

## Effects of Daily Stress on Negative Mood

Niall Bolger  
University of Michigan

Anita DeLongis  
University of British Columbia  
Vancouver, British Columbia, Canada

Ronald C. Kessler and Elizabeth A. Schilling  
University of Michigan

This article examines the influence of daily stressors on mental health in a community sample. Six hundred and sixteen married couples who completed diaries each day for 6 weeks. In pooled within-person analyses, daily stressors explained up to 20% of the variance in mood. Interpersonal conflicts were by far the most distressing events. Furthermore, when stressors occurred on a series of days, emotional habituation occurred by the second day for almost all events except interpersonal conflicts. Contrary to certain theoretical accounts, multiple stressors on the same day did not exacerbate one another's effects; rather, an emotional plateau occurred. Finally, on days following a stressful event, mood was better than it would have been if the stressor had not happened. These results reveal the complex emotional effects of daily stressors, and in particular, they suggest that future investigations should focus primarily on interpersonal conflicts.

In recent years, it has become increasingly apparent that minor, everyday stressors influence health and psychological well-being (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Eckenrode, 1984; Kanner, Coyne, Schaefer, & Lazarus, 1981). As a result, there has been a reorientation in stress research from a nearly exclusive emphasis on major events to an appreciation of the significance of minor environmental stressors. These minor stressors (e.g., work deadlines, marital arguments) are an important focus of research because they provide a means of describing the stressful features of enduring relationships (e.g., spouse, friend) and roles (e.g., worker, student).

Despite the growing research interest in minor stressors, work to date has implicitly assumed that all minor stressors are equivalent. This is exemplified by the almost universal practice of aggregating these stressors into a summary measure for analytic purposes. Thus, with one notable exception (Stone, 1987),<sup>1</sup> there have been no studies of the differential effects of minor stressors on health and well-being. This type of aggregation may obscure important variation in the microprocesses underlying psychological well-being. Previous studies of major stressors have demonstrated that stressor disaggregation reveals important variability in effects (e.g., Eckenrode & Gore, 1981; Kessler & McLeod, 1984). Similarly, analyses of coping pro-

cesses show strong variability in responses as a function of stressor type (Mattlin, Wethington, & Kessler, 1988; McCrae, 1984). Therefore, there is reason to suspect that daily stressors have similarly varied effects.

Minor stressors are a recurrent feature of daily life. For this reason it is difficult to establish that they lead to the onset of mood disturbance. Often all that can be shown in conventional nonexperimental research is that enduring everyday stress is associated with enduring poor mental health (e.g., people with poor social relationships tend to be distressed). Clearly, such associations do not rule out the possibility of reverse causation or spuriousness due to third variables. Moreover, there is reason to believe that the measures of minor stress used in many studies are systematically biased because they are based on retrospective reports that can be affected by preexisting emotional impairment (Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984).

A significant breakthrough in the study of minor stress has been the use of daily diaries. These are self-report instruments that are completed each day over a period of several weeks and are designed to record day-to-day variation in stressful events and emotional functioning. These instruments help resolve the retrospective recall problem by allowing respondents to report minor stressors near the time they occur. They also help solve the problem of causal imputation by capturing information about the dynamics of roles and relationships that, in conventional, cross-sectional designs, appear static. Furthermore, be-

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Niall Bolger is now at the University of Denver.

Correspondence concerning this article should be addressed to Ronald C. Kessler, Institute for Social Research, University of Michigan, Ann Arbor, Michigan 48106-1248.

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<sup>1</sup> Stone's (1987) analyses focused on the relative magnitudes of bivariate associations rather than on the multivariate relationships examined in this article. Furthermore, Stone's analyses highlighted the different effects of stressors within various role domains (e.g., negative work events, which combined work overloads with interpersonal conflicts) rather than the substantive domains considered in our analyses. As is discussed later, combining different stressors within the same role domain masks important variations in stressor effects.

cause daily diaries obtain many repeated measurements on the same individuals, they provide the opportunity to study the effects of stress within persons over time, thereby allowing the researcher to rule out temporally stable personality and environmental factors as third-variable explanations.

The literature on daily diaries is quite new. As in other areas of research that have been opened up by methodological innovation, more initial progress has been made in establishing field procedures (Stone & Neale, 1982; Verbrugge, 1980, 1984) and measurement instruments (Stone & Neale, 1982, 1984) than in documenting important empirical associations. This article attempts to move in a more substantive direction by using the diary method to provide basic data on the emotional effects of daily stress.

### Research Questions

This study is based on daily reports of stress obtained over a 6-week period from husbands and wives in a large sample of married couples. In this article, we focused on the individual, rather than the couple, as the unit of analysis. A basic aim of the study was to obtain information on the emotional effects of the various kinds of daily stressors that people most commonly experience. Almost all previous research has either ignored this issue or provided only aggregate information on the effects of stress.

A related research question stems from the fact that daily stressors can cluster in time; for example, spouses may argue on successive days. This suggests that research on daily stress processes should attend to multiday episodes of stress and to their changing effects on well-being as episodes become prolonged. The conventional line of thinking is that the persistence of a stressor over several days increases its emotional impact (Brown & Harris, 1978; Silver & Wortman, 1980). An alternative possibility is that people habituate to the impact of events over time (Marks, 1977). The longitudinal design of this study permits us to test these alternative possibilities in a rigorous manner.

Almost all previous daily stress research has assumed a linear, additive relationship between stress and emotional functioning (e.g., Eckenrode, 1984; Stone, 1987). Yet there is good reason to think that the meanings and effects of particular daily stressors can be modified by the occurrence of other stressors. The notion of role overload, for example, suggests a situation where multiple events within a given role domain (e.g., the combination of a work deadline and an argument with a coworker) have effects greater than the sum of the constituent events. Similarly, the notion of role conflict suggests that an emergent stress is created when overloads occur in two different role domains at the same time (e.g., the occurrence of a work argument on the day one's child becomes ill; see Baruch & Barnett, 1986, for a discussion of these issues). We tested for these interactive effects by examining the cooccurrence of a range of daily stressors.

In summary, this study used a daily diary methodology to obtain information on daily stress from husbands and wives in a representative sample of married couples in a major metropolitan area. We studied the emotional effects of the most commonly occurring daily stressors. We investigated whether these stressors have different effects on mood as stress episodes be-

come prolonged, and we investigated the interactive effects of various combinations of daily stressors.

## Method

### *Design and Sample*

Respondents were men and women in 166 married couples, all of whom had previously participated in a community survey of stress and coping. The original sample consisted of 778 intact couples from the Detroit metropolitan area. The response rate in the original survey was 76%. Of these, we attempted to recontact and recruit 489 couples by telephone to participate in the current study 1 year after the earlier interview (the remaining 289 couples were not called because they had been approached in an earlier study). We were successful in tracing and recruiting only 166 couples in which both spouses agreed to participate. The couple-level response rate was 166 out of 489, or 34%. A response rate this low makes it difficult to think of the sample as superior in any substantial way to the volunteer samples that have been used in many previous daily diary studies (e.g., Lewinsohn & Talkington, 1979; Rehm, 1978; Stone & Neale, 1984). We discuss this limitation later.

Respondents were asked to complete a short daily diary questionnaire on each of 42 consecutive days (6 weeks). Each week they received by mail a diary booklet containing diary forms for each of 7 days. After completing each diary booklet, they mailed it back to the investigators. To maintain confidentiality, diaries were mailed to spouses separately. Also, to guard against spouses seeing one another's diary responses, each mailing included a set of 7 adhesive tabs with the word *confidential* printed on each, and respondents were instructed to seal completed pages of the diary booklet.

Respondents were not paid for their participation, although a \$5 gift was sent along with the first diary booklet. Of the respondents who agreed to participate in the diary phase of the study, 74% completed the full set of 42 diary days, and 89% completed 28 days or more. Data were obtained on 12,054 diary days in all and on 11,578 diary days in which both the husband and wife in a couple reported. We based our analysis on the latter subsample.

Because participants mailed their completed diaries to us weekly rather than daily, we cannot be sure that they actually filled them out on a daily basis. We sought, however, to offset any pressures people might feel to be dishonest about the timing of their reports. We assumed that some people would occasionally forget to fill out their diaries, and we allowed people to fill them out late. When this occurred, we required them to note *when* they eventually filled them out. Eighty percent of the time, people reported filling out the diaries on the appropriate day. Fifteen percent of the time, they reported filling out the diaries 1 day late. Thus, it appears that 95% of reports were completed within 1 day of the target day. Although these reports may not be entirely reliable, our procedure probably lessened pressures to lie about timing.

The low response rate (34%) makes it especially important to compare the diary sample to the larger community sample. Bolger, DeLongis, Kessler, and Wethington (1989a) made such a comparison on a range of background variables obtained in the baseline survey, including age, education, hours worked, number of children, family income, and frequency of marital conflicts. No systematic differences were observed between the groups except in frequency of conflicts. Couples who did not participate in the diary study reported an average of 1.1 marital conflicts per month, whereas those who provided complete diary data reported an average of 0.9 marital conflicts. These means differ significantly at  $p < .05$ . This comparison suggests that the low response rate did not lead to bias in prevalence estimates for daily stressors other than marital conflicts; estimates of marital conflict, however, are biased downward.

## Measures

**Daily stress.** The diary included a checklist of 21 daily events. This list, shown in the Appendix, is based on earlier pilot testing of stressor items in a sample of 64 married couples (see Kessler, DeLongis, Haskett, & Tal, 1988). In the earlier study, we also used an open response format to identify common daily events in this population. We included only those daily stressors—identified by either open- or closed-format methods—that occurred on at least 5% of person-days in the earlier study and were associated with distressed daily mood in a pooled within-person regression analysis (see Equation 1 in the following section).

For the purposes of analysis, checklist responses were aggregated into 10 summary event categories. Two criteria were used. First, we grouped stressors on a rational basis; for instance, we included the items *spouse sick* and *child sick* in a more highly aggregated measure of *family demands*. Our second criterion was that the stressors had to have similar effects on mood in order to be combined. Thus, stressors were grouped together only if they were conceptually similar and had similar effects (magnitude and direction) on mood. We determined comparability of effects in a preliminary regression analysis using all 21 checklist items simultaneously. The regression model we used was identical to that presented in the following section.

The final 10 event categories were as follows: (a) overload at home; (b) overload at work; (c) family demands; (d) other demands (e.g., demands from relatives, friends, or neighbors); (e) transportation problems; (f) financial problems; and interpersonal conflicts or tensions (g) with one's spouse, (h) with one's child, (i) with a single other person, or (j) with multiple other persons on the same day.<sup>2</sup> The relationship of the original 21 stressor items to these 10 categories is shown in the Appendix. Prevalence data for most of these 10 stressor categories were presented in two earlier studies (Bolger, et al., 1989a, 1989b).

**Daily mood.** The diary also included an inventory of 18 mood items from the Affects Balance Scale (Derogatis, 1975) designed to measure anxiety (e.g., nervous, tense, afraid), hostility (e.g., irritable, angry, resentful), and depression (e.g., helpless, worthless, depressed).<sup>3</sup> On the basis of their emotional state over the previous 24 hr, respondents were asked to rate each of the 18 items on a 4-point scale ranging from *not at all* to *a lot*. Responses to all items were combined and rescaled to create a summary measure of distressed mood, which ranged from 0 (all items endorsed *not at all*) to 1 (all items endorsed *a lot*). The scale had high internal consistency (Cronbach's  $\alpha = .91$ ). The mean was .09, and the standard deviation was .14.

## Statistical Model

The analysis of stress effects on daily mood was based on the following statistical model:

$$DM_{it} = b_0 + b_1 S_{1it} + \dots + b_{10} S_{10it} + \text{Controls} + e_{it}, \quad (1)$$

where  $M_{it}$  is the mood score of respondent  $i$  on day  $t$ ,  $S_{nit}$  is a dummy variable indicating whether respondent  $i$  experienced stressor  $n$  on day  $t$  (coded 1 for those who experienced the stressor and 0 for those who did not),  $b_0$  is an intercept,  $b_1$  through  $b_{10}$  are regression coefficients defining the effects of the stressors on mood, and  $e_{it}$  as an error term.

This model is different from a conventional regression equation or time series equation in that it is based on a multilevel data array of  $i$  people, each assessed at  $t$  time points. This means that both within-person and between-persons variation play a role in the unrestricted data structure (Mason, Wong, & Entwistle, 1984). We wanted to focus our analysis, however, on within-person variation and to purge the data of the effects of individual difference variables that create between-persons variation. We accomplished this by subtracting the within-person mean on the dependent variable ( $M_i$ ) from each observed mood score ( $M_{it}$ ) to obtain the residual ( $DM_{it}$ ) that served as the outcome variable.

This procedure converts the analysis into a study of pooled within-person variation (Kessler, 1987), which means that the main effects of all temporally stable variables are unrelated to the outcome variable.

Because our model specifies that stress and mood affect one another within the same time period, the data do not allow us to test the causal relationship between the variables. We assume, however, that the bulk of the relationship between stress and mood is due to a causal effect of stress on mood. We discuss this issue in more depth in the section entitled Limitations.

Control variables were included in the model to adjust for time-varying correlates of stress and mood. These included day of the week (six dummy [0, 1] variables) and the linear and quadratic forms of a variable defining the number of days that had elapsed since the respondent first began filling out the diary. Day of the week was controlled because prior research has documented systematic day-of-the-week variation in mood (e.g., Rossi & Rossi, 1977; Stone, Hedges, Neale, & Satin, 1985). We also know that some events are more likely to occur on particular days of the week (e.g., overloads are more common on work days). Finally, we controlled for length of time in the study in order to capture any common tendency of respondents to change how they filled out the diaries in response to novelty, fatigue, or boredom. Previous work has found that diary respondents report fewer stressors and health problems over time (DeLongis, Folkman, & Lazarus, 1988). We allowed for non-linear change in such effects by including both linear and quadratic forms of this variable.

In preliminary analyses, prior day's mood was controlled to help rule out the otherwise plausible hypothesis that an association between stressful events and mood might come about because of prior mood affecting the subsequent occurrence of stress (e.g., a bad mood can increase the risk of getting into an argument with one's spouse). Because we found no evidence of such effects, we omitted prior day's mood from the final analyses.

Because this is a study of married couples, it is important to note that husbands' and wives' diary observations were not independent. Accordingly, we analyzed data for men and women separately. This approach, however, does not take into account the likelihood that spouses' stressors and moods influenced one another within the same day.<sup>4</sup> Modeling these reciprocal effects requires the use of instrumental variable techniques (Kessler, 1987) and is beyond the scope of this article. By ignor-

<sup>2</sup> There were too few reports of arguments or tensions with particular persons other than one's spouse or child to warrant the creation of separate variables for arguments with other kinds of people. Preliminary analyses of some slightly less aggregated groups—relatives (other than spouse or children), coworkers, friends, and others—failed to document any meaningful variation in effects. Also, it was rare to find a respondent who reported the occurrence of arguments with three or more people on the same day, so multiple arguments were coded as a single variable indicating arguments with two or more persons. Powerful analysis of the relationship between more than two arguments on a day and mood was not possible, but the data suggest that the emotional effects of exactly two versus more than two arguments do not differ.

<sup>3</sup> Note that in terms of the Watson and Clark (1984) structure-of-affect model, our measure does not index negative affect alone. Our measure of distress contains components that load highly on negative affect (anxiety and hostility) and that load moderately on (low) positive affect (depression).

<sup>4</sup> In a previous study (Bolger et al., 1989a), it was demonstrated that one spouse's stressor in the workplace affects the other spouse's stressor at home. Thus, there will be an indirect effect of one spouse's stressor on the other's mood through this stress contagion process. In response to a reviewer's comments, we tested whether one spouse's stressor has a direct effect on the other spouse's mood, that is, an effect that is independent of the other spouse's exposure to stress. No such effects were found.

Table 1  
*Impact of Daily Stressors on Mood: Regression Coefficients*

Stressor	Men ( <i>n</i> = 5,229)		Women ( <i>n</i> = 5,368)	
	Unstandardized	Standardized	Unstandardized	Standardized
Demand				
Overload at home	.005	.020	-.005*	-.024*
Overload at work	.008**	.038**	.013**	.054**
Family demand	.013**	.043**	.020**	.072**
Other demand	.008	.014	.026**	.053**
Argument				
Spouse argument	.060**	.182**	.083**	.228**
Child argument	.059**	.128**	.048**	.125**
Argument with single other	.111**	.279**	.115**	.236**
Argument with multiple others	.133**	.153**	.175**	.144**
Other				
Transportation problem	-.000	-.000	.022**	.036**
Financial problem	.043**	.085**	.009	.017

\* .05 < *p* < .06. \*\* *p* < .05, two-tailed.

ing these reciprocities we have not introduced bias into our results. Specifically, the effects of stressors on mood will be unbiased estimates of the population values. However, we are unable to decompose these stressor effects into their various components, that is, their direct effects on mood and their indirect effects through the spouse's mood.

## Results

### *Impact of Daily Stress on Mood*

**Basic associations.** Our assessment of the stress effects shown in Table 1 was based on Equation 1. We found that 19% of the within-person variance in mood is associated with daily stress among men,  $F(10, 5210) = 122.93$ ,  $p < .001$ , and 20% among women,  $F(10, 5349) = 136.99$ ,  $p < .001$ . In contrast, the controls (the six day-of-week dummy variables, day of study, and the square of the day of study) explained 1% of the variance for women,  $F(8, 5359) = 6.5$ ,  $p < .001$ , and 2% of the variance for men,  $F(8, 5220) = 12.3$ ,  $p < .001$ . It is noteworthy that these estimates are based on pooled within-person analyses. Results of this sort are more compelling than results based on cross-sectional data (between-persons analyses) or unrestricted analyses of pooled diary data (analyses combining both within-person and between-persons variance), because the confounding influences of individual difference variables are taken out of consideration. Although several researchers (e.g., Stone and Neale; Lewinsohn) have consistently distinguished these sources of variance, this practice has not become standard in the literature.

Almost all previous analyses of daily stressor effects have used aggregate stress measures. We went beyond this preliminary kind of analysis to study the relative influences of different kinds of stressors. As is shown in Table 1, our analysis documented the existence of considerable variation in daily stressor effects. In particular, interpersonal conflicts are much more upsetting than other daily stressors. Among men and women alike, not only do conflicts have the largest effects on mood, but these

effects are, in almost all cases, more than twice as large as those of other daily events.

A striking illustration of the importance of interpersonal conflicts can be seen by examining their contribution to explained variance in mood. As noted earlier, the set of 10 stressors explained 19% and 20% of the variance in mood for men and women, respectively. However, controlling for the 6 other stressors, the 4 interpersonal conflict measures alone uniquely explained 16% of the mood variance for men,  $F(4, 5210) = 254.95$ ,  $p < .001$ , and 16% of the mood variance for women,  $F(4, 5349) = 276.94$ ,  $p < .001$ . These results clearly show that interpersonal conflicts are overwhelmingly the most important kind of daily stress influencing psychological distress among the stress categories considered in this analysis.<sup>5</sup>

**Gender differences.** Inspection of the data in Table 1 shows that in 7 of 10 comparisons the effects of stress on mood are stronger among women than men. Three of these 7 differences are significant at the (two-tailed) .05 level: arguments with spouse,  $F(1, 10559) = 14.20$ ,  $p < .001$ , arguments with multiple

<sup>5</sup> Note that we have not examined the importance of positive events for psychological distress. In addition, our methodology may be biased against detecting certain kinds of negative events, such as the nonoccurrence of an expected positive event. We address these limitations in the Discussion section. Also, these analyses do not take account of the effects of less frequent, major negative events. In fact, in preliminary analyses, we examined this issue. In addition to using a daily event checklist, each day we asked respondents the following open-ended question: "If anything else *bad* happened in the past 24 hours that you haven't yet told us about, please tell us about it here." Examples of severe daily events include a death in the family and becoming unemployed. Such events were very rare in the sample of days we analyzed—only 58 out of 12,054 (.5% of days). In preliminary analyses, we included a dummy (0, 1) variable in our regression models for such events in order to take account of their unique effects on mood. The effect of daily stressors on mood remained unchanged. Therefore we dropped these control variables from the final analyses we reported.

Table 2  
*First-Day and Other-Day Impacts of Daily Stressors on Mood:  
 Unstandardized Regression Coefficients*

Type of event	Men ( <i>n</i> = 5,229)			Women ( <i>n</i> = 5,368)		
	First day	Other days	Absolute difference	First day	Other days	Absolute difference
Demand						
Overload at home	.008**	.002	-.006	-.004	-.007**	-.003
Overload at work	.011**	.005	-.006	.017**	.011**	-.006
Family demand	.017**	.010	-.007	.023**	.016**	-.007
Other demand	.002	.050**	.050**	.025**	.037**	.012
Argument						
Spouse argument	.057**	.074**	.017*	.076**	.107**	.031**
Child argument	.052**	.078**	.026*	.058**	.021**	-.037**
Argument with single other	.108**	.121**	.013	.114**	.121**	.007
Argument with multiple others	.122**	.151**	.029	.157**	.228**	.071**
Other						
Transportation problem	.011	-.020**	-.031**	.039**	-.010	-.049**
Financial problem	.044**	.043**	-.001	.023**	-.005	-.028**

\* .05 < *p* < .07. \*\* *p* < .05, two-tailed.

others,  $F(1, 10559) = 5.37, p < .025$ , and transportation problems,  $F(1, 10559) = 5.71, p < .025$ .<sup>6</sup> Men are significantly more distressed by financial problems than are women,  $F(1, 10559) = 14.00, p < .001$ . In addition, home overloads are associated with significantly better mood for women,<sup>7</sup> whereas they are associated with worse mood among men. These effects differ significantly,  $F(1, 10559) = 6.35, p < .025$ .

### *Speed of Recovery From Stressful Event*

Previous research suggests that, for the average person, the effects of daily stressors do not persist beyond the day they occur. We attempted to replicate these results. In our analysis, we compared distress scores on two types of stress-free days: (a) those immediately following a stressful event and (b) all other stress-free days. To do this, we added nine (0, 1) dummy variables (we combined arguments with single and multiple others) to the regressions summarized in Table 2. Each dummy variable was coded 1 on the first stress-free day following a stressor series and 0 otherwise. With this parameterization, the coefficient for each of these dummy variables represents the mean difference in distress between a stress-free day immediately following a given stressor series and other stress-free days.

In seven out of nine comparisons for men and in eight out of nine comparisons for women, mood was better on stress-free days following a stressor than on other stress-free days. Most of these comparisons were not significant. However, we performed a global test of the distress difference between the two types of stress-free days by testing the significance of all nine dummy variables as a group. This test was significant for both men,  $F(9, 5191) = 2.17$ , and women,  $F(9, 5330) = 2.63, p < .05$  for both. The average improvement over stress-free days was .006 units for men and .007 units for women. Thus, there is a rebound effect associated with the termination of a stressful experience.

### *Length of Stressful Episode*

Nearly half the stressful events reported in the diaries represented second or later days in a series of events of the same type. As we noted earlier, prior theory suggests that the emotional effects of these stressors might vary depending on when they occurred within episodes. We examined this issue by estimating a model that included separate predictors for the first day, the second day, and the third or later day of an episode.<sup>8</sup> This set of

<sup>6</sup> These tests treat husbands' and wives' reports as independent, an unrealistic assumption. Hence, our estimates of gender differences will not be biased, but they will be slightly inefficient. Essentially, we are ignoring the additional statistical power to be gained by treating spouses' mood observations as paired, as in the case of the additional power of paired *t* tests over independent sample *t* tests. We have ignored this loss of power because statistical power is not a problem in a data set of over 10,000 observations.

<sup>7</sup> In response to a reviewer's comment, we tested whether the home overloads-negative mood relationship differed on the basis of whether women worked primarily at home (less than 20 hr per week in the labor force) or outside the home (20 or more hr per week in the labor force). We reestimated the model for each of these groups and found no significant difference between them in the relationship between overloads at home and negative mood,  $F(1, 5347) = .064, ns$ .

<sup>8</sup> Although we do not have the necessary information to determine whether an episode consists of independent events or the continuation of a single event, we concluded that this information would be almost impossible to obtain. For example, even if the object of a stressor changed across days of an episode (subject of an argument, specific tasks involved in an overload), one stress may have led to another. We were able to determine, however, that the stress episodes in our data occurred more frequently than would be expected by chance. This involved simulating data by randomly reordering or "shuffling" each person's diary days and comparing the number of simulated multiday series to the actual number. The number of days involved in multiday series was consistently higher in the actual data than in the simulated data for all

three predictors, in the form of three dummy (0, 1) variables, was created for each of the 10 stressor types separately, yielding a prediction equation with 30 stressor measures. This model is an augmentation of the basic 10-stressor model presented in Equation 1. Instead of using a single dummy variable to capture the effect of a given stressor, we used three dummy variables to differentiate first-day, second-day, and third-or-later-day stressors (adding the three variables together would result in the original stressor variable). The predictive power of this augmented model was significantly better than the basic model— $F(20, 5181) = 3.71, p < .001$ , among men and  $F(20, 5320) = 4.27, p < .001$ , among women—suggesting that timing in an episode is a determinant of stressor impact.

Predictive power is improved because the effects of daily stressors change after the first day of episodes; no substantial change occurs between second and later days of episodes, however. Consequently, we present results based on a model distinguishing the effects of first-day from later-day stressors by using a dummy variable for the first day of an episode of each stressor and a dummy variable for second or later days of an episode of each stressor. Results in Table 2 show that first- and later-day stressor effects for conflicts and nonconflict stressors exhibit different patterns. For nonconflict stressors, first-day stressor effects are larger than those that occur later in episodes in five of six comparisons among both men and women (the other-demands category is the only exception). In contrast, for conflict stressors, first-day stressor effects are smaller than those that occur later in episodes in four out of the four comparisons for men and three out of the four comparisons for women. Two of these differences are significant among men and five among women (at the .05 level, two-tailed tests).

We compared the proportionate temporal change in the effects of interpersonal conflicts and other daily stressors using tests of the difference between coefficients from the same regression model (see Cohen & Cohen, 1983, Appendix A2.1). Specifically, for men and women separately, we carried out four multivariate tests. Each test summarized six comparisons: an argument effect versus each of the six nonconflict effects. All of these tests were significant at  $p < .05$  except for those involving a woman's conflict with her child. In summary, mood is typically worse on later days of a conflict stressor series, whereas it is typically better on later days of a nonconflict stressor series.

In addition to comparing the effect changes for different stressors (e.g., overloads, conflicts), we also tested for gender differences in effect changes for each of the 10 stressors. Only 1 of the 10 comparisons was significant: There is a striking gender difference in reactions to conflicts with children,  $F(1, 10559) = 12.35, p < .001$ . Women are in significantly better mood after the first day of an episode, whereas men are in worse mood.

### Multiple Daily Stressors

One quarter of all diary days involved at least two concurrent stressors. Certain combinations of these events could be ex-

pected to have multiplicative effects on mood. Overloads at home and at work on the same day, for example, might create a conflict between loyalties that affects mood more than we would expect by considering the two overloads additively. In an effort to investigate these multiple-stressor effects, we estimated a multiplicative stress model for men and for women. We added dummy variables indicating the cooccurrence of stressors to the basic model (Equation 1). We included three types of (0, 1) dummy variables representing three types of multiple stressor days: those on which two or more different demands occurred (i.e., overload at home, overload at work, family demand, other demand), those on which two or more different arguments occurred (i.e., argument with spouse, argument with child, argument with other person), and those on which at least two events occurred (one of which was an overload and one of which was an argument). Thus, the multiple-demands dummy variable was coded 1 on days when two or more different demands occurred and 0 otherwise. Similarly, the multiple-arguments dummy variable was coded 1 on days when two or more different arguments occurred and 0 otherwise. Finally, the multiple demands and arguments dummy variable was coded 1 if at least one demand and one argument occurred on a given day and 0 otherwise. For each of these variables, a positive coefficient would indicate that the combination of stressors on the same day was more distressing than the sum of their effects if they had occurred on separate days. A negative coefficient would indicate that the combination of stressors was less distressing than if they had occurred on separate days.

A clear pattern emerged from these analyses. The interaction terms were almost all negative. In no case did we find a significant positive interaction effect. This indicates that, in general, a person who experienced two or more stressors on a given day was in a better mood than would be expected if each stressor had its full additive effect. The set of three interaction terms was significantly related to mood for women,  $F(3, 5101) = 8.73, p < .05$ . All three coefficients were negative in sign. However, of the three, only the multiple-argument coefficient had a large and significant marginal effect,  $b = -.05, t(5101) = -4.81, p < .05$ . For men, the set of interaction terms was not significantly related to mood,  $F(3, 4987) = 0.41, ns$ , nor were the marginal effects of the three interaction terms. However, two of the three interaction terms (multiple arguments, and a multiple involving an argument and a demand) were negative in sign, and the third (multiple demands) was essentially zero. Once again, the largest effect was due to multiple arguments,  $b = -.01, t(1, 4989) = -1.06, ns$ . We found no significant gender differences in these effects, except for multiple arguments, where women are less distressed than men on multiple stressor days compared to single stressor days,  $F(1, 10090) = 7.04, p < .01$ .

In summary, these results contradict the view that several minor stressors can add up to create an emotionally disabling composite. Multiple stressors on each day have smaller effects than if they had occurred on separate days. In this sense, the results parallel the temporal patterns for noninterpersonal stressors discussed earlier, whereby most of these stressors become less upsetting on successive days of multiday episodes.

### Discussion

#### Impact of Daily Stress

Despite wide variation in study populations and measurement precision, previous research provides consistent evidence

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stressors for both men and women (from 6% to 25% higher for women, and from 8% to 19% higher for men). Also, series lasting 3 days or longer were 12% to 62% more prevalent for men, and 1% to 73% more prevalent for women. Therefore, we are confident that the stresses involved in a substantial number of the multiday series are related.

of a significant relationship between daily stress and mood. The variance in daily mood explained by day-to-day fluctuations in stress ranges from 4% (Eckenrode, 1984) to 13% (Rehm, 1978). In the present study, the level of explained variance was higher than in previous research (19% among men and 20% among women) and may be due to our inclusion of interpersonal conflicts as a major category of daily stressor.

Our results show that interpersonal conflicts are by far the most upsetting of all daily stressors, a finding not previously documented. Furthermore, interpersonal conflicts are sufficiently common that they account for more than 80% of the explained variance in daily mood in the multivariate models. This suggests that a greater understanding of daily arguments is essential for progress in the study of daily stress and mood, a topic to which we return later.

It is interesting that conflicts with family members are less distressing than those with other persons. We inspected our data to determine who these other persons were. Conflicts with strangers occurred very rarely: Most conflicts with other persons were with friends, neighbors, and persons in the workplace. Conflicts with persons in ongoing, nonfamily relationships may be particularly distressing because these relationships have continuity and yet usually have insufficient intimacy and understanding to prevent arguments from being perceived as a major threat. In contrast, families with reasonably stable relationships have a bond of intimacy that makes even serious conflicts less threatening to the relationship and, therefore, less distressing than equivalent nonfamily conflicts.

It may also be the case that nonfamily conflicts are objectively more severe, thereby leading to greater distress. For example, the lack of intimacy in nonfamily relationships may increase the risk that arguments with nonfamily will escalate in seriousness. Alternatively, it may be that, in general, the content of nonfamily conflicts (rather than their tendency to escalate) is more severe. For example, conflicts at work may center on issues of pay, authority, and tenure, whereas conflicts at home may center on less serious topics. Unfortunately, we do not currently have data to test these alternative possibilities.

The greater emotional impact of conflicts with people other than one's spouse or children could also be due to relative rarity. Consistent with this interpretation, a previous diary study of married couples found that infrequently occurring negative interactions had a greater negative impact on mood than did frequently occurring negative interactions (Jacobson, Follette, & McDonald, 1982). Pooled within-person analyses of the relationship between frequencies and impact of different daily stressors would provide direct confirmation of this interpretation. Analyses of this sort, however, have not yet been carried out.

More generally, our findings on interpersonal stressors suggest that daily stress research, to the extent that it is concerned with the negative events that influence emotional distress, should be reoriented toward the study of interpersonal conflicts. Conflicts and tensions with others are by far the most distressing events in daily life both in terms of initial and enduring effects. As such, our results confirm the findings of Rook (1984) and Abbey, Abramis, and Caplan (1985) concerning the importance of negative social interactions as determinants of emotional well-being. Our results extend this work by identifying the spe-

cific everyday social conflicts that lead to significant distress, an approach not previously taken in the literature on the negative aspects of social relationships.

Future work should focus on how daily conflicts are initiated, how they are maintained, and how they are resolved. Progress in understanding maintenance and resolution will depend on the development of measurement tools to study conflicts (Kessler, Price, & Wortman, 1985). Measures such as the ways of coping (Lazarus & Folkman, 1984) or the daily coping inventory developed by Stone and Neale (1984) are, unfortunately, not well-suited to the study of interpersonal conflict.

### *Speed of Recovery From Daily Stressors*

Previous research by Rehm (1978) and Stone and Neale (1984) has shown that daily stressors do not, on average, appear to affect mood beyond the day of their occurrence. However, with our larger sample and more powerful analysis approach, we were able to document a slightly different pattern: Mood is significantly better on the day following a stressful event than on other stress-free days. Although this effect is small, it suggests that recovery from negative events is rapid, and moreover, the termination of a negative event appears to function as a positive experience.

This rebound effect is predicted by Solomon's *opponent-process theory of emotion* (Solomon, 1980; Solomon & Corbit, 1974). According to the theory, when an environmental stimulus (e.g., a stressor) elicits an initial emotional reaction (e.g., distress), this emotion in turn elicits an opponent emotion (e.g., well-being). At any given time, a person's emotional state is the sum of the initial and opponent emotions. If a stressful event occurs, the initial negative emotional response will be dominant while the stressor lasts. After the stressful event ends, however, the opponent positive emotion will dominate, and a person will be in better mood than usual. Our analysis shows that this effect persists a full day after the stressor ends.

It is important to note that these are patterns of response for typical men and women in our sample. We have not, as yet, investigated individual differences in reactivity to daily stress. There may be subgroups of individuals who, having low levels of personal or social resources, are less likely to habituate to daily stress. For example, Caspi, Bolger, and Eckenrode (1987) have shown that the effects of daily stress persist beyond a single day for those people who are socially isolated or who live in chronically stressful environments. Because such variables were not considered in our analyses, certain individual differences in effects may have been masked.

### *Episodes of Daily Stress*

As stated earlier, researchers have ignored the fact that many daily stressors occur on a series of days. For most stressors that do not involve interpersonal conflicts, our analysis shows that mood is more affected by first-day stressors than by stressors on later days of episodes. This result undermines the notion that persistent stressors of these kinds are particularly damaging to mood. It also suggests that for noninterpersonal stressors, people have a capacity for rapid emotional habituation. A clearer understanding of this process would be of considerable impor-

tance. This could be achieved by comparing cognitions, coping responses, and emotions over at least the first 2 days of a stress episode, possibly with assessments at time intervals shorter than a full day.

In contrast to most other daily events, our data suggest that emotional habituation does not occur for interpersonal tensions. Indeed, in certain cases (e.g., marital conflicts), there is a significant increase in emotional impact as an episode extends over multiple days. A comparative analysis of habituation processes for conflicts and for other kinds of stressors is clearly called for by this pattern of results.

Another important issue raised by these results concerns the determinants of stress resolution, particularly the resolution of conflicts. Approximately one third of all daily stressors occur on days following the report of a similar stressor. Preliminary individual-difference analyses of these data show there is substantial variation in the average length of stress episodes across persons. The sources of this variation should be explored in future work. Although previous research has focused on situational (e.g., Deutsch, 1973; Janis & Mann, 1977) and personal (e.g., Sternberg & Dobson, 1987; Sternberg & Soriano, 1984) determinants of conflict resolution, this work has not focused specifically on minor conflicts, nor has it used the intensive temporal framework used here.

### *Multiple Stressors*

Our analyses documented that the incremental effects of multiple stressors on mood are less than would be predicted by an additive model. An example of this finding appeared even in our most basic analysis (Table 1), where we found that the emotional effect of multiple arguments on the same day is only fractionally greater than the effect of a single argument. The low average levels of distressed mood in this sample suggest that this is not a methodological artifact of a ceiling on the mood scale but a genuine finding.

There are at least two possible explanations for this pattern of results. First, it may be that multiple daily stressors combine logarithmically to influence mood. In the same way that stimulus detection is treated in classical psychophysics (Stevens, 1974), it may be necessary to increase environmental stress by larger and larger amounts to obtain equivalent increases in negative affect. Thus, the consistently negative interaction term associated with combinations of daily stressors could reflect the general tendency for initial units of stress to have greater impacts on mood than subsequent units of stress. This line of interpretation contrasts with the Holmes and Rahe (1967) scaling tradition in which combinations of stressors are assumed to have additive effects.

An alternative possibility is that people's moods have plateaus or set points that are not easily affected by increasing the level of daily stress. It is likely there are individual differences in the levels of these plateaus. It is already established that there are individual differences in a variety of mood parameters such as variability (Depue et al., 1981; Wessman & Ricks, 1966) and frequency of mood change (Larsen, 1987). This work, however, has not attended to the role of environmental stress in generating, maintaining, and revealing these individual differences.

Our results suggest that such an extension could provide important insights into daily stress effects.

### *Gender Differences*

As has been found for major life events (Kessler et al., 1985; Wethington, McLeod, & Kessler, 1987), daily stress was found to be more upsetting to women than to men. The only exception to this pattern involved financial stress, a result consistent with previous evidence that financial adversity has a greater impact on men than on women (Kessler, 1982). It is important to note that these gender differences in stress reactivity may be more apparent than real. For example, work by Gottman and Levenson (1988) indicates that men have greater physiological reactivity to stress than do women and that high negative affect is more aversive for men than for women. According to this argument, men act to limit their levels of emotional distress more than do women. Thus, the apparent lower emotional reactivity of men may reflect their greater efforts to manage their distress.

Surprisingly, we found that home overloads are associated with lower negative mood for women. There are at least two possible explanations for this finding. First, it may reflect chance variation; that is, the true effect is positive and close to zero. Alternatively, under certain conditions overload and associated time pressure may actually have a beneficial effect on emotional well-being. Consistent with this latter possibility, Lazarus, DeLongis, Folkman, and Gruen (1985) documented that among older men, work overload is sometimes associated with improved mental health.

We noted in the Results section that women's moods do not typically worsen on second and later days of episodes involving conflicts with their children, whereas the opposite holds for men. It may be that women are more experienced in managing these kinds of conflicts. Consistent with this notion, we found in a previous study that women were almost twice as likely as men to experience daily conflicts with children (Bolger et al., 1989a). Alternatively, it may be that the sources of child conflicts differ by gender of parent; perhaps mother-child conflicts center on relatively minor disciplinary problems, whereas father-child conflicts center on more serious problems. Unfortunately, we have no way to test this latter possibility with our current data.

### *Limitations of the Study*

This study has several significant limitations. First, given that we used respondents from an earlier survey as the basis for the diary sample, it is clear to us in retrospect that our response rate would have been considerably higher if we had recruited respondents at the close of the original face-to-face interview rather than by telephone 1 year later. Verbrugge (1985) used the former strategy and obtained a much higher response rate than ours (85% vs. 34%). Starting a diary study at the end of a face-to-face interview has other advantages. It would be possible to train respondents in how to complete the diary—particularly any open-ended questions—thereby reducing response errors and irrelevant response variability. And such a training procedure would allow more complex questions to be included in the



diary instrument, such as those requiring more detailed reports of stress, mood, and symptom timing.

Second, we acknowledge that our categories of daily stressors are crude and incomplete. For example, there is considerable variability within event types that is not captured in our data, such as minor arguments versus serious arguments. Moreover, it is unclear whether people use the same intensity thresholds in reporting overloads and arguments. Differences in such thresholds might explain why overloads appear less upsetting than arguments. Regarding incompleteness, our study suffers from a problem that is endemic to life-event research, namely, how to measure stress that is due to the absence of events. For example, our daily stress instrument fails to capture interpersonal stressors such as spouses ignoring one another or failing to engage in positive activities with one another. These may be an important component of stressful daily experience that is missing in our data. A challenge to future work on daily stress is to develop suitable measures of such events.

A third limitation is that our study did not fully resolve the potential problem of simultaneity in the relationship between stressors and mood. In preliminary analyses, we found that yesterday's mood does not spill over and lead to either bad mood or stressful events today. Of course, this does not rule out the possibility that substantial simultaneity exists between stressors and mood within the same day. An indirect assessment of this possibility can be made by using cross-lagged analyses (Kessler & Greenberg, 1981). Preliminary analyses of this sort showed that cross-lagged mood-to-stress and stress-to-mood effects were both insignificant in the diary data, suggesting that whatever causal processes are at work must be studied within a day. A study of this process would require repeated measurements at various points during each day. Alternatively, it is possible to identify within-day reciprocal effects using an instrumental variables approach with data collected on a daily basis only. However, because in research on stress and mood the substantive theory for identifying appropriate instrumental variables does not currently exist, this approach is very difficult to carry out. A challenge for future research will be the development of an explicit test for within-day simultaneity.

A final limitation of the study concerns our exclusive focus on negative events as predictors and negative affect as an outcome. We focused on negative affect because we were interested in the determinants of daily distress and psychopathology rather than the determinants of positive affect. Thus, we used negative events as predictors because previous research (e.g., Stone, 1981, 1987) has shown that negative events are significantly more important than positive events for predicting negative affect. However, it is clear that variation in positive affect is an important feature of daily life (e.g., Clark & Watson, 1988; Stone, 1987; Watson, 1988), and a full understanding of the relationship between daily experiences and mood requires the inclusion of positive affect as an outcome.

In conclusion, this study has attempted to provide basic data on the emotional effects of daily stress in a sample of married couples in the general population. Our results demonstrate that fluctuations in negative moods are linked strongly to negative interpersonal events both in first days and in later days of stress episodes. In contrast, for most other daily stressors we found that emotional habituation occurs following the first days of

multiday stress episodes. These findings suggest that future investigations of minor stressors should focus intensively on the interpersonal domain. We also found that, contrary to previous thinking, multiple stresses occurring on the same day often have a smaller emotional effect than one would predict from an additive model and that the termination of stressful events leaves people in better moods than if these events had not occurred. Thus, this study shows that minor stressors are related to mood in unexpectedly complex ways, and it confirms that we can gain important insights into these complexities by intensively studying people's everyday experiences.

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## Appendix

## Original List of Daily Stressors

*Stem question:* "Here is a list of troublesome things that sometimes happen to people. Please check the box for each one that happened to you during the *past 24 hours*."

*Demands*

Overload at home: "A lot of work at home."  
 Overload at work: "A lot of work at job or school."  
 Family demand: "A lot of demands made by your family"; "Spouse sick or injured"; "Your child sick or injured."  
 Other demand: "A lot of demands made by other relatives or friends."

*Other*

Transportation problem: "Problem with transportation."  
 Financial problem: "A financial problem."

*Stem question:* "We would like to know about any tension or argument you had with any of these people during the past 24 hours. Please check each box that applies."

*Arguments*

Spouse argument: "Your wife/husband."  
 Child argument: "Your child(ren)"; "Tension or disciplinary problem with your child(ren)."  
 Argument with other (single or multiple): "Brother or sister"; "Parent"; "Parent-in-law"; "Other relative (please specify)"; "Friend"; "Neighbor"; "Supervisor at work"; "Coworker"; "Subordinate at work"; "Someone else (please specify)."

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