



BASIC AND APPLIED SOCIAL PSYCHOLOGY, 1989, 10(2), 101-117  
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## An Examination of Perceived Control, Humor, Irrational Beliefs, and Positive Stress as Moderators of the Relation Between Negative Stress and Health

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Coping humor, beliefs about personal control, irrational beliefs, and the occurrence of desirable events (positive stress) have been proposed as moderators of the effects of negative stress on psychological and physical health. The effects of these variables and of negative stressful life events on health were examined in a retrospective study of 159 college students. The results indicated that: (a) negative stress was directly related to both psychological and physical health as a main effect, but positive stress was not; (b) when statistical corrections designed to hold the overall Type I error rate at .05 were made, there were no significant negative stress by moderator interactions; (c) when less conservative statistical restrictions were used, four negative stress by moderator interactions approached significance; however, three of these were actually in the wrong direction, further suggesting (as in b) that these moderator effects were actually Type I errors; (d) coping humor, personal control, and irrational beliefs each yielded at least one significant main effect on health. The prevalence of Type I errors within studies and between studies as a function of publication and reporting biases is also discussed.

Over the last 2 decades interest in the effects of life experiences on a person's health has blossomed. Much of this interest began with Holmes and Rahe's work on the effects of stress on disease (T. H. Holmes & Rahe, 1967; Rahe,

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Meyer, Smith, Kjaer, & T. H. Holmes, 1964). Subsequently, researchers have investigated the effects of life stress on health measures as varied as depression and the common cold (e.g., T. S. Holmes & T. H. Holmes, 1970; Paykel et al., 1969; Rahe, 1968) as well as psychological adjustments to specific stressors such as breast cancer (Taylor, Lichtman, & Wood, 1984). In this article, we address two main issues—the measurement and assessment of positive stress effects, and the premature acceptance of moderator models of the stress/health relation for several potentially moderating variables.

### POSITIVE STRESS

Consider first the issue of the existence and effects of positive stress. Because positive events in one's life (e.g., promotions, marriage) necessitate great changes as negative events, they may increase one's health problems (T. H. Holmes & Rahe, 1967). On the other hand, common sense notions (as well as most reinforcement theories) suggest that positive events can have only positive effects on one's health.

Initial research ignored this distinction between positive and negative stress, and assumed that both would adversely affect health because both types of stress required life changes (T. H. Holmes & Rahe, 1967). This theoretical assumption was reflected in the major scale designed to assess stress. Subsequent researchers recognized the need to examine the effects of each type of stress separately, and grouped life events into those that are primarily positive versus those that are primarily negative (e.g., Sarason, Johnson, & Siegel, 1978; Vinokur & Selzer, 1975). The results of studies of this type are somewhat mixed, but generally suggest that positive stress has little direct effect on health (Lin, Dean, & Ensel, 1986; Mueller, Edwards, & Yarvis, 1977; Ross & Mirowsky, 1979; Sarason et al., 1978; Vinokur & Selzer, 1975).

There is, unfortunately, an additional methodological problem with this work. Classifying each life event as either positive or negative may be unnecessarily simplistic. In a given person's life, some important events will have primarily positive effects, others will have primarily negative effects, still others will have approximately equal positive and negative effects. Any given event of importance (e.g., marriage) is likely to have both positive and negative consequences, and the degree will vary from one individual to another. Thus, the most sensitive tests of positive and negative stress effects require that both the positive and the negative effects of each life event be assessed for (and by) each person individually.

Improved assessment of stress was one goal of our research. But, despite the foregoing argument that the failure to find positive stress effects may

reside in past approaches to the assessment of stress, we expected little effect of positive stress for two reasons. First, the methodological problems that may have contributed to the lack of consistent effects of positive stress also exist with measures of negative stress. Yet, the results of negative stress (particularly main effects) are fairly consistent. Second, there is a psychological difference between positive and negative stress that parallels success and failure differences in other domains. Basically, people tend to be optimistic; we expect and plan for positive events. Negative events are generally unexpected and are typically more disruptive.

Of course, a strong case can be made for expecting positive events to be associated with improved health, rather than with health problems, either directly (as a main effect) or as a moderator of negative life events (e.g., Lazarus, Kanner, & Folkman, 1980). Thus, our goal in refining the measurement of stress is twofold. First, by more accurately assessing stress we expect to improve the predictability of health from stress measures. Second, we provide a more sensitive test of the effects of positive stress on health both as a main effect and as a moderator.

### MODERATOR VARIABLES

A second major issue concerns several psychological variables that may moderate the stress/health relation. A number of variables have been proposed that may attenuate or exacerbate the deleterious effects of stress. For example, it has been proposed that having a particular sense of humor effectively insulates a person from the negative effects of stress (Martin & Lefcourt, 1983). That is, this sense of humor helps the person to cope with stressful events, so that they do not adversely affect health. Those who lack this particular sense of coping humor will be particularly sensitive to the deleterious effects of negative stress (according to the theory).

In essence, these moderating theories predict that it is the interaction of stress and some second (moderating) variable that adversely affects health. The range of proposed moderators is both wide and fascinating. A partial listing includes hardiness (Kobasa, 1979), attributional style (Metalsky, Abrahamson, Seligman, Semmel, & Peterson, 1982), social support (Cohen & Hoberman, 1983; Cohen & Wills, 1985; Lefcourt, Martin, & Saleh, 1984), coping humor (Martin & Lefcourt, 1983), personal control beliefs (Folkman, 1984; Johnson & Sarason, 1978; Lefcourt et al., 1984), and irrational beliefs (Ellis, 1977). As mentioned earlier, positive stress has also been proposed as a moderator (Cohen & Hoberman, 1983; Lazarus et al., 1980).

Theoretical and empirical support for the moderator view of each of these variables ranges from weak to moderately strong. We selected the

latter four for study primarily because their empirical support is rather weak (and because we could not study all the above variables at once). More specifically, we were concerned that these variables had been accepted as having the predicted interactive effects on the stress/health relation without adequate empirical support.

### Coping Humor

Of the four potential moderators under study (humor, personal control beliefs, irrational beliefs, and positive stress), humor appears to have the most support. In all three of their studies, Martin and Lefcourt (1983) found significant negative stress by humor interactions in the prediction of mood disturbances. That is, the presence of high levels (relative to low levels) of humor effectively insulated subjects from the deleterious effects of negative stress. All three studies were well conducted and analyzed. Humor was assessed in a different way in each, providing convergent validity. In only one study, though, was the Coping Humor Scale used as a measure of the proposed moderator. Furthermore, to date there have been no published reports replicating these findings. Thus, we felt it would be useful to attempt to replicate the coping human results.

### Personal Control

The support for personal control beliefs as a moderator of the negative stress/health relation is weaker. There is good reason to expect perceptions of control to moderate the stress/health relation. That is, people high in perceptions of control should show weaker relations between negative stress and health than people low in perceptions of control. Research in a variety of areas, such as attributional style (e.g., Anderson & Arnoult, 1985a, 1985b) and performance under aversive conditions (e.g., Averill, 1973), suggests such a relation. However, the two major research articles purportedly demonstrating moderator effects of personal control both suffer from the same statistical weakness. Johnson and Sarason (1978) showed that for people with an external locus of control (i.e., low personal control) the negative stress/health relation was significantly different from zero (for both depression and state anxiety); for people with an internal locus of control the relation was not different from zero. Although this suggests a moderating effect, it does not test it. The proper statistical test is whether the slope relating stress to health differs as a function of locus of control (i.e., the interaction of locus of control and negative stress). Unfortunately, the authors did not report this test. Inspection of their reported data analyses (the partial correlations) suggests that this interaction test would not have

been significant, but without the appropriate statistical test we cannot be certain.

Lefcourt et al. (1984) reported three studies in which the stress/health relation was supposedly moderated by control. Again, the interactions were not tested. Inspection of the reported analyses suggests that these interaction tests also would be nonsignificant.

An article by Caldwell, Pearson, and Chin (1987) reported the appropriate control by stress interaction results for both physical and psychological health. Because of other variables included in the study, 10 such interactions were tested; none were significant.

In sum, there is good theoretical reason to expect control beliefs to moderate the negative stress/health relation, but little empirical support for this expectation. Thus, we include a measure of personal control beliefs in our study.

### Irrational Beliefs

There is considerable discussion in the clinical literature about the debilitating effects of irrational beliefs, especially in conjunction with negative life events (e.g., Ellis, 1977; Woolfolk & Richardson, 1978). One might expect that people with many irrational beliefs, such as "Everyone must love me, or I'm a failure as a human being", would be more susceptible to the negative effects of negative stressors, such as failed social relationships. However, we were unable to locate any studies testing irrational beliefs as a moderator of the stress/health relation.

### Positive Stress

Finally, the positive stress as moderator view is a fairly recent one (Lazarus, Kanner, & Folkman, 1980). The idea is that people experiencing lots of positive stress should be relatively unaffected by negative stress events. Only one study has been reported that is directly relevant. In a well-conducted correlational study, Cohen and Hoberman (1983) found a significant negative stress by positive stress interaction in predicting depression. Their results failed to find a significant interaction in predicting physical symptoms (though it approached significance).

One other study is sometimes cited as support for the positive stress as moderator position. Reich and Zautra (1981) instructed a random subset of their subjects to engage in certain pleasurable activities over a 2-week period. Among other findings, these authors reported that engaging in pleasurable activities interacted with negative life events, such that negative stress was less distressful for those who had been instructed to perform the pleasant activities. Although this study is important in many respects, it is

not a solid test of the positive stress as moderator model. One obvious interpretational problem concerns the pleasurable activities manipulation. To be sure, it does manipulate positive life events. However, it also manipulates perceptions of control or personal efficacy. Thus, it is not clear to what the moderating effect of the activity instructions should be attributed.

## OVERVIEW

We selected for study four potential moderating variables based on the weakness of empirical support for them as well as their obvious potential importance. We hoped to provide the needed additional support for the moderator view of coping humor, control, irrational beliefs, and positive stress. Of course, at the outset of such a project one must realize (as we did) that the relevant theories may be wrong. Given the bias of most authors against reporting null results ("If we run it right, next time it will work") and the corresponding bias of editors and reviewers against their publication ("Maybe this author doesn't know how to conduct studies properly" or "What do null results tell us?"), the few supportive studies could be simple Type I errors (Greenwald, 1975). That is, on occasion empirical results will suggest rejecting the null hypothesis when in fact the null hypothesis is true, and such errors are much more likely to result in publication than are Type II errors (i.e., acceptance of null results when in fact the null hypothesis is false; we hasten to acknowledge that these same biases intrude on our own decisions from time to time). Research on the perseverance of theories (e.g., Anderson, 1983; Anderson, New, & Speer, 1985; Anderson & Sechler, 1986) as well as philosophy of science considerations (e.g., Greenwald, Pratkanis, Leippe, & Baumgardner, 1986) suggest that such Type I errors are extremely difficult to correct. Greenwald's (1975) discussion and simulation model of prejudice against the null hypothesis pointed out the magnitude of Type I error problems and clarified the various factors that exacerbate these problems in psychology. Thus, in a display of our own biases against the null hypothesis we hoped to provide support for the interactive models of humor, control, irrational beliefs, and positive stress in the stress/health relation, but we were open to the possibility that these models are wrong. Further, because theory development depends on willingness to fairly test hypotheses and to accept and report null results, we decided to attempt to publish our results regardless of the outcome, as long as certain methodological requirements (e.g., scale reliability) were met (cf. Greenwald, 1975).

Although one cannot protect against the reporting and publication biases that generally exist and that tend to produce Type I errors across studies,

one can reduce the likelihood of such errors within a particular data set by adjusting significance levels to maintain the overall  $p$  level (probability of rejecting the null hypothesis when it is true) at some reasonable level (e.g., .05). For example, if there are 20 independent tests of some effect, and the null hypothesis is true, it is quite likely that one or more of the tests will be significant at the .05 level simply by chance. One procedure to adjust for this is to divide the criterion  $p$  level (.05) by the number of tests of the hypothesis performed (e.g., 20) to establish a more realistic significance criterion (e.g., .0025). This procedure, known as the Bonferroni solution, is used throughout our analyses.

The variables in this study were stress (positive and negative), negative mood, physical symptoms (e.g., colds, headaches), coping humor, and irrational beliefs. All variables were assessed by self-reports. One issue that frequently arises in this kind of research concerns the accuracy of such self-reports. In particular, it could be that observed relations between negative stress and depressed mood (for instance) obtain artifactually because they share the same affective tone, not because stress affects mood. We feel that this is not a particularly serious problem in our study for four primary reasons. First, our main goal was to test moderator models of stress and health using the same type of measures (although improved versions, in several cases) as have been frequently reported in the literature. Thus, if one accepts the dominant methodology in stress research, then one cannot fault our replication/extension study.

Second, physical health symptoms as requested in this study should not be very susceptible to affect/memory response biases; one doesn't forget a cold experienced several weeks ago just because of a present positive mood state. Thus the stress/physical health relations should not be very susceptible to any such bias.

Third, one might expect the stress/psychological health relations to be more susceptible to such a bias. That is, if such affect/memory response biases were at work, we should expect the stress/psychological health relations to be stronger than the stress/physical health symptoms relations. Our data show just the opposite, despite the above response bias prediction and despite the higher reliabilities of the psychological health measures (to be reported later).

Fourth, and most convincing to us in the design phase of this work, is empirical evidence demonstrating that such biases do not occur in this type of research. Specifically, Lahey and Heller (1985) showed that this frequently proposed response bias criticism of self-report stress/health research does not stand up empirically.

In sum, our attempt to conceptually replicate a number of moderator relations in the stress/health domain is consistent with current knowledge and methodologies in the field.

## METHOD

College students completed measures of life events, health, mood states, and three personality variables: perceived control, sense of humor, and irrational beliefs.

### Subjects

Undergraduates at Rice University participated in this study as an in-class demonstration of stress-health relations. There were 89 male and 70 female students in the sample.

### Procedure

At the beginning of an introductory psychology class, subjects completed the following measures.

**Stress.** We adapted the Life Experiences Survey (Sarason et al., 1978). This instrument consists of 60 life events that lead to change in the lives of those who experience them. Our adaptation chiefly concerns the instructions given subjects for responding to the items. The original instrument instructs subjects to check items that they experienced during the last 6 months and those experienced between 7 months and 1 year ago. Subjects also are asked to rate the degree to which each event experienced had either positive or negative impact on their lives. In this study, we instructed subjects to rate each event experienced during the past year for positive and negative impact. The following example was given to illustrate the possibility that an event might have both positive and negative impact.

When people retire from work, they usually enjoy the freedom they have to spend their time as they like. That's positive. In many cases, though, they miss their work or their friends at work. That's negative. So retirement can have both positive and negative impact.

Each item was rated twice, once for positive impact and once for negative impact. Ratings were on 4-point scales anchored at *no impact* (0) and *extreme impact* (3). Subjects also were instructed to check a "didn't occur" column for events not experienced. This column was included so that, in the case of an item not rated on the impact scales, we could determine whether the subject had simply overlooked the item.

Four of the original items were omitted, due to the possibility of confounding with the concurrent measures of health and mood (Schroeder & Costa, 1984). These were Item 35, "Major personal illness or injury," and

open-ended Items 48-50, "Other recent experiences which have had an impact on your life."

**Affect.** We administered the Multiple Affect Adjective Check List (MAACL; Zuckerman, 1960; Zuckerman, Lubin, Vogel, & Valerius, 1964). This measure consists of lists of adjectives grouped into three subscales assessing depression, hostility, and anxiety, respectively. Subjects were instructed to indicate whether or not each adjective described how they had been feeling over the last month, in general. These three affective measures correlated highly with each other (average  $r = .71$ ) and produced similar results in preliminary analyses. Therefore, a summed z-score composite MAACL score was created for use in all subsequent analyses.

Subjects also completed the short form of the Beck Depression Inventory (BDI; Beck & Beck, 1972), which consists of 13 items measuring current degree of depression.

**Physical health.** Subjects indicated how many colds they had had so far that semester (approximately 10 weeks). Subjects also were asked how often during the past week they had experienced each of the following: indigestion, headache, and insomnia. Incidences of colds, indigestion, and headaches were significantly but moderately related (average  $r = .27$ ); a summed z-score composite sickness measure was created for subsequent analyses. Insomnia was not related to sickness ( $r = .06$ ), and so was kept as a separate dependent measure. Finally, subjects rated their overall health, ranging from *very poor* (1) to *excellent* (7), during the last 6 months as a measure of wellness.

**Humor.** The Coping Humor Scale (Martin & Lefcourt, 1983), which measures a person's use of humor to cope with stressful events, was administered.

**Perceived control.** Subjects indicated on 7-point scales, ranging from *no control* (1) to *total control* (7), the degree of control they had had during the last year over the following six aspects of their lives: living environment, relations with others, financial state, academic program, health, and mood. Note that the last two items might produce an artificial confounding with the dependent measures. However, when analyses were conducted with these items removed from the measure of control, virtually no change in results or conclusions appeared. Therefore, all items were retained in the analyses reported in this article.

**Irrational beliefs.** A measure of irrational (or dysfunctional) beliefs was created, based on the work of Ellis (1977) and of Woolfolk and

Richardson (1978). Subjects rated their agreement with six such beliefs on 7-point scales ranging from *totally disagree* (1) to *totally agree* (7). The items were: (a) in order to be truly happy, I must prove that I am thoroughly adequate and achieving in most things I attempt; (b) everyone is basically equal and as good as anyone else, but in the real world you have a "market value" that determines most of your happiness; (c) in order to feel like a worthwhile person, I must tell myself things such as "I *will* be recognized as a success in my chosen career" or "I *do* measure up"; (d) only highly talented or superior individuals can get the deepest kind of satisfaction out of their work; (e) I become upset when I fail to live up to the expectations that others have of me; (f) people must achieve their full potential for happy and worthwhile living, else they have little value as humans.

One week after completion of these measures, the results of the study were shared with the subjects, accompanied by a discussion of the theoretical relations among the variables, and of current knowledge about stress-management strategies.

## RESULTS

Preliminary analyses revealed no consistent or reliable effects of subject sex; it was therefore dropped from subsequent analyses.

### Moderator effects

A series of regression analyses was performed to see if there was any evidence that the effects of negative stress on health were moderated by coping behavior, personal control beliefs, irrational beliefs, or positive stress. Such moderator effects would be seen as interactions between negative stress and the moderating variables. For each of the five health measures and for each of the four proposed moderators we assessed the main effects of negative stress and the moderator, and their interaction. Because there are 20 resulting interaction tests (i.e., tests of moderator models), the Bonferroni solution to insuring that the overall Type I error rate was .05 required adjusting the significance level to .0025. The results, presented in Table 1, were that none of the interactions met this criterion. There was no evidence that any of the four proposed moderators affected the negative stress/health relation.

One could argue that our criterion (.0025) was too stiff, given that there is some a priori reason to expect negative stress by moderator interactions to occur. But, even if the truth is that moderator effects do not occur with these variables, we should not be surprised to find several significant interactions at .05. Further, if the null hypothesis is true, we would expect

TABLE 1  
 Predictability of Health: Overall R<sup>2</sup>, Main Effects, and Interactions of Negative Stress and Four Potential Moderators

| Health Measure | Moderator Model |                |                 |                   |                  |                |                 |                   |                    |                |                 |                   |                 |                |                 |                   |
|----------------|-----------------|----------------|-----------------|-------------------|------------------|----------------|-----------------|-------------------|--------------------|----------------|-----------------|-------------------|-----------------|----------------|-----------------|-------------------|
|                | Coping Humor    |                |                 |                   | Personal Control |                |                 |                   | Irrational Beliefs |                |                 |                   | Positive Stress |                |                 |                   |
|                | R <sup>2</sup>  | N <sup>a</sup> | CH <sup>b</sup> | N×CH <sup>c</sup> | R <sup>2</sup>   | N <sup>a</sup> | PC <sup>b</sup> | N×PC <sup>c</sup> | R <sup>2</sup>     | N <sup>a</sup> | IB <sup>b</sup> | N×IB <sup>c</sup> | R <sup>2</sup>  | N <sup>a</sup> | PS <sup>b</sup> | N×PS <sup>c</sup> |
| MAACL          | .181            | .001           | .01             |                   | .219             | .001           | .001            |                   | .147               | .001           | .03             |                   | .120            | .001           |                 |                   |
| BDI            | .188            | .001           | .01             |                   | .315             | .001           | .001            |                   | .162               | .001           |                 |                   | .154            | .001           |                 |                   |
| Sickness       | .187            | .001           |                 |                   | .223             | .001           | .01             |                   | .201               | .001           |                 | .03               | .192            | .001           |                 | .04               |
| Wellness       | .145            | .001           |                 | .02               | .283             | .01            | .001            |                   | .109               | .001           |                 |                   | .108            | .001           |                 |                   |
| Insomnia       | .086            | .03            |                 | .01               | .070             |                | .05             |                   |                    |                |                 |                   | .049            | .04            |                 |                   |

Note. Only effects significant at .05 (unadjusted) are listed.

<sup>a</sup>Main effects of negative stress, *p* < the value listed. <sup>b</sup>Main effects of proposed moderators, *p* < the value listed. <sup>c</sup>Interaction (moderating) effects, *p* < the value listed.

those interactions that do appear marginally significant to sometimes support the underlying theory and to sometimes contradict the theory.

As shown in Table 1, 4 of the 20 interactions were significant by the standard unadjusted criterion level,  $p < .05$ . Interestingly, three of these were actually in the wrong direction. First, the negative stress by irrational beliefs interaction for sickness showed that those who had the most irrational beliefs were essentially unaffected by negative stress, whereas those without irrational beliefs reported more sickness when they experienced lots of negative stress than when they experienced little or no such stress.

Second, the negative stress by humor interaction for wellness was also in the wrong direction. Those who scored highly on coping humor reported lower levels of wellness when they had experienced much stress than when they had experienced little stress; those who were low on coping humor revealed no stress/wellness relation.

Third, the negative stress by positive stress interaction for sickness contradicted the findings of the one directly relevant study (Cohen & Hoberman, 1983). Specifically, those with high positive stress showed a stronger negative stress/sickness relation than did those with low positive stress.

Only the negative stress by humor interaction for insomnia was in the right direction. Overall, then, the results of the Bonferroni adjusted tests and examination of the four marginally significant interactions yielded little evidence of moderator effects in these data.<sup>1</sup>

### Main Effects

Null results are always hard to interpret, because they could result from many sources irrelevant to the hypothesis being tested. For instance, poor or unreliable measures could be the culprit. One way of addressing this issue is to assess the reliabilities of the various measures, when possible. A second way is to see if the measures relate to other variables in predictable ways.

Table 1 includes the results of main effect analyses of the negative stress and moderator models, and the squared multiple correlations (% variance explained) of these models of health. Several fascinating results appeared. First, note the frequency with which negative stress contributed significant unique increments to the prediction of health. These increments were quite

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<sup>1</sup>We also assessed moderator effects with models that included positive stress. Specifically, we computed an overall stress score by summing positive and negative stress. Once again, none of the moderator effects was significant by the Bonferroni criterion; three marginally significant effects emerged; two of these were in the wrong direction. This further supports the view that positive stress is unrelated to health and that there are no real moderator effects in these data.

reliable (beyond the Bonferroni adjusted  $p$  level of .0025) in almost every case. These main effects were that better health was associated with less negative stress. Second, note that most of the health measures were well predicted by the various models. Only insomnia was not well accounted for by the models. Third, the main effects of coping humor, irrational beliefs, and positive stress were quite weak. Indeed, none of them were significant according to the Bonferroni adjusted criterion. Finally, note that beliefs in personal control yielded consistently strong main effects, except for insomnia. People with beliefs in greater personal control had less negative affect (MAACL), were less depressed (BDI), reported less sickness, and more overall wellness. Indeed, the combination of knowing a person's negative stress and control led to models that predicted over 20% of the variance in all the health measures except insomnia.

To get a better idea of the reliability of these measures and their interrelationships, we constructed a correlation matrix that included the alpha indices of reliability on the diagonal. Table 2 presents these results. First note that the measures have acceptable reliabilities (except insomnia and wellness, for which alpha cannot be calculated because each contains only one item). Thus the failure to find reliable moderating effects cannot simply be attributed to unreliable measures. The various measures also tended to correlate with each other in meaningful ways, lending some credibility to their validity. For instance, irrational beliefs correlated with negative affect,  $r = .24, p < .01$ ; depression,  $r = .19, p < .02$ ; and negative stress,  $r = .23, p < .01$ .

Insomnia emerged as the most suspect measure for several reasons. It did not correlate with other health measures that were expected to be related (i.e., sickness, which is composed of colds, headaches, and digestive problems, and overall wellness). It was based on a single item, which precluded reliability assessment. As shown in Table 1, it was the least predictable health measure. The only variable that correlated strongly with insomnia was depression. The fact that insomnia was perhaps the least valid (or reliable) measure further reinforces the conclusion that there were no significant moderator effects; the only interaction that was in the right direction and that was at least marginally significant was with insomnia as the criterion variable.

## CONCLUSION

Our results do not, indeed they cannot, conclusively demonstrate that moderator effects do not occur in the stress/health relation. Other variables, such as social support or hardiness, may prove to be powerful moderators. Moderator effects with the current variables may occur with

TABLE 2  
Intercorrelations and Reliabilities of Stress, Health, and Potential Moderator Variables

|                    | <i>Negative Stress</i> | <i>MAACL</i> | <i>BDI</i> | <i>Sickness</i> | <i>Insomnia</i> | <i>Wellness</i> | <i>Humor</i> | <i>Personal Control</i> | <i>Irrational Beliefs</i> | <i>Positive Stress</i> |
|--------------------|------------------------|--------------|------------|-----------------|-----------------|-----------------|--------------|-------------------------|---------------------------|------------------------|
| Negative stress    | .75                    | .34**        | .38**      | .41**           |                 | -.32**          |              | -.23*                   | .23*                      | .45**                  |
| MAACL              |                        | .88          | .61**      |                 |                 | -.31**          | -.23*        | -.38**                  | .24*                      |                        |
| BDI                |                        |              | .83        |                 | .25*            | -.42**          |              | -.48**                  |                           |                        |
| Sickness           |                        |              |            | .52             |                 | -.45**          |              | -.31**                  |                           | .24*                   |
| Insomnia           |                        |              |            |                 | —               |                 |              | -.22*                   |                           |                        |
| Wellness           |                        |              |            |                 |                 | —               |              | .48**                   |                           |                        |
| Humor              |                        |              |            |                 |                 |                 | .65          |                         |                           |                        |
| Personal control   |                        |              |            |                 |                 |                 |              | .62                     |                           |                        |
| Irrational beliefs |                        |              |            |                 |                 |                 |              |                         | .73                       |                        |
| Positive stress    |                        |              |            |                 |                 |                 |              |                         |                           | .69                    |

*Note.* Only correlations that were significant at .01 are reported. Diagonal elements are reliabilities (alpha) based on our study. Insomnia and wellness are based on single item ratings; therefore, alpha cannot be computed.

\* $p < .01$ . \*\* $p < .001$ .

different populations (e.g., older, more illness-prone individuals), or with different health measures. In addition, more complex moderator models may prove useful. For example, Folkman (1984) has argued cogently for a more complex model of personal control, coping, and stress that takes into account variables such as accuracy of control appraisals and costs associated with control attempts.

But, our data suggest several specific conclusions. First, there appears to be little evidence that positive stress affects health even when the methodological improvements discussed earlier are implemented. Although based on null results, the fact that the negative stress effects were assessed in the same way and still produced powerful effects justifies this conclusion. Second, sex effects also appeared weak or nonexistent. Third, the powerful main effects of personal beliefs in control on health (both psychological and physical) were quite impressive and lend further support to the idea that control issues are critical in a wide variety of domains (see Anderson & Arnoult, 1985a, 1985b; Arkin & Baumgardner, 1985; Fiske & Taylor, 1984; Pittman & D'Agostino, 1985).

Finally, we wish to reemphasize the need for more replication studies and greater attention to the possibility of Type I errors in this domain. Of course, it is also possible that our findings are random departures from the truth. Only further replications and extensions can reveal the truth. However, our call for more research can result in more accurate understandings only if the reporting and publication biases against null results can be reduced. This is true for all areas of psychology, of course, not just the stress/health area. Greenwald (1975) has offered several important suggestions concerning "How to accept the null hypothesis gracefully." We urge others to reconsider his suggestions (as we have done) and to begin to attack the bias against the null hypothesis.

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