated good internal consistency ($\alpha = .94$) and concurrent validity using standard measures of social support at work and satisfaction with social relations at work.[1]

Four measures of daily workload were included in the study, two factor-based measures of perceived workload and two objective measures. The Difficult Conditions scale ($\alpha = .74$) was a three-item scale that assessed the ATC's perception of weather and traffic conditions at the airport during his or her shift that day (e.g., "We had the kind of weather conditions I would like to have every day at work"). The Busy Day scale ($\alpha = .81$) was a five-item subjective rating of the amount and pace of workload that day (e.g., "It was a very busy shift"). For both measures, ATCs used a 4-point response scale to rate the accuracy of each statement; high scores indicated a perception of greater workload on that day.

The two objective measures assessed daily weather and traffic conditions at the airport. Less visibility around the airport and greater air traffic volume increase an ATC's workload. Low Visibility, the average visibility during the ATC's shift, was based on hourly weather observations made at the airport by the National Climatic Data Center. The score was the average visibility multiplied by -1, so that high scores would indicate lower visibility or greater workload. High Traffic Volume was the total number of aircraft handled at the airport on each day. It included takeoffs, landings, overflights, and so

[1] Individuals' mean scores for Negative Social Interaction at Work (i.e., their averaged daily ratings) correlated significantly with their ratings, taken weeks earlier, of supervisor support ($r = -.39, p \leq .001$) and co-worker support ($r = -.46$, $p \leq .001$) on scales developed by Caplan, Cobb, French, Harrison, and Pinneau (1975). They also correlated with scores obtained weeks after the daily reports from Hackman's (1980) Job Diagnostic Survey measures of satisfaction with supervisors ($r = -.52$, $p \leq .001$) and satisfaction with general social relations at work ($r = -.43, p \leq .001$).

on, and was based on Federal Aviation Administration daily summary records. The subjective and objective measures of daily workload were moderately correlated ($rs = .20–.35, p \leq .05$).[2]

Measures of Daily Physical and Mental Well-Being

Daily Health Complaints was an 11-item checklist of minor physical symptoms (e.g., headaches, stomach pains, and back pain). Daily responses ranged from no complaints reported (33.6%) to four symptoms checked (5.4%). Most ATCs (65%) reported an average of one or more symptoms each day. Several longitudinal studies provide evidence for the validity of self-report measures of health. Both reports of symptoms and ratings of overall health have been found to be good predictors of mortality, even with controls for standard risk factors (Kaplan & Camacho, 1983; Waldron, Herold, & Dunn, 1982).

A factor analysis of 18 mood adjectives, some taken from Nowlis's (1965) scale and some added by me, resulted in two measures of daily mood. ATCs used a 3-point response scale to rate how well each adjective described their mood after work that day. I factor analyzed the mood adjective ratings using principal-axis factor analysis with varimax rotation. Factors with eigenvalues greater than 1 were used to create factor-based scales in which each item was weighted equally. An item was retained as a measure of a factor if its correlation with that factor was greater than or equal to .40 and its correlation with the other factors was less than .40. The resulting two factor-based scales were Daily Positive Mood ($\alpha = .78$), a 6-item scale (e.g., playful, energetic, and kindly), and Daily Negative Mood ($\alpha = .87$), a 10-item scale (e.g., tense, sad, nervous, and frustrated). Same-day scores on the two scales were significantly correlated ($r = -.41, p \leq .0001$).

Results

Comparisons of High- and Low-Stress Days at Work

Table 1 contains mean daily physical and mental well-being scores on days of highest and of lowest stress. Highest and lowest stress days were first identified for each ATC on each of the five occupational-stress measures. The ATC then contributed well-being data from 1 day to each high-stress condition (i.e., out of his or her 3 days, the 1 with the highest score on that occupational-stress scale) and well-being data from another day to each low-stress condition (i.e., out of his or her 3 days, the 1 with the lowest score on that occupational-stress scale). Mean negative mood was significantly greater on high-stress days identified by four of the five measures of occupational stress, including the objective measure of traffic volume. Positive mood was significantly lower on the days that the ATCs described more distressing social interactions at work. More health complaints were reported on days of distressing social interactions and on days when ATCs appraised weather and traffic conditions as more difficult. In a marginally significant result, ATCs also reported more minor physical symptoms on objectively identified highest traffic-volume days.

Multiple Regression Analysis

Data from all 3 days were included in a multiple regression analysis to assess the within-subject association between each daily occupational stressor and day-to-day changes in each of the subjective well-being outcomes. The basic regression model was

$$Y_{ij} = (b_1 SUBJ_1 + \ldots + b_n SUBJ_n) + bX_{ij},$$

where Y_{ij} was the well-being outcome score for respondent j on day i, the dummy variable $SUBJ_j$ equaled 1 for respondent j and 0 otherwise, and X_{ij} was the job stressor score for respondent j on day i (Cohen & Cohen, 1975; Repetti, 1989). The regression coefficients (bs) were estimated with least squares.

The regression model separated within-subjects and between-subjects variance. Between-subjects variance (effects and errors) was controlled by the set of dummy variables, one for each subject ($SUBJ_1 \ldots SUBJ_n$). (This necessitated exclusion of a constant to prevent perfect multicollinearity.) Because all variance that was due to person factors, or individual differences, had been removed by the dummy variables, this procedure controlled for each ATC's tendency, over 3 days, to respond to the daily-report scales in a particular way. Thus, once the set of dummy variables had been entered, the well-being outcome being predicted was that particular day's deviation from the subject's baseline level of the outcome or his or her 3-day average. After controlling for the dummy variables, data from each daily-report day were treated as independent observations. That is, the residuals were independent at the cost of losing $n + 1$ degrees of freedom in fitting $n + 1$ coefficients. This regression model was similar but superior to an averaging of within-subject correlations, because it provided unbiased statistical inferences and more powerful estimators. In summary, the regression model represented a within-subjects design exploring the determinants of day-to-day fluctuations in well-being.

Occupational Stressors and Daily Changes in Mood

The results of the multiple regression analyses testing the relation between occupational stressors and mood are presented in Table 2. First, for each mood outcome, five separate regressions were performed in which one of the five measures of a daily occupational stressor was the main predictor variable. Before examining the contribution of the daily occupational stressor, all of the between-subjects variance in the daily-mood scores was controlled by the set of dummy variables. Out of the total variance in daily-positive-mood scores, 53% was between-subjects variance, and out of the total variance in daily-negative-mood scores, 65%–66% was between-subjects variance.

After controlling for between-subjects variance, daily variability in social interaction at work was significantly associated with day-to-day changes in both positive- and negative-mood outcomes. Both measures of perceived workload were significantly related to daily fluctuations in negative mood, and one of the perceived-workload measures, Difficult Conditions, was

[2] There were significant same-day correlations between Low Visibility and the perceived-workload scales (Difficult Conditions: $r = .30$, $p \leq .001$; Busy Day: $r = .26$, $p \leq .001$) and between High Traffic Volume and the perceived-workload scales (Difficult Conditions: $r = .20, p \leq .05$; Busy Day: $r = .35, p \leq .0001$). See Repetti (1989) for more information about the measures of daily workload.

Table 1
Well-Being Scores on High- and Low-Stress Days at Work

Well-being outcome	Occupational-stress measure	Well-being score: High-stress-days *M*	Well-being score: Low-stress-days *M*	*t*[a]
Negative mood	Negative social interaction	1.50	1.34	2.46*
	Difficult conditions	1.45	1.33	2.26*
	Busy day	1.50	1.33	2.71**
	High traffic volume	1.50	1.35	2.20*
	Low visibility	1.44	1.37	1.19
Positive mood	Negative social interaction	1.75	2.08	−5.05***
	Difficult conditions	1.84	1.97	−1.47
	Busy day	1.87	1.95	−0.87
	High traffic volume	1.92	1.92	−0.07
	Low visibility	1.96	1.88	0.90
Health complaints	Negative social interaction	1.50	0.92	4.00***
	Difficult conditions	1.41	0.95	2.28*
	Busy day	1.39	1.11	1.57
	High traffic volume	1.52	1.18	1.82†
	Low visibility	1.25	1.34	−0.48

Note. $n = 44$–50 within each group of high- and low-stress days.
[a]Paired-samples *t*-tests comparing the air traffic controllers' well-being scores on the highest and the lowest stress days.
†$p \leq .10$. *$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

significantly related to daily fluctuations in positive mood. One of the objective measures of daily workload predicted changes in mood: Greater traffic volume at the airport was associated with a significant daily increase in negative mood over the person's baseline level. To summarize, on days in which interactions with co-workers and supervisors were described as more disturbing and less pleasurable and on days in which workload was perceived to be high, ATCs' descriptions of their moods were more negative and less positive than their average mood scores. There was also support for a short-term association between actual traffic volume and negative mood.

Because there could be a confounding between the perception of a heavy workload and perceived negative social interactions, a regression analysis was performed in which the daily-social-interaction scale and the two daily measures of perceived workload were added simultaneously as predictor variables. The results of that analysis are reported in the last four rows of Table 2. Even after controlling for daily variability in ATC workload, social interaction at work remained significantly associated with that day's positive and negative mood. Perceived workload predicted changes only in positive mood; ATCs reported less positive mood on days in which weather and traffic conditions were described as unfavorable.

Occupational Stressors and Daily Changes in Health Complaints

Results of multiple regression analyses testing the relation between each daily job stressor and changes in minor physical symptoms are presented in the first five rows of Table 3. Watson and Pennebaker (1989) have suggested that health-complaint scales actually assess two factors, one that is related to objective health status and another that is more subjective and psychological. In within-subject analyses, daily physical complaints were found to be significantly correlated with both positive affect and negative affect (Watson, 1988). Similarly, in this sample of ATCs, when the health-complaints scores were separately regressed onto the positive- and negative-mood scores, there were significant or marginally significant associations between daily fluctuations in Daily Health Complaints and both Positive Mood ($\beta = -.24$, $p = .01$) and Negative Mood ($\beta = .21$, $p = .06$). Evidence also suggests that negative affect may inflate correlations between ratings of certain stressful events, in particular those involving interpersonal relations at work, and physical symptoms (Brett, Brief, Burke,

Table 2
Results of 12 Multiple Regressions Predicting Daily Fluctuations in Mood From Day-to-Day Changes in Job Stressors

Daily occupational stressors	Daily Positive Mood: Total[a] R^2	Daily Positive Mood: β[b]	Daily Negative Mood: Total[a] R^2	Daily Negative Mood: β[b]
1. Negative Social Interaction	.58***	−.53***	.71***	.45**
Perceived Workload				
2. Difficult conditions	.56***	−.23*	.68***	.19*
3. Busy Day	.53**	−.01	.68***	.19*
Objective Workload				
4. High Traffic Volume	.53***	−.06	.67***	.21*
5. Low Visibility	.53***	.12	.67***	.12
6. Combined Daily Job Stressors	.60***		.72***	
Negative Social Interaction		−.48**		.40**
Difficult Conditions		−.22*		.08
Busy Day		.12		.13

Note. $n = 146$–149 days.
[a]Total variance in daily mood accounted for by each regression. Total R^2 includes all between-subjects variance in mood (53% for positive mood and 65%–66% for negative mood), as well as the variance explained by the daily-occupational-stressor variable(s). [b]Standardized beta for the occupational-stressor predictor variable.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Table 3
Results of Six Multiple Regressions Predicting Daily Fluctuations in Health Complaints From Day-to-Day Changes in Job Stressors

Daily occupational stressors	Daily Health Complaints	
	Total[a] R^2	β[b]
1. Negative Social Interaction	.64***	.29†
Perceived workload		
2. Difficult Conditions	.65***	.25**
3. Busy Day	.64***	.16†
Objective workload		
4. High Traffic Volume	.63***	.12
5. Low Visibility	.63***	.06
6. Combined daily job stressors	.66***	
Negative Social Interaction		.25
Difficult Conditions		.21*
Busy Day		.07

Note. n = 146–149 days.
[a]Total variance in daily health complaints accounted for by each regression. Total R^2 includes all between-subjects variance in health complaints (59%), as well as the variance explained by the daily-positive- and negative-mood scores and the variance explained by the daily-occupational-stressor variable(s). [b]Standardized beta for the occupational-stressor predictor variable.
†$p \leq .10$. *$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

George, & Webster, 1990). To avoid overestimating the association between daily job stress and health symptoms in this study, all of the regression analyses reported in Table 3 included controls for daily positive and negative mood. The following regression equation was used for Table 3:

$$Y_{ij} = (b_1SUBJ_1 + \ldots + b_nSUBJ_n) + bPM_{ij} + bNM_{ij} + bX_{ij},$$

where PM_{ij} is the Positive Mood score for respondent j on day i and NM_{ij} is the Negative Mood score for respondent j on day i.

Of the total variance in daily-health-complaint scores, 59% was between-subjects variance. The results of the regression analyses showed that after controlling for all of the between-subjects variance and for daily mood, the relation between daily fluctuations in social interaction at work and minor physical symptoms was marginally significant, though in the predicted direction. Perceived workload was a stronger predictor. Daily increases in health complaints were significantly associated with subjective perceptions of difficult weather and traffic conditions and were marginally associated with the perception of a fast pace on shift that day. Neither of the objective workload measures was significantly associated with health complaints. The results of a regression analysis in which the daily-social-interaction measure and the two daily-perceived-workload scales were included simultaneously as predictors are presented in the last four rows of Table 3. The measure of perceived weather and traffic conditions was the only significant predictor of health complaints. Thus, a high level of perceived workload was associated with a short-term increase in self-reported physical symptoms, after controlling for the person's mood and the quality of his or her social experiences at work that day.

The regression analyses reported in Table 3 were repeated without controls for positive and negative mood. The only findings that differed from those presented above involved the Negative Social Interaction scale. In both cases (the one in which social interaction was the sole predictor and the one in which social interaction was combined with the workload predictors), more distressing interactions with co-workers and supervisors were associated with a significant increase in symptom reports when daily mood was not controlled in the analysis. The significance levels of the betas for perceived (and objective) workload remained the same. Thus, the relationship between daily perceived workload and health complaints did not appear to be affected by daily mood levels, but the relationship between daily social interaction and health complaints did appear to be affected by mood.

Discussion

The results reported here indicate that daily increases in job stressors are related to short-term changes in subjective well-being. On days when interactions with co-workers and supervisors were described as more distressing, ATCs described moods that were more negative and less positive than their baseline or average mood states. On days when workload was perceived to be high, they reported both more distressed mood and more health complaints than usual. In addition, daily increases in objectively measured workload were associated with more negative moods.

Daily Health Complaints as an Outcome

The same-day link between perceptions of more demanding workloads and reports of more minor physical symptoms, such as more headaches and stomach pains, parallels earlier findings of short-term increases in adrenaline excretion, heart rate, and unhealthy behaviors when workload is perceived to be high (Conway et al., 1981; Frankenhaeuser, 1981; Lundberg & Palm, 1989). Thus, a subjective experience of physical discomfort may accompany the previously observed physiological and behavioral correlates of perceptions of increased workload. This finding is noteworthy because it is independent of the ATC's concurrent mood state and his or her perception of social conditions at work that day. Removing variance that is due to daily mood levels eliminates an important potential third-variable account for the association between subjective perceptions of workload and daily health complaints.

The importance of distinguishing between objective and subjective indicators of workload is highlighted by the failure to find a significant association between the two objective measures of workload and daily health complaints. Although increases in physiological arousal have been measured during independently defined high-workload periods (Jamner et al., 1991; Rose et al., 1978), the present results suggest that the experience of physical strain occurs only when the person judges conditions at work to be demanding.

The results reported here support Brett et al.'s (1990) findings that negative affect may contaminate the association between some self-reported negative events and physical symptoms. In the present study, controls for daily mood weakened the relation between daily social interaction at work

and health complaints but did not weaken the relation between daily workload and health complaints. Brett et al. also found that reports of troubled interpersonal relations at work were contaminated by negative affectivity but that reports of increased workload were not contaminated.

Daily Mood as an Outcome

In contrast to the findings for physical symptoms, a higher objective workload was associated with a same-day increase in negative mood. The significant association between daily traffic volume at the airport and negative mood is important because it is not easily explained by reverse causality or by a third variable. It suggests that previously reported correlations between perceptions of overloads at work and distressed mood represent more than the confounding inherent in subjective data. Although there need to be additional tests of a link between objective measures of daily workload and mood, this initial result suggests that short-term increases in negative mood may play a role in the long-term mental health outcomes that have been reported, such as Rose et al.'s (1978) finding of a positive association between ATCs' objective workloads and their overall levels of depression and anxiety.

This study replicates earlier findings that daily mood fluctuates along with changes in subjective perceptions of both workload and social interaction at work. Although they did not report results separately for job stressors, Bolger et al. (1989) did find evidence of a general "rebound effect," (p. 812) or improvement in mood on the day after a stressful event. Unfortunately, because of the limited statistical power associated with a sample of only 3 daily-report days from each participant in this study, it was impossible to assess the lagged effects of job stressors on mood. Further investigation of delayed mood outcomes, particularly using objective measures of daily job stressors, will contribute to the development of more accurate models that integrate short-term and long-term processes.

Finally, the results reported here appear to be consistent with Bolger et al.'s (1989) suggestion that the effect of interpersonal relations on daily mood may be even stronger than the effect of perceived workload. Note, however, the previously reported finding that mood seems to contaminate the reporting of interpersonal events more than the reporting of workload. Other research indicates that induced negative mood may affect perceptions of social experience, such as the perception of the availability of social support (Cohen, Towbes, & Flocco, 1988). Thus, a stronger association between interpersonal factors at work and daily mood may also reflect the effect that mood has on perceptions of social interaction, in addition to the effect of social interaction on mood.

Conclusion

Studies of daily stress and well-being offer a microscopic look at short-term processes with long-term implications for health. The findings reported here indicate that employed people describe changes in physical and psychological comfort that correlate with daily increases in stress at work. It may be informative to link what is learned about the effects that stressors have on subjective well-being to findings about short-term behavioral changes in response to job stress. For example, in this sample of ATCs, daily increases in workload were followed by social withdrawal at home (Repetti, 1989). More cigarette smoking and coffee drinking have also been observed on high-workload days (Conway et al., 1981). It is possible that both types of behavior represent attempts to cope in the short-run with the physical and psychological distress that result from work overload. The study of changes in subjective well-being and the behavioral adjustments that accompany short-term increases in job stressors should provide critical information about the processes that underlie the long-term health consequences of occupational stressors and about adaptive and maladaptive strategies for coping with job stress.

References

Barnett, R. C., Davidson, H., & Marshall, N. L. (1991). Physical symptoms and the interplay of work and family roles. *Health Psychology, 10,* 94–101.

Billings, A. G., & Moos, R. H. (1982). Work stress and the stress-buffering roles of work and family resources. *Journal of Occupational Behavior, 3,* 215–232.

Bolger, N., DeLongis, A., Kessler, R. C., & Schilling, E. A. (1989). Effects of daily stress on negative mood. *Journal of Personality and Social Psychology, 57,* 808–818.

Brett, J. F., Brief, A. P., Burke, M. J., George, J. M., & Webster, J. (1990). Negative affectivity and the reporting of stressful life events. *Health Psychology, 9,* 57–68.

Bromet, E. J., Dew, M. A., Parkinson, D. K., & Schulberg, H. C. (1988). Predictive effects of occupational and marital stress on the mental health of a male workforce. *Journal of Organizational Behavior, 9,* 1–13.

Caplan, R. D., Cobb, S., French, J. R. P., Harrison, R. V., & Pinneau, S. R. (1975). *Job demands and worker health* (Publication No. NIOSH 75-160). Washington, DC: U.S. Department of Health, Education, and Welfare.

Cohen, J., & Cohen, P. (1975). *Applied multiple regression/correlation analysis for the behavioral sciences.* Hillsdale, NJ: Erlbaum.

Cohen, L. H., Towbes, L. C., & Flocco, R. (1988). Effects of induced mood on self-reported life events and perceived and received social support. *Journal of Personality and Social Psychology, 55,* 669–674.

Connell, C. M., & D'Augelli, A. R. (1990). The contribution of personality characteristics to the relationship between social support and perceived physical health. *Health Psychology, 9,* 192–207.

Conway, T. L., Vickers, R. R., Ward, H. W., & Rahe, R. H. (1981). Occupational stress and variation in cigarette, coffee, and alcohol consumption. *Journal of Health and Social Behavior, 22,* 155–165.

Estryn-Behar, M., Kaminski, M., Peigne, E., Bonnet, N., Vaichere, E., Gozlan, C., Azoulay, S., & Giorgi, M. (1990). Stress at work and mental health status among female hospital workers. *British Journal of Industrial Medicine, 47,* 20–28.

Frankenhaeuser, M. (1981). Coping with stress at work. *International Journal of Health Services, 11,* 491–510.

Golding, J. M. (1989). Role occupancy and role-specific stress and social support as predictors of depression. *Basic and Applied Social Psychology, 10,* 173–195.

Hackman, R. (1980). Appendix A. In *Work redesign* (pp. 275–294). Reading, MA: Addison-Wesley.

Haynes, S. G., Eaker, E. D., & Feinleib, M. (1984). The effect of employment, family, and job stress on coronary heart disease. In

E. B. Gold (Ed.), *The changing risk of disease in women: An epidemiologic approach* (pp. 37–48). Lexington, MA: Heath.

Hibbard, J. H., & Pope, C. R. (1985). Employment status, employment characteristics, and women's health. *Women & Health, 10,* 59–77.

Holahan, C. J., & Moos, R. H. (1982). Social support and adjustment: Predictive benefits of social climate indices. *American Journal of Community Psychology, 10,* 403–415.

House, J. S., & Wells, J. A. (1978). Occupational stress, social support, and health. In A. McLean, G. Black, & M. Colligan (Eds.), *Reducing occupational stress: Proceedings of a conference* (Publication No. 78-140, pp. 8–29). Washington, DC: U.S. Government Printing Office.

Jamner, L. D., Shapiro, D., Goldstein, I. B., & Hug, R. (1991). Ambulatory blood pressure and heart rate in paramedics: Effects of cynical hostility and defensiveness. *Psychosomatic Medicine, 53,* 393–406.

Kaplan, G. A., & Camacho, T. (1983). Perceived health and mortality: A nine-year follow-up of the human population laboratory cohort. *American Journal of Epidemiology, 117,* 292–304.

Karasek, R., & Theorell, T. (1990). *Healthy work: Stress, productivity and the reconstruction of working life.* New York: Basic Books.

Landsbergis, P. A. (1988). Occupational stress among health care workers: A test of the job demands–control model. *Journal of Organizational Behavior, 9,* 217–239.

LaRocco, J. M., House, J. S., & French, J. R. P. (1980). Social support, occupational stress, and health. *Journal of Health and Social Behavior, 21,* 202–218.

Lundberg, U., Granqvist, M., Hansson, T., Magnusson, M., & Wallin, L. (1989). Psychological and physiological stress responses during repetitive work at an assembly line. *Work and Stress, 3,* 143–153.

Lundberg, U., & Palm, K. (1989). Workload and catecholamine excretion in parents of preschool children. *Work and Stress, 3,* 255–260.

Matthews, K. A., Cottington, E. M., Talbott, E., Kuller, L. H., & Siegel, J. M. (1987). Stressful work conditions and diastolic blood pressure among blue collar factory workers. *American Journal of Epidemiology, 126,* 280–291.

Medalie, J. H., Snyder, M., Groen, J. J., Neufeld, H. N., Goldbourt, U., & Riss, E. (1973). Angina pectoris among 10,000 men. *American Journal of Medicine, 55,* 583–594.

Nowlis, V. (1965). Research with the Mood Adjective Check List. In S. Tomkins & C. Izard (Eds.), *Affect, cognition and personality* (pp. 352–389). New York: Springer.

Repetti, R. L. (1987). Individual and common components of the social environment at work and psychological well-being. *Journal of Personality and Social Psychology, 52,* 710–720.

Repetti, R. L. (1989). Effects of daily workload on subsequent behavior during marital interaction: The roles of social withdrawal and spouse support. *Journal of Personality and Social Psychology, 57,* 651–659.

Repetti, R. L. (1993). The effects of workload and the social environment at work on health. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress* (2nd ed., pp. 368–385). New York: Free Press.

Repetti, R. L., Matthews, K. A., & Waldron, I. (1989). Employment and women's health: Effects of paid employment on women's mental and physical health. *American Psychologist, 44,* 1394–1401.

Rose, R. M., Jenkins, C. D., & Hurst, M. V. (1978). *Air traffic controller health change study* (FAA Report No. AM-78-39). Washington, DC: Federal Aviation Administration.

Steffy, B. D., Jones, J. W., & Noe, A. W. (1990). The impact of health habits and life-style on the stressor–strain relationship: An evaluation of three industries. *Journal of Occupational Psychology, 63,* 217–229.

Stone, A. A. (1987). Event content in a daily survey is differentially associated with concurrent mood. *Journal of Personality and Social Psychology, 52,* 56–58.

Unden, A., Orth-Gomer, K., & Elofsson, S. (1991). Cardiovascular effects of social support in the work place: Twenty-four-hour ECG monitoring of men and women. *Psychosomatic Medicine, 53,* 50–60.

Waldron, I., Herold, J., & Dunn, D. (1982). How valid are self-report measures for evaluating relationships between women's health and labor force participation? *Women & Health, 7,* 53–66.

Watson, D. (1988). Intraindividual and interindividual analyses of positive and negative affect: Their relation to health complaints, perceived stress, and daily activities. *Journal of Personality and Social Psychology, 54,* 1020–1030.

Watson, D., & Pennebaker, J. W. (1989). Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychological Review, 96,* 234–254.